TOWN OF NEWMARKET

WATER AND WASTEWATER MASTER PLAN

MASTER PLAN REPORT

MARCH 2017

WSP

XCG

Environmental Engineers & Scientists

WATER AND WASTEWATER MASTER PLAN

MASTER PLAN REPORT

Town of Newmarket

WSP Project No.: 151-04561-00
Date: March 2017

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1 INTRODUCTION

1.1 PROJECT DESCRIPTION

The Corporation of the Town of Newmarket has retained WSP to undertake a Water and Wastewater Master Plan to identify the required improvements and/or expansion to the Town's water distribution and wastewater collection systems to support existing and proposed growth within the Town, including the intensification of the Urban Centres Secondary Planning Area. The Master Plan will be a long-term plan for system improvements to meet servicing demands to 2041.

The Ontario Provincial Government enacted the Places To Grow Act in 2005 to help plan for growth and development by giving the authority to designate growth plan areas and develop growth plans. Under the Places To Grow Act, the Growth Plan for the Greater Golden Horseshoe was approved (June 16, 2006, as amended in 2012 and 2013), A key component of the Growth Plan for the Greater Golden Horseshoe is the population and employment growth forecasts, including those established for York Region, which encompasses nine local municipalities including the Town of Newmarket.

The Master Plan addresses the system improvements only related to the Town of Newmarket's local water distribution and wastewater collection systems, as the Regional Municipality of York (York Region) is responsible for providing water and wastewater treatment, pumping as well as water storage for the Town's local water distribution and wastewater collection systems.

All recommended infrastructure improvements and/or expansions to the Town's local water and wastewater systems will be located within the Study Area, as illustrated in Figure 1-1. The Urban Centres Secondary Planning Area is where most of the future population growth for Newmarket will be located. Hence, the Urban Centres Planning area is expected to have the greatest impact on the future infrastructure.

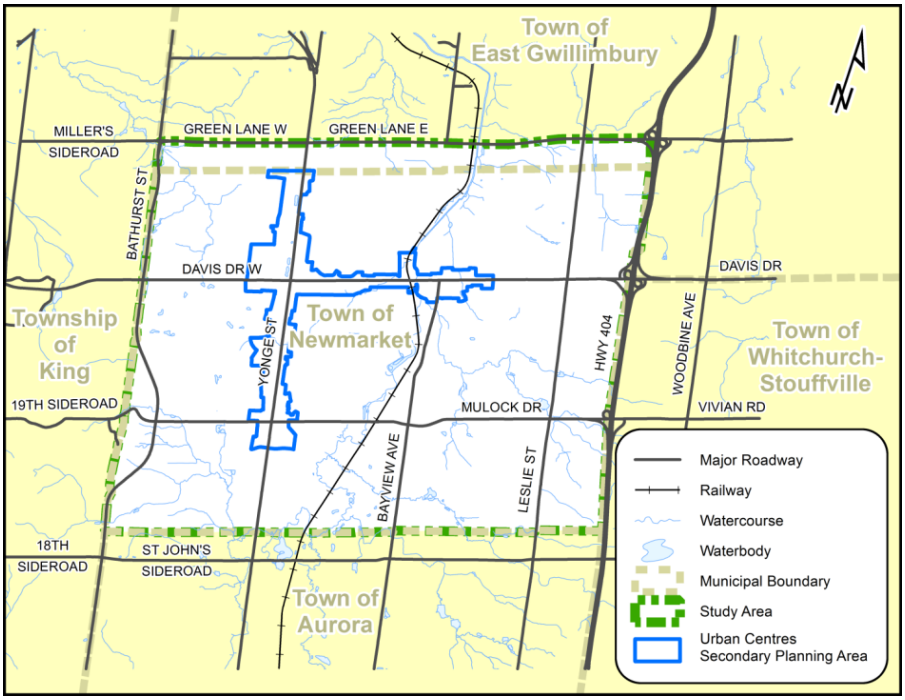


Figure 1-1 Study Area

1.2 BACKGROUND STUDIES & REPORTS

The following documents were reviewed for pertinent information during the development of the Master Plan:

- Town of Newmarket Official Plan (Meridian Planning Consultants, Sept 2014)
- Newmarket Urban Centres Secondary Plan, OPA #10, Office Consolidation (Town of Newmarket, Oct 25, 2016)
- York Region Water and Wastewater Master Plan Update (York Region, 2016)
- York Region Water and Wastewater Master Plan Update (GENIVAR/XCG, November 2009)York Region Employment and Industry Report 2013 (York Region, Mar 2014)
- York Region Employment and Industry Report 2014 (York Region, April 2015)
- Town of Newmarket Development Charges Background Study (Hemson Consulting Ltd., Sept 2014)
- Newmarket Population Projections/Growth Areas Memorandum (Town of Newmarket, May 2015)
- Town of Newmarket Census Data (Statistics Canada, 2011)
- Town of Newmarket Engineering Design Standards and Criteria (Town of Newmarket, Feb 2015)
- Functional Servicing Report Northwest Newmarket (Schaeffers Consulting Engineers, Jan 2005)
- Armitage Valley Southwest Newmarket Secondary Plan Master Servicing Update (Schaeffers Consulting Engineers, May 2001)
- Long Term Water Conservation Strategy and Inflow and Infiltration Reduction Strategy Annual Report (York Region, Mar 2015)
- Newmarket Development and Infrastructure Services Report Engineering Services (Town of Newmarket, April 2015)
- Active Transportation Network Summary Report (planningAlliance, Mar 2014)
- Town of Newmarket Master Sanitary Sewer Hydraulic Study (R.V. Anderson Associates Limited, May 2008)
- Town of Newmarket Urban Centres Transportation Study (GHD, May 2013)

1.3 CLASS ENVIRONMENTAL ASSESSMENT PROCESS

Class Environmental Assessments (EAs) were approved by the Minister of the Environment in 1987 for municipal projects, including water and wastewater/stormwater projects, having predictable and preventable impacts. The Municipal Class EA document was revised and updated in 1993, 2000, 2007, 2011 and again in 2015. The Class EA approach streamlines the planning and approvals process for municipal projects which have the following characteristics:

- Recurring
- Similar in nature
- Usually limited in scale
- Predictable range of environmental impacts
- Environmental impacts are responsive to mitigation

This Master Plan is prepared in accordance with the requirements of the *Municipal Class Environmental Assessment* document prepared by the Municipal Engineers Association (MEA) (October 2000, as

amended in 2007, 2011 and 2015). The Municipal Class Environmental Assessment document outlines the procedures to be followed to satisfy Class EA requirements for municipal infrastructure projects. The process includes five phases:

- Phase 1: Problem Definition
- Phase 2: Identification and Evaluation of Alternative Solutions to Determine a Preferred Solution
- Phase 3: Examination of Alternative Methods of Implementation of the Preferred Solution
- Phase 4: Documentation of the Planning, Design and Consultation Process
- Phase 5: Implementation and Monitoring

The Class EA process flowchart is provided in Figure 1-2.

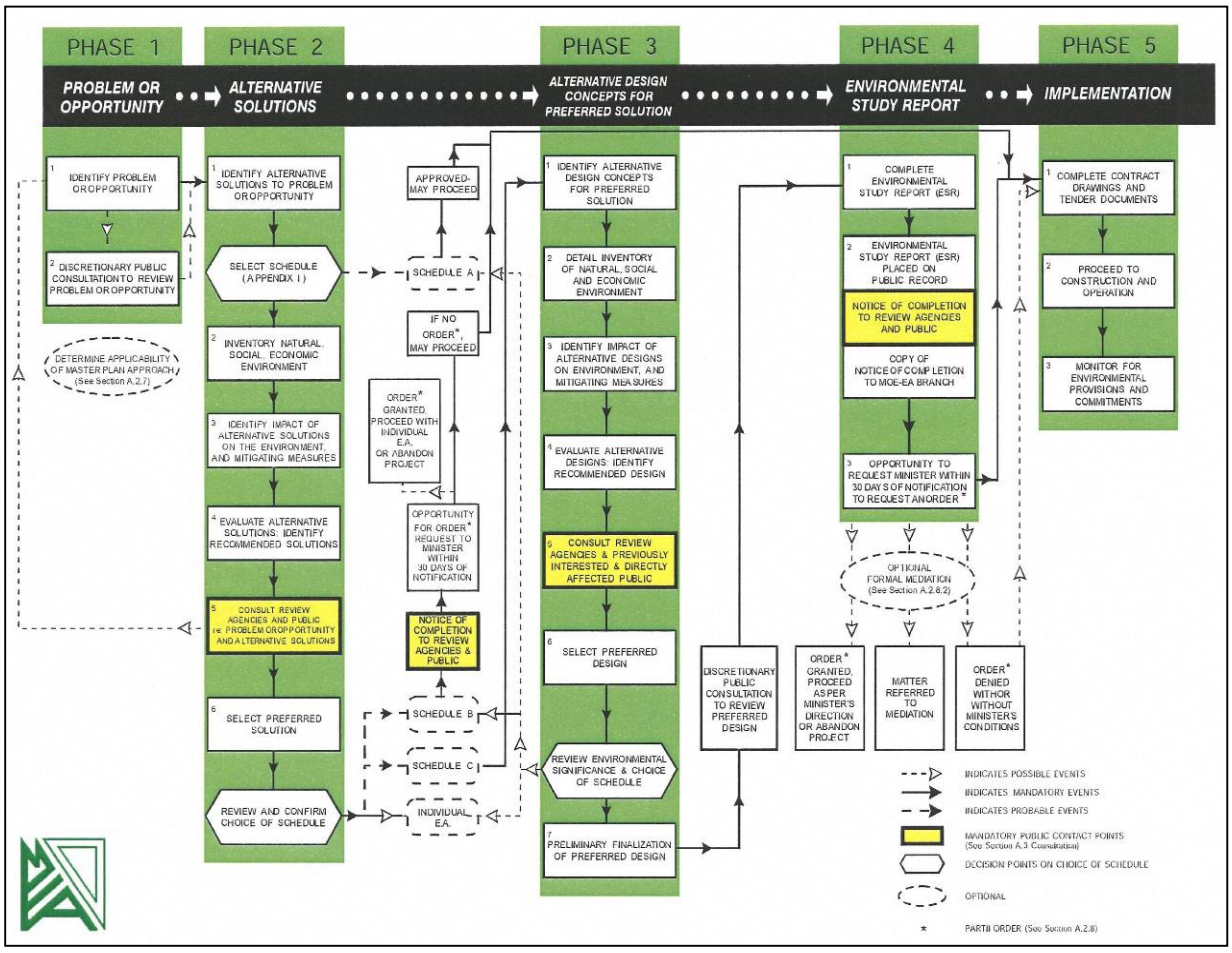


Figure 1-2 Municipal Class EA Process

Public and agency consultation are integral to the Class EA planning process. Projects subject to the Class EA process are classified into four possible Schedules depending on the degree of expected impacts. Albeit the process for selecting which Schedule ought to be used for a particular project is proponent driven, there is a general guideline for how projects are categorized into the four schedules. The *Municipal Class Environmental Assessment* document provides listings of which projects are categorized under each schedule. The following provides some general characteristics of the projects categorized under each schedule.

Schedule A

- These projects generally include normal or emergency operational and maintenance activities.
- The environmental effects of these activities are usually minimal and, therefore, these projects are pre-approved.
- Typical projects that follow a Schedule A process will be the construction of watermains and sewers within existing road allowances where no watercourse crossings are required.

Schedule A+

- In 2007, the MEA introduced the Schedule A+ classification. These projects are pre-approved; however, the public is to be advised prior to project implementation. The manner in which the public is advised is to be determined by the proponent.

Schedule B

- These projects generally include improvements and minor expansions to existing facilities.
- There is the potential for some adverse environmental impacts as a result of implementing these projects and, therefore, the proponent is required to proceed through a screening process including consultation with those who may be affected.
- Typical projects that follow a Schedule B process will include: projects requiring watercourse crossings, watermains and sewers outside of existing road allowances, pumping stations and reservoirs.
- These projects require completion of Phases 1 & 2 of the MEA Class EA process.

Schedule C

- These projects generally include the construction of new facilities and major expansions to existing facilities.
- Typical projects that follow the Schedule C process include the expansion of existing or construction of new Water and Sewage Treatment Facilities.
- These projects require completion of Phases 1 through 4 of the MEA Class EA process

1.3.1 MASTER PLAN PROCESS

Master Plans are long-range plans that identify infrastructure requirements for existing and future land use within a larger study area through the application of environmental assessment principles. There are several approaches to undertaking Master Plans; however, a general requirement of all Master Plan studies is that they satisfy Phase 1 and part of Phase 2 of the Class EA process. The Town of Newmarket is completing this Master Plan using Approach No. 1 of the MEA Class EA process, whereby the study is conducted at a broad level of assessment and in which site-specific Class EA's for all recommended Schedule B and Schedule C projects are to be completed in the future, closer to the time of the projects' implementation. By using this approach, the final Master Plan produced will serve as a 'roadmap' for implementing future recommended infrastructure projects. More project-specific Class EA work will have to be completed on the future Schedule B and C projects identified within the Master Plan.

This Master Plan will be used as an overall guide for planning and implementing infrastructure within the Town of Newmarket. The identification of infrastructure projects within the Master Plan will serve as the justification for implementing infrastructure, in the case of Schedule A and A+ projects, and for carrying on with additional Class EA work, in the case of Schedule B and C projects. The Class EA schedule requirements for all recommended infrastructure projects will therefore be identified as part of the Study.

In general, it is recommended that a Master Plan be reviewed every 5 years, regardless of the approach followed, to determine the need for updating infrastructure recommendations. Potential changes that may trigger the need for a detailed review include: major changes to original inputs including planning projections, significant new environmental effects, and, major changes in proposed timing of projects within the Master Plan.

2 STUDY OBJECTIVES

2.1 OPPORTUNITY STATEMENT

The Master Plan is being undertaken to identify and evaluate alternatives to provide water and wastewater servicing options for existing and future development, to 2041, in the Town of Newmarket, as planned for in the Official Plan, including OPA #10 (the Urban Centres Secondary Plan).

2.2 STUDY OBJECTIVE

The objective of the Master Plan is to identify the required improvements to the Town of Newmarket's water distribution and wastewater collection systems to support existing and future development, including the proposed growth in the Urban Centres Secondary Planning Area.

Some key aspects of the scope of work for the Master Plan include:

- Identifying existing deficiencies in both the water and wastewater networks;
- Identifying key peaking factors and demand rates;
- Determining future requirements of the water and wastewater distribution and collection systems;
- Establishing evaluation criteria;
- Proposing works to maintain or enhance water quality;
- Proposing water and wastewater servicing alternatives;
- Evaluating water and wastewater servicing alternatives;
- Preparing cost estimates for proposed infrastructure; and
- Preparing an infrastructure implementation phasing plan.

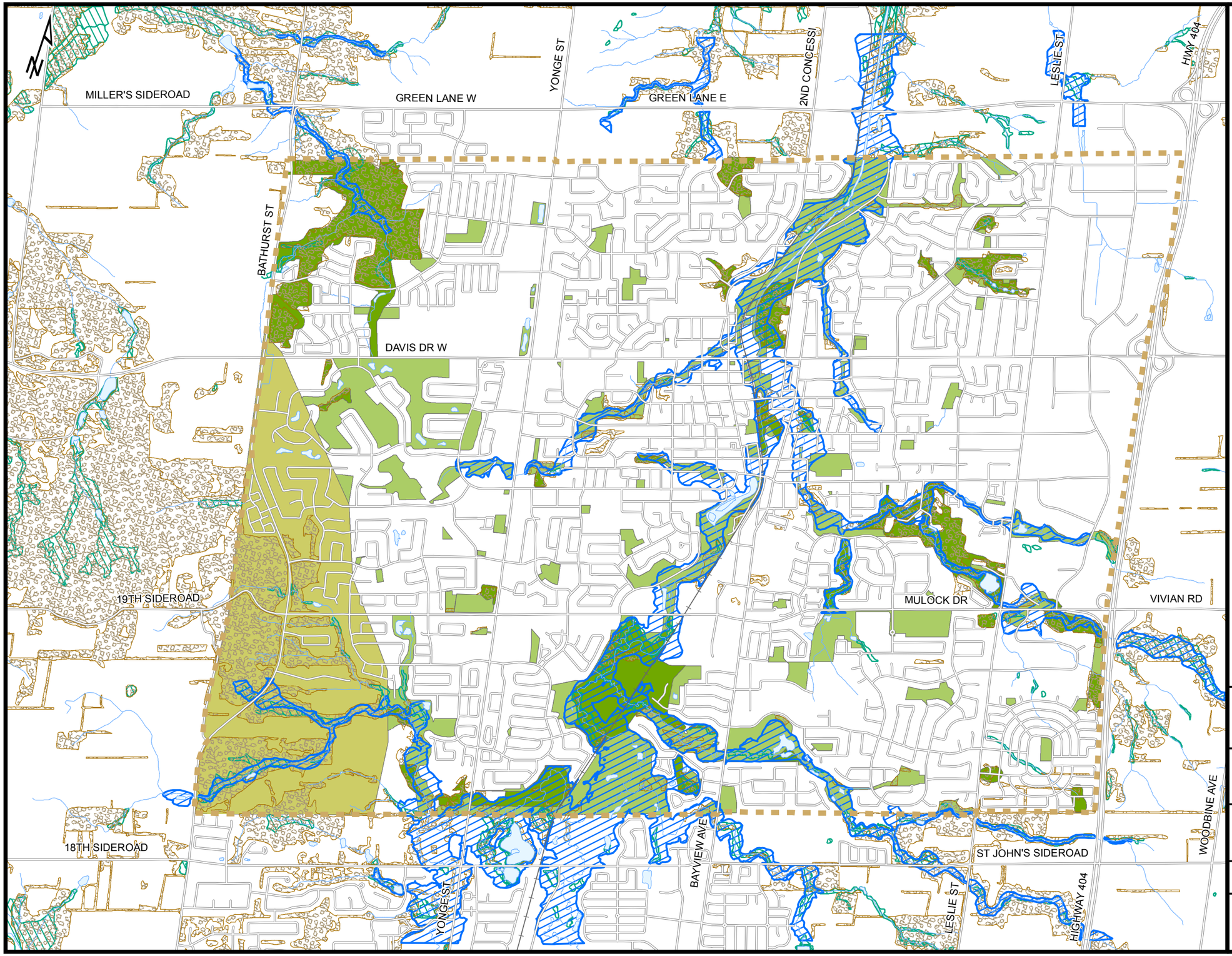
3 STUDY AREA

3.1 NATURAL FEATURES

The downtown Newmarket area is centered around Main Street on the west side of the East Holland River. The Study Area is located mostly within the East Holland watershed and partially within the West Holland watershed; both of which are subwatersheds of the Lake Simcoe watershed and are managed by the Lake Simcoe Region Conservation Authority (LSRCA).

The south west area of the Town is situated on the Oak Ridges Moraine, an environmentally sensitive geological landform that is protected under The Oak Ridges Moraine Conservation Act, 2001. The Act provides authority for the creation of the Oak Ridges Moraine Area and the Oak Ridges Moraine Conservation Plan.

The natural features of the Newmarket area are shown in Figure 3-1.



Legend

- Roadway
- Railway
- Waterbody
- Watercourse
- Town of Newmarket
- Floodplain
- Wooded Area
- Wetland
- Parks and Open Space
- Natural Heritage System
- Oak Ridges Moraine Area

WSP XCG

Newmarket Water and Wastewater Master Plan

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Figure 3-1

Town of Newmarket
Natural Features

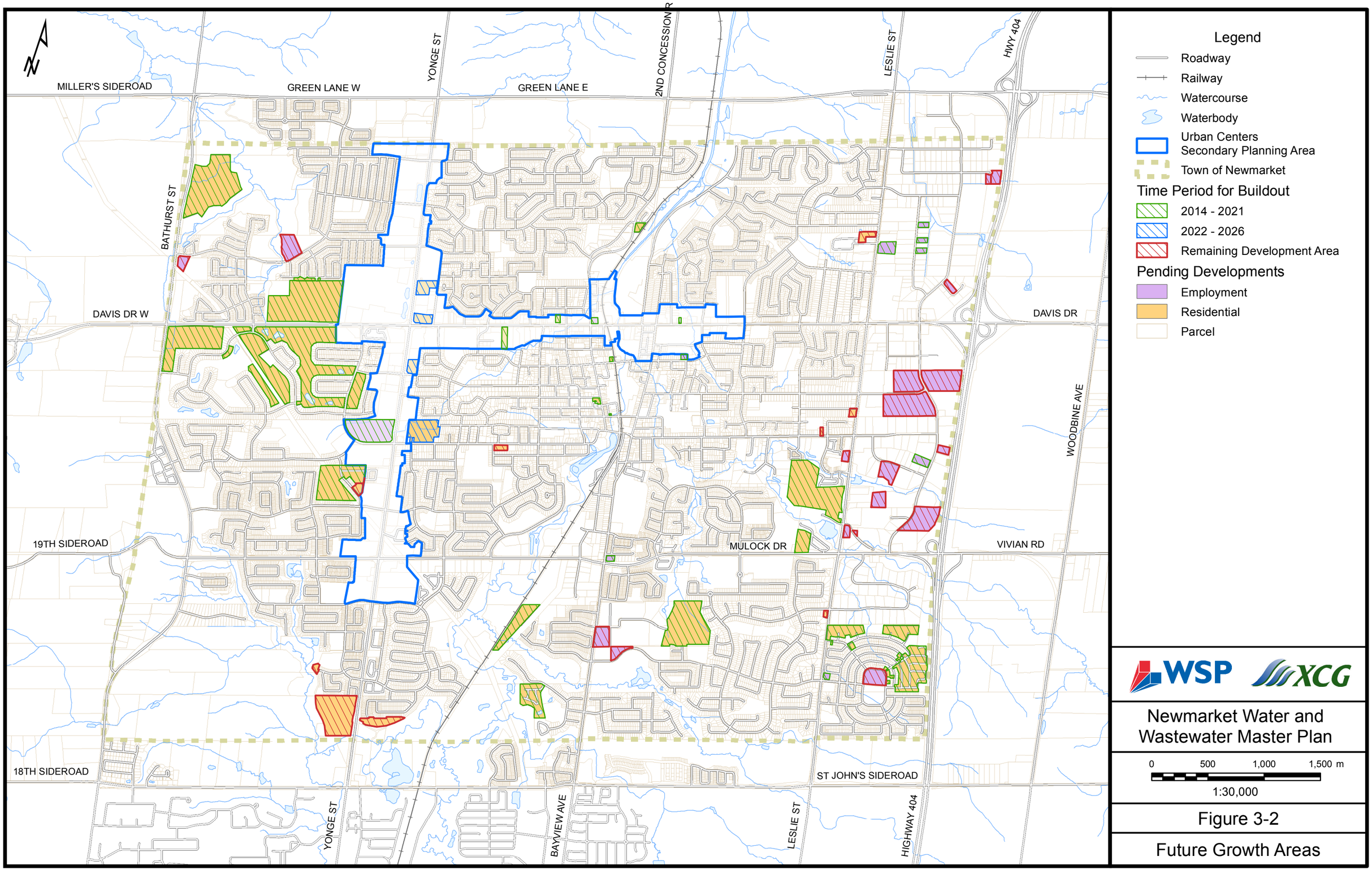
3.2 DEVELOPMENT AREAS

The future development areas for residential and employment growth and their respective buildout time periods are shown below in Figure 3-2. There is one main future development area that has been identified within the Study Area, the Urban Centres Secondary Planning Area. Additional details on the Urban Centres Secondary Planning Area are provided in Section 3.2.1.

3.2.1 URBAN CENTRES SECONDARY PLAN

The Urban Centres Secondary Plan was consolidated as Official Plan Amendment #10 to the Town of Newmarket's Official Plan in 2016 (Newmarket Urban Centres Secondary Plan, OPA #10, Office Consolidation, October 25, 2016).

The majority of growth in the Town of Newmarket is expected to come from the redevelopment of the Urban Centres Secondary Planning Area, generally located at the intersection of Yonge Street and Davis Drive. The area is approximately 290 ha (716 acres) in total and approximately 130 ha (321 acres) of this area is prime for redevelopment. The Urban Centres Secondary Plan is a planning document that guides how and where this development will take place, and supports a mix of development uses including residential, commercial, employment and institutional. The Plan identifies various building heights and densities to support the future mixed use development (Newmarket Urban Centres Secondary Plan, OPA #10, Office Consolidation, October 25, 2016).



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Newmarket Water and Wastewater Master Plan

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Figure 3-2

Future Growth Areas

3.3 POPULATION FORECAST

3.3.1 RESIDENTIAL

The residential population projections to 2041 are summarized in Table 3-1. Residential growth will occur in all areas; however, most of the development will occur within the Urban Centres Secondary Planning Area.

Table 3-1 Residential Population Forecast

YEAR INTERVAL	OUTSIDE URBAN CENTRES SECONDARY PLANNING AREA		WITHIN URBAN CENTRES SECONDARY PLANNING AREA	
	POPULATION GROWTH	CUMULATIVE POPULATION	POPULATION GROWTH	CUMULATIVE POPULATION
2014	-	86,315	-	2,700
2015-2021	8,129	94,444	492	3,192
2022-2026	400	94,844	2,590	5,782
2027-2031	169	95,013	5,603	11,385
2032-2036	169	95,182	5,603	16,988
2037-2041	169	95,351	5,603	22,591
Total (by Area)	**9,036**	**95,351**	**19,891**	**22,591**
Total Population Growth	**28,927**			
Total Population	**117,942**			

3.3.2 EMPLOYMENT

The employment population projections to 2041 are summarized in Table 3-2. Employment growth will occur in all areas; however, most of the development will occur within the Urban Centres Secondary Planning Area.

Table 3-2 Employment Population Forecast

YEAR INTERVAL	OUTSIDE URBAN CENTRES SECONDARY PLANNING AREA		WITHIN URBAN CENTRES SECONDARY PLANNING AREA	
	POPULATION GROWTH	CUMULATIVE POPULATION	POPULATION GROWTH	CUMULATIVE POPULATION
2014	-	27,276	-	17,416
2015-2021	190	27,466	1,659	19,075
2022-2026	224	27,690	465	19,540
2027-2031	285	27,975	465	20,005
2032-2036	285	28,260	3,000	23,005
2037-2041	285	28,545	3,000	26,005
Total (by Area)	**1,269**	**28,545**	**8,589**	**26,005**
Total Population Growth	**9,858**			
Total Population	**54,550**			

3.3.3 WATER AND WASTEWATER MODEL UPDATE

The water and wastewater models were updated using the residential and employment population projections for the analysis of the Town's water and wastewater systems to support the projected demands to the year 2041. The water and wastewater models were updated by determining the total population and associated demand for the nodes and manholes in the Town's water and wastewater systems, respectively,

that will be impacted by the population growth. The nodes and manholes that will be impacted by the population growth were identified based on the future development areas as shown in Figure 3-2. To update the water model, Thiessen polygons were created around all demand nodes using the pressure district boundaries as the outer limit. The Thiessen polygons were then used to determine the total population associated with the individual nodes by multiplying the contributing population areas by the respective projected population densities. Demands for each node were calculated using this population data and the approved water design criteria. To update the wastewater model, the manholes were similarly assigned populations according to their subcatchment areas, and the demands for each manhole were calculated using the population data and the approved wastewater design criteria. Lastly, the demand data for the nodes and manholes was imported into the water and wastewater models, respectively.

Further discussion on water and wastewater model development and validation is contained in Technical Memorandum No. 1 and Technical Memorandum No. 2, respectively, in Appendix B.

4 EVALUATION CRITERIA AND APPROACH

4.1 EVALUATION APPROACH

Several servicing alternatives have been developed and subsequently evaluated to determine the preferred approach to servicing the Town of Newmarket. Each alternative has been evaluated using the same set of criteria, outlined below in Table 4-1, which have been developed in order to consider the natural environmental, the social and cultural environment, the technical and operational suitability, and cost. The criteria have been included in an evaluation matrix to objectively assess the impacts of each alternative. The evaluation matrix is then used to conduct a comparative assessment of the alternatives to determine which solution has the least overall impact.

The approach used to determine the preferred servicing solution for each proposed future development area is explained below:

- **Step 1: Determine Evaluation Criteria** – Criteria upon which the alternatives will be evaluated was defined at the beginning of the process. As mentioned above, evaluation criteria for this project will include (1) natural environment considerations, (2) social and cultural environment considerations, (3) technical and operational suitability and (4) economic considerations. The individual impacts considered will typically fit into these four general categories. A breakdown of the impacts included under each criterion is defined in Table 4-1.
- **Step 2: Create an Evaluation System** – An evaluation system was then created, whereby each set of alternatives can be evaluated against. In order to be impartial, this system was developed prior to determining the potential impacts associated with each alternative. During the evaluation, each of the alternatives was assigned a colour rating: green for “most preferred”, yellow for “less preferred” and orange/red for “least preferred”, for each of the evaluation criterion. The colour rating reflected how the alternative performed with respect to that criterion. The four evaluation criteria categories were assigned equal weighting as they were considered to have equal importance in this evaluation.
- **Step 3: Document Potential Impacts** - The individual impacts associated with each alternative were determined and documented. These impacts were categorized under one of the four evaluation criteria described above, based on whether they impact the natural environment, social and cultural environment, the technical and operational suitability or cost. A matrix was created to document the impacts, weigh the alternatives qualitatively, and ultimately determine the preferred solution. The matrix has the alternatives listed by row and the evaluation criteria by column.

- **Step 4: Evaluate the Alternatives** - Each of the alternatives was assigned a colour rating for each of the four evaluation criteria using the methodology established in Step 2. The evaluation was based on a qualitative assessment of the individual impacts documented in the table created during Step 3. The colour green rating indicates that the alternative had a low impact (most preferred) with respect to that particular criterion. A yellow colour indicates a moderate impact (less preferred). An orange/red colour indicates that the alternative had a high impact (least preferred) with respect to that particular criterion.
- **Step 5: Determine the Preferred Alternative** - The servicing alternative with the least overall impact was recommended for implementation.

4.2 EVALUATION CRITERIA

The evaluation of each alternative will take into consideration any impacts to the natural environment, social and cultural environments, as well as technical and operational suitability and overall cost.

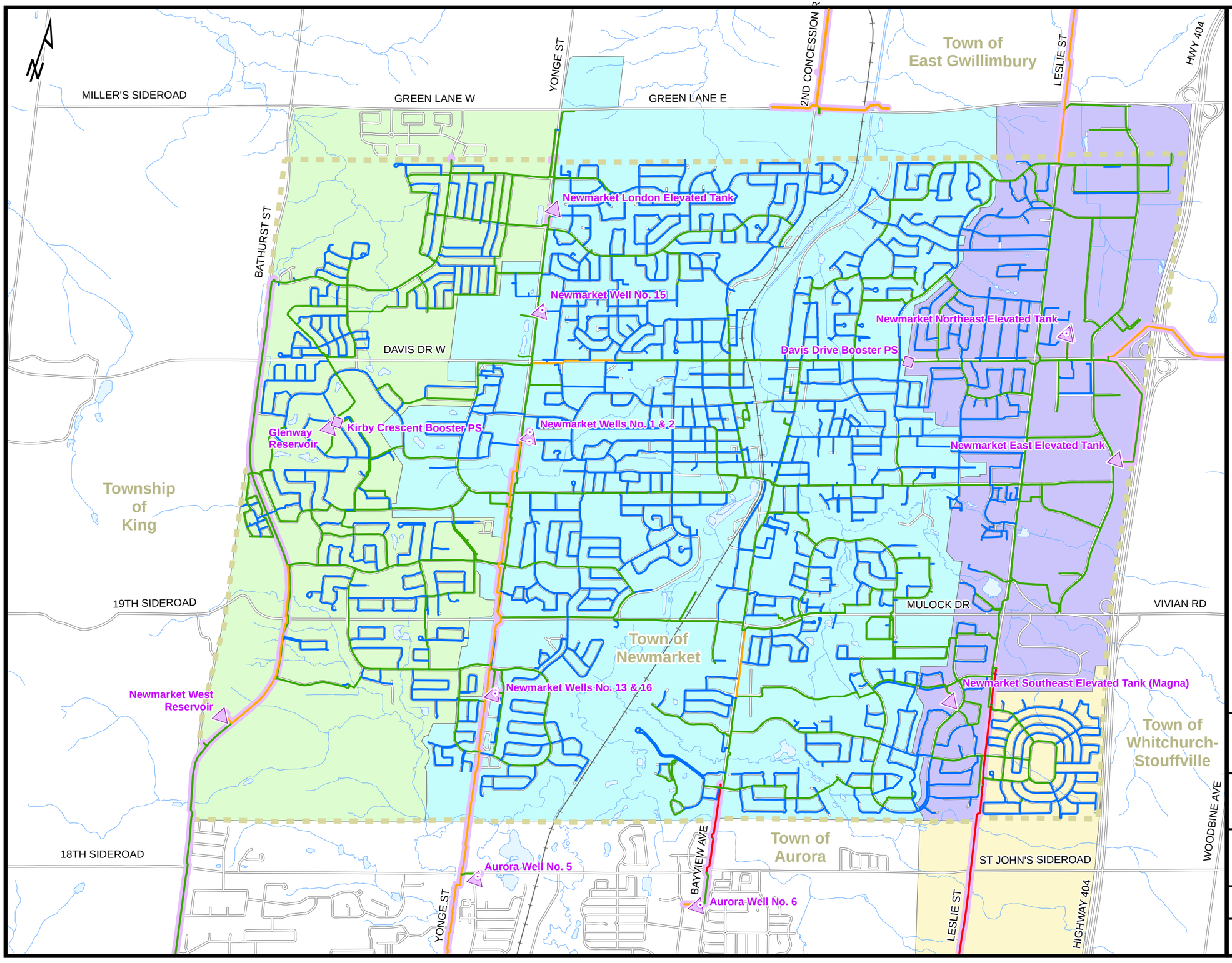
Table 4-1 Evaluation Criteria

CRITERIA	KEY CONSIDERATIONS
Natural Environment Considerations	Natural Features (including Woodlands, hedgerows or wetlands)
	Watercourses and Aquatics
	Natural Heritage Areas
	Areas of Natural and Scientific Interest (ANSI), Environmentally Sensitive Areas (ESA), provincially or locally significant wetlands
	Designated Natural Areas
Social and Cultural Environment Considerations	Archaeological and Cultural Features (including known archaeological sites, cultural areas or the potential for archaeological impacts)
	Designated Heritage Features
	Wells or Wellhead Protection Areas
	Consistency with Land Use Designations, Approved Development Plans and Proposed Land Use Changes
	Community Impacts During Construction (e.g. road access, visibility, noise)
Technical and Operational Suitability	Constructability (the potential for encountering difficulties during construction (e.g. geotechnical conditions, utility crossings, traffic impacts))
	Maintaining or Enhancing Drinking Water Quality
	Security and Performance of System
	Infrastructure Phasing
	Feasibility of Connection to Existing Infrastructure & Feasibility of Modifications Required to Existing Infrastructure
Economic Considerations	Total Capital Costs
	Operations and Maintenance Costs

5 WATER SERVICING

5.1 EXISTING CONDITIONS

The existing water distribution system in the Town of Newmarket is illustrated in Figure 5-1 and described in the subsections below.



Legend

- Production Well (Owned by Region)
- Pumping Station (Owned by Region)
- Water Storage (Owned by Region)

Watermain (Diameter mm)

- 0 - 200
- 201 - 400
- 401 - 600
- 601 - 900
- Watermain (Owned By Region)
- Roadway
- Railway
- Waterbody
- Watercourse
- Municipal Boundary

Pressure Districts

- Newmarket Central
- Newmarket East
- Newmarket West
- Aurora East Reduced

WSP XCG

Newmarket Water and Wastewater Master Plan

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Figure 5-1

Existing Water System

5.2 WATER SYSTEM DESIGN CRITERIA

5.2.1 EXISTING AND FUTURE WATER DEMAND RATES

The criteria used to calculate the projected water demands for the Town of Newmarket are documented in Table 5-1. The criteria in the Town's Engineering Design Standards (Town of Newmarket, February 2015) were considered; however, the average day flow and peaking factors used in the Town's Master Plan were derived from historical data for the Town's existing water distribution system and were found to be aligned with, the criteria used for the base year in York Region's current Water and Wastewater Master Plan. The historical data includes the Town's average day flows between 2012 and 2014, and the ten max day and associated peak hour flows for each year between 2012 and 2014. The historical data including the water design criteria calculations is included in Appendix A.

Table 5-1 Water Design Criteria

	YORK REGION'S WATER AND WASTEWATER MASTER PLAN (2009)	2015 NEWMARKET ENGINEERING DESIGN STANDARDS	NEWMARKET WATER AND WASTEWATER MASTER PLAN
Average Day (L/cap/day)	220	300	220
Maximum Day Factor	1.7	2.0	1.7
Peak Hour Factor	2.5	3.0	2.5

In addition, the ultimate conditions scenario (to 2041) for the water distribution system was evaluated based on the required fire flow criteria, as shown below in Table 5-2. The Town's fire flow criteria for the various development types has generally increased over time and as such, the Town's watermains have been sized according to the criteria at the time of installation. The Town's fire flow criteria was modified in consultation with the Town to better reflect the fire flows required for the types of developments found within the Town of Newmarket.

Table 5-2 Required Fire Flow Criteria

DEVELOPMENT TYPE	2015 NEWMARKET ENGINEERING DESIGN STANDARDS	NEWMARKET WATER AND WASTEWATER MASTER PLAN FIRE FLOW CRITERIA
Detached and Semi-Detached Dwellings	7,000 L/min (117 L/s)	5,400 L/min (90 L/s)
Townhouses	10,000 L/min (167 L/s)	10,000 L/min (167 L/s)
Apartments	15,000 L/min (250 L/s)	15,000 L/min (250 L/s)
Industrial/Commercial	15,900 L/min (265 L/s)	N/A
Industrial	N/A	15,900 L/min (265 L/s)
Commercial/Institutional	N/A	10,000 L/min (167 L/s)

5.3 WATER SERVICING ALTERNATIVES

MODELING OF EXISTING SYSTEM

The Town's water model was updated prior to conducting an analysis of the water distribution network for the Master Plan. The Town's model was based on 2006 census information and had been updated with developments that had come online to the 2010 timeframe. During the development of the Master Plan, the base model was updated to reflect the existing (2014) water distribution network using GIS files for the Town's water infrastructure. Furthermore, the Region's boundary conditions and planned upgrades and associated demands in Holland Landing and Aurora were added to the model. After the required updates to the Town's model were completed, an analysis of the water distribution network to support existing conditions and the projected demands to the year 2041 was conducted.

Discussion on model development and validation is contained in Technical Memorandum No. 1 in Appendix B.

5.4 WATER SUPPLY, TREATMENT AND STORAGE

The Regional Municipality of York is responsible for providing water supply, treatment, storage as well as transmission to the Town of Newmarket's local water distribution system. The existing and future water supply, treatment and storage infrastructure is planned for through the Region's Water and Wastewater Master Plan. Since the Town is responsible for the distribution of water to residents and businesses, the Master Plan will focus on planning for the Town's local water distribution system to support existing conditions and future growth to 2041. Alternatives related to water supply, treatment and storage will not be developed as part of the Town's Master Plan.

5.4.1 WATER DISTRIBUTION

As identified through the modeling exercise, Table 5-3 lists the deficiencies in the existing water distribution system and the proposed improvements. The list of deficiencies is limited to the water modeling results which do not indicate all operational issues and do not take into consideration the age and condition of existing infrastructure or fire hydrant location/coverage.

Table 5-3 Existing and Future Water System Deficiencies

ITEM	STREET NAME	EXTENT	DEFICIENCY	DETAIL OF DEFICIENCY	PROPOSED IMPROVEMENT
W1	Bristol Road	Main Street North to Stiver Drive	Fire flow less than current standard	Modeled fire flow less than 116 L/s	Increase diameter to 300 mm
W2	Main Street North	From Regional Main to Bristol	Inconsistent watermain velocity/size	Existing 200 mm watermain inconsistent with connecting 300 mm watermain proposed on Bristol Road	Increase diameter to 300 mm
W3	George Street	Kingston Road to Davis Drive	Fire flow less than current standard	Modeled fire flow less than 265 L/s	Increase diameter to 200 mm
W4	Willow Lane	From existing 250 mm WM to Longford Drive	Inconsistent watermain velocity/size	Existing 150 mm watermain inconsistent with connecting 250 mm watermain	Increase diameter to 250 mm
W5	Huron Heights Drive	Davis Drive to existing 200 mm WM	Fire flow less than current standard	Modeled fire flow less than 265 L/s	Increase diameter to 200 mm
W6	Willstead Drive	Queen Street to Davis Drive	Fire flow less than current standard	Modeled fire flow less than 116 L/s	Increase diameter to 200 mm
W7	Queen Street	Millard Avenue to Parkside	Fire flow less than current standard	Modeled fire flow less than 167 L/s	Increase diameter to 200 mm
W8	Parkside Drive	Queen Street to existing 200 mm WM	Fire flow less than current standard	Modeled fire flow less than 265 L/s	Increase diameter to 200 mm
W9	Calgain Road	Lorne Avenue to End	Fire flow less than current standard	Modeled fire flow less than 250 L/s	Increase diameter to 200 mm
W10	Lorne Avenue	Davis Drive to Calgain Road	Fire flow less than current standard	Modeled fire flow less than 250 L/s	Increase diameter to 200 mm
W11	Charles Street	Davis Drive to Queen Street	Fire flow less than current standard	Modeled fire flow less than 265 L/s	Increase diameter to 200 mm
W12	Glenway Circle	Eagle St. to existing 200 mm WM on Glenway Circle	Fire flow less than current standard	Modeled fire flow less than 116 L/s	Increase diameter to 200 mm

ITEM	STREET NAME	EXTENT	DEFICIENCY	DETAIL OF DEFICIENCY	PROPOSED IMPROVEMENT
W13	Millard Avenue	Yonge Street to Queen Street	Fire flow less than current standard (on Queen Street)	Modeled fire flow less than 167 L/s	Increase diameter to 200 mm

The modeling exercise determined that the majority of the deficiencies in the Town's water distribution system are due to fire flows that are less than the current standard listed in Table 5-2. The results of recent hydrant tests conducted throughout the Town's system were used to validate the results of the model.

5.4.1.1 WATER DISTRIBUTION ALTERNATIVES

Since most of the Town's future growth to 2041 will be due to redevelopment and intensification (within the Urban Centres Secondary Planning Area, in particular) as opposed to new development, the water system solutions proposed in the Master Plan become somewhat simplified. That is, the Master Plan becomes an exercise in determining how to plan the Town's existing water servicing network to supply the higher demands associated with future intensification. As a result, the water system upgrades developed in the Master Plan involve the upsizing of existing watermains to provide adequate service pressures and meet fire flow requirements.

Water servicing alternatives considered for the Town of Newmarket's local water distribution system included the following:

- Do Nothing (required for evaluation per the Class EA process)
- Upgrade and Expand Existing Water System Network

5.4.1.2 EVALUATION OF WATER DISTRIBUTION ALTERNATIVES

Upon further consideration of the water distribution alternatives, it was clear that the "Do Nothing" alternative could be eliminated through a screening process, instead of using the evaluation approach as described in Section 4. The screening process allows for the elimination of a certain alternative based on the alternative's adverse impact on one of the evaluation criterions or the Master Plan's Opportunity Statement. The "Do Nothing" alternative represents a scenario where no improvements or expansions would be undertaken. It may be preferred for some of the evaluation criteria, but it does not satisfy the Master Plan's core objective to support future growth to 2041. Future planning policies and opportunities to provide water and wastewater servicing for existing and future development would not be adhered to in selecting this alternative. This alternative is therefore not a viable solution since it does not fulfill the projects' Opportunity Statement.

York Region is responsible for providing water treatment, storage and transmission to the Town's water distribution system. Since the Town is responsible for the distribution of water to residents and businesses, the recommended alternative is to improve the ability of the water distribution system to provide adequate service pressures and fire flow.

5.5 FUTURE WATER INFRASTRUCTURE REQUIREMENTS

The following subsections include a description of the future water infrastructure requirements for servicing the Town of Newmarket, as well as the associated capital costs and proposed infrastructure phasing to 2041.

5.5.1 RECOMMENDED WATER SERVICING NETWORK

The recommended upgrades were determined through a water modeling exercise and will be required to support existing and future development to 2041 in the Town of Newmarket. Watermain upgrades to the year 2041 are presented in Table 5-4 and illustrated in Figure 5-2.

Table 5-4 Recommended Watermain Upgrades to Service to 2041

ITEM	STREET NAME	EXTENT	LENGTH (M)	CURRENT DIAMETER (MM)	PROPOSED DIAMETER (MM)
W1	Bristol Road	Main Street North to Stiver Drive	1,680	200	300
W2	Main Street North	From Regional Main to Bristol	15	200	300
W3	George Street	Kingston Road to Davis Drive	657	150	200
W4	Willow Lane	From existing 250 mm WM to Longford Drive	120	150	250
W5	Huron Heights Drive	Davis Drive to existing 200 mm WM	185	150	200
W6	Willstead Drive	Queen Street to Davis Drive	481	150	200
W7	Queen Street	Millard Avenue to Parkside	390	150	200
W8	Parkside Drive	Queen Street to existing 200 mm WM	130	150	200
W9	Calgain Road	Lorne Avenue to End	95	150	200
W10	Lorne Avenue	Davis Drive to Calgain Road	135	150	200
W11	Charles Street	Davis Drive to Queen Street	330	150	200
W12	Glenway Circle	Eagle St. to existing 200 mm WM on Glenway Circle	540	150	200
W13	Millard Avenue	Yonge Street to Queen Street	400	150	200

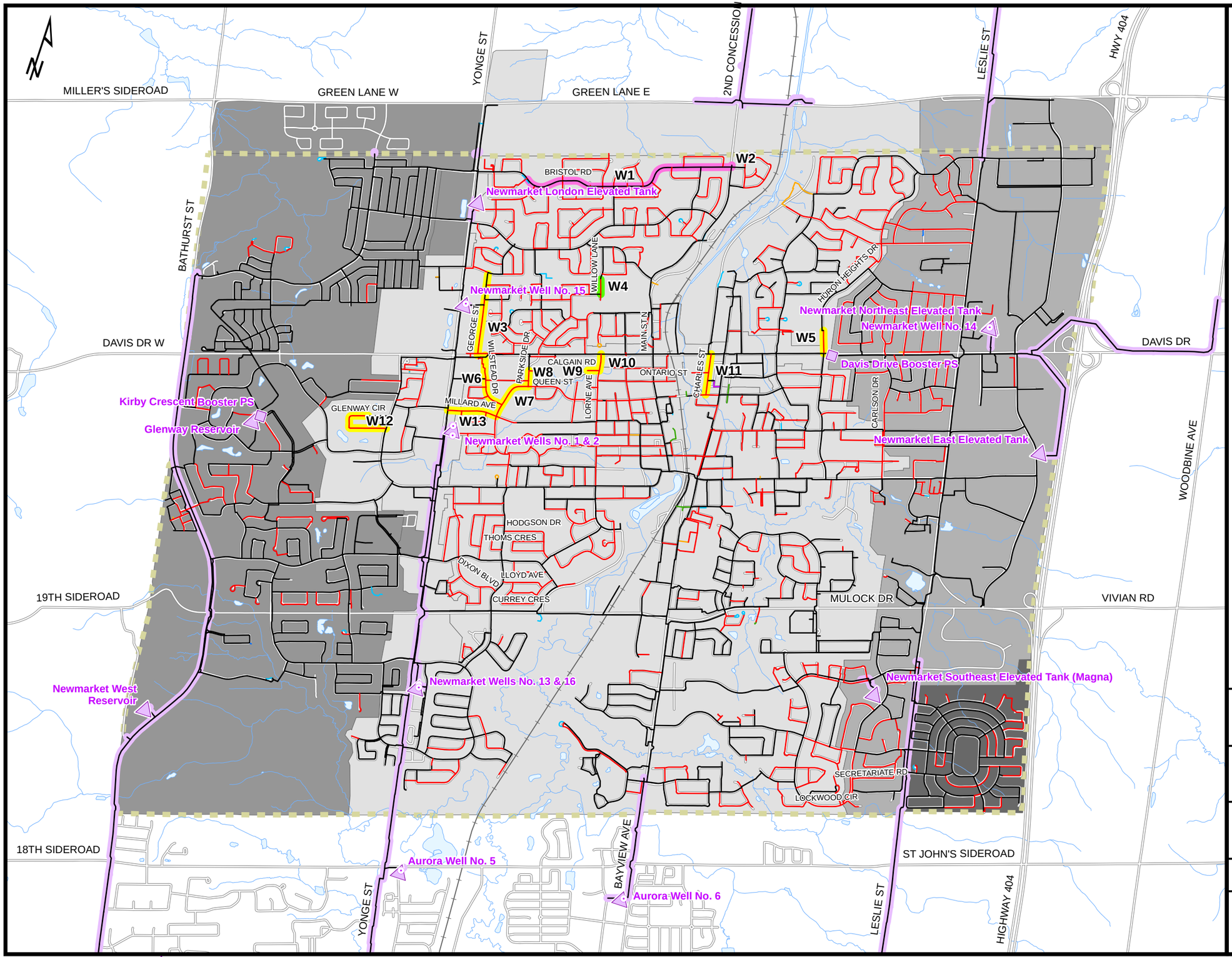
5.5.2 COST OF RECOMMENDED WATER INFRASTRUCTURE

The capital investments required to address the water system deficiencies identified in Table 5-3 are provided below in Table 5-5. These Class D cost estimates were developed using WSP's Watermain Unit Cost Table (2016), as shown in Appendix C, and include pipe material costs, excavation, road restoration within the trench width for the watermain and engineering (10%) and contingency (25%). The unit costs for the watermains are based on the Town's costs for recent linear infrastructure works undertaken within the Town of Newmarket. The unit costs assumed that areas in which pipes are being replaced are dense urban, meaning the watermains were replaced within a road. Class D cost estimates, including those provided in Table 5-5, are determined using unit costs based upon a comprehensive list of project requirements, and are only an indication of the total final project cost.

Table 5-5 Recommended Watermain System Upgrades Cost to Service to 2041

ITEM	STREET NAME	INFRASTRUCTURE UPGRADES REQUIRED	PIPE LENGTH (M)	TOTAL COST (2016$)
W1	Bristol Road	Increase diameter from 200 mm to 300 mm	1,680	$1,340,000
W2	Main Street North	Increase diameter from 200 mm to 300 mm	15	$20,000
W3	George Street	Increase diameter from 150 mm to 200 mm	657	$430,000
W4	Willow Lane	Increase diameter from 150 mm to 250 mm	120	$90,000
W5	Huron Heights Drive	Increase diameter from 150 mm to 200 mm	185	$120,000
W6	Willstead Drive	Increase diameter from 150 mm to 200 mm	481	$310,000
W7	Queen Street	Increase diameter from 150 mm to 200 mm	390	$260,000
W8	Parkside Drive	Increase diameter from 150 mm to 200 mm	130	$90,000
W9	Calgain Road	Increase diameter from 150 mm to 200 mm	95	$60,000
W10	Lorne Avenue	Increase diameter from 150 mm to 200 mm	135	$90,000

ITEM	STREET NAME	INFRASTRUCTURE UPGRADES REQUIRED	PIPE LENGTH (M)	TOTAL COST (2016$)
W11	Charles Street	Increase diameter from 150 mm to 200 mm	330	$220,000
W12	Glenway Circle	Increase diameter from 150 mm to 200 mm	540	$350,000
W13	Millard Avenue	Increase diameter from 150 mm to 200 mm	400	$260,000
Capital Cost to Service Town of Newmarket				**$3,640,000**



Legend

- Production Well (Owned by Region)
- Pumping Station (Owned by Region)
- Water Storage (Owned by Region)

Watermain Diameters

- 25 mm
- 50 mm
- 75 mm
- 100 mm
- 125 mm
- 150 mm
- 200 mm and Greater
- Watermain (Owned By Region)
- Roadway
- Recommendation to Upsize to 200 mm Watermain
- Recommendation to Upsize to 250 mm Watermain
- Recommendation to Upsize to 300 mm Watermain
- Railway
- Waterbody
- Watercourse
- Town of Newmarket

Pressure Districts

- Newmarket Central
- Newmarket East
- Newmarket West
- Aurora East

WSP XCG

Newmarket Water and Wastewater Master Plan

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1:30,000

Figure 5-2

Recommended Water Upgrades to Service Growth to 2041

5.5.3 WATER INFRASTRUCTURE PHASING

The infrastructure upgrades discussed above, as determined by water modeling exercises, should be implemented as the need arises. As previously noted, the recommended water infrastructure upgrades were based on the water modeling results which do not indicate all operational issues and do not take into consideration the age and condition of existing infrastructure or fire hydrant location/coverage.

Estimated project construction timelines and the Class EA Schedule for each recommended water servicing project are provided in Table 5-6. The timelines are based on factors such as location, and the timing of other Town-planned infrastructure works within the same roadways. To better refine the project timelines, it is recommended that the Town:

- review these timelines and adjust as needed based on the actual rate of development progress;
- replace watermains if roadwork or sewer replacement is planned in the same street to minimize repeated disturbance and reduce costs; and
- model the system based on projected water demands to each pressure zone for a given horizon year.

Table 5-6 Estimated Water Infrastructure Construction Phasing Timelines

ITEM	STREET NAME	EXTENT	CLASS EA SCHEDULE	ESTIMATED CONSTRUCTION YEAR INTERVAL
W1	Bristol Road	Main Street North to Stiver Drive	A+	2037-2041
W2	Main Street North	From Regional Main to Bristol	A+	2017-2021
W3	George Street	Kingston Road to Davis Drive	A+	2022-2026
W4	Willow Lane	From existing 250 mm WM to Longford Drive	A+	2022-2026
W5	Huron Heights Drive	Davis Drive to existing 200 mm WM	A+	2017-2021
W6	Willstead Drive	Queen Street to Davis Drive	A+	2017-2021
W7	Queen Street	Millard Avenue to Parkside	A+	2017-2021
W8	Parkside Drive	Queen Street to existing 200 mm WM	A+	2027-2031
W9	Calgain Road	Lorne Avenue to End	A+	2017-2021
W10	Lorne Avenue	Davis Drive to Calgain Road	A+	2017-2021
W11	Charles Street	Davis Drive to Queen Street	A+	2017-2021
W12	Glenway Circle	Eagle St. to existing 200 mm WM on Glenway Circle	A+	2017-2021
W13	Millard Avenue	Yonge Street to Queen Street	A+	2022-2026

The study uses Master Plan Approach #1 whereby Phases 1 and 2 of the Class EA process are completed and all Schedule A and A+ projects may proceed to be implemented without further study. All of the recommended water servicing projects identified in the Master Plan have been categorized as Schedule A+, and therefore do not require further study.

The capital costs to service the Town of Newmarket to support existing and future growth to 2041 are summarized by time interval in Table 5-7.

Table 5-7 Estimated Water System Capital Costs by Timeframe

YEAR INTERVAL	ITEMS	TOTAL ESTIMATED COST (2014$)
2017-2021	W2, W5, W6, W7, W9, W10, W11, W12	$1,430,000
2022-2026	W3, W4, W13	$780,000
2027-2031	W8	$90,000
2032-2036	N/A	N/A
2037-2041	W1	$1,340,000
Total		**$3,640,000**

6 WASTEWATER SERVICING

6.1 EXISTING CONDITIONS

The existing wastewater collection system in the Town of Newmarket is illustrated in Figure 6-1 and described in the subsections below.

6.1.1 WASTEWATER TREATMENT AND PUMPING STATIONS

The wastewater collection system that services the Town of Newmarket consists of local sanitary sewers, local pumping stations, and sub-trunk sewers owned by the Town of Newmarket, and trunk sewers, pumping stations and the York Durham Sewerage System (YDSS) which are owned by York Region. Ultimately, wastewater generated in Newmarket receives treatment at the Duffin Creek Water Pollution Control Plant which is co-owned by the Regions of Durham and York. This Master Plan addresses the wastewater system improvements and/or expansion related only to the Town's local and sub-trunk wastewater system. Details on expansion and system improvements within the Regional System can be found in the Region's Water and Wastewater Master Plan.

6.1.2 WASTEWATER CONVEYANCE NETWORK

The Town's existing wastewater system is illustrated in Figure 6-1. Figure 6-2 shows the drainage areas associated with each of the Town's sanitary sub-trunks. Key elements of the Town's wastewater conveyance network include:

- The Town owns and operates local wastewater sewers, sub-trunk sewers, and six local sanitary pumping stations. The Town's local sanitary pumping stations include the Bayview Avenue Sanitary Pumping Station (SPS), St. Andrew's SPS, Woodmount SPS, Woodspring SPS, Northwest SPS and Senior's SPS. Details for four of these stations (Bayview Avenue SPS, St. Andrew's SPS, Woodmount SPS and Woodspring SPS) were obtained from the Town.

- The Bayview Avenue Sub-trunk sewer services the southeastern part of the Town, south of Stonehaven Avenue and east of Bayview Avenue, and discharges into the Town's Bayview SPS. The St. Andrews SPS is located upstream of the Bayview SPS. The Bayview SPS forcemain discharges into the YDSS Trunk Sewer north of Newmarket's southern boundary.

- The Bogart Creek Sub-trunk sewer services the southeastern part of the Town located south of Gorham Street, north of Stonehaven Avenue and east of Bayview Avenue. The Bogart Creek Sub-trunk discharges into the Regional Bogart Creek SPS.

- Cherrywood Penn and Penn Amelia Sub-trunks service the area generally bounded by Davis Drive to the south, Kingston Road to the north, Yonge Street to the west and the Holland River to the east. The Penn Amelia Sub-trunk discharges into the Western Sub-Trunk. The Cherrywood Penn Sub trunk discharges into the Regional East Holland and West Holland Trunk Sewers upstream of the Newmarket SPS.

- Colter Street and Doubletree Lane Sub-trunks service the area bounded by McCaffrey Road in the north, the Town boundary in the south and west, and Yonge Street in the east. The Doubletree Lane Sub-trunk discharges into the Colter Street Sub-trunk, which discharges into the YDSS Trunk Sewer north of Newmarket's southern boundary.

- Davis Drive, Wildwood Drive and Sparrow Road Sub-trunks all discharge into the East Central Sub-trunk, which in turn discharges into the Regional East Holland Trunk Sewer upstream of the Newmarket SPS. These sub-trunks service the area generally bounded by Leslie Street in the east, Gorham Street in the south, Charles Street in the west and Red Deer Street in the north.

- Elgin Road, Stellar Drive and Wayne Drive Sub-trunks service the area generally located south of Leslie Valley Drive, east of the Holland River, north of Davis Drive and east to the Town boundary. The Elgin Road Sub-trunk discharges into the Region's East Holland River Trunk Sewer immediately upstream of the Newmarket SPS.

- Holland River Sub-trunk is generally located within the valley lands of the Holland River and extends from Mulock Drive in the south to Davis Drive in the north where it discharges into the Regional East Holland Trunk Sewer. The Queens Sub-trunk discharges into the Holland River Sub-trunk. The Holland River and Queens Sub-trunks service the area generally bounded by Mulock Drive in the south, Queen Street in the north, Davis Drive in the north, and Sandford Street in the west.

- Leslie Valley Sub-trunk services the area bounded by the Town limit in the north, Stellar Street in the south, the Town boundary in the east and Bayview Avenue in the west. The Leslie Valley Sub-trunk receives wastewater from an ICI (industrial, commercial and institutional) subdivision located in the Town of Gwillimbury. The Leslie Valley Sub-trunk discharges into a Regional sewer upstream of the Newmarket SPS.

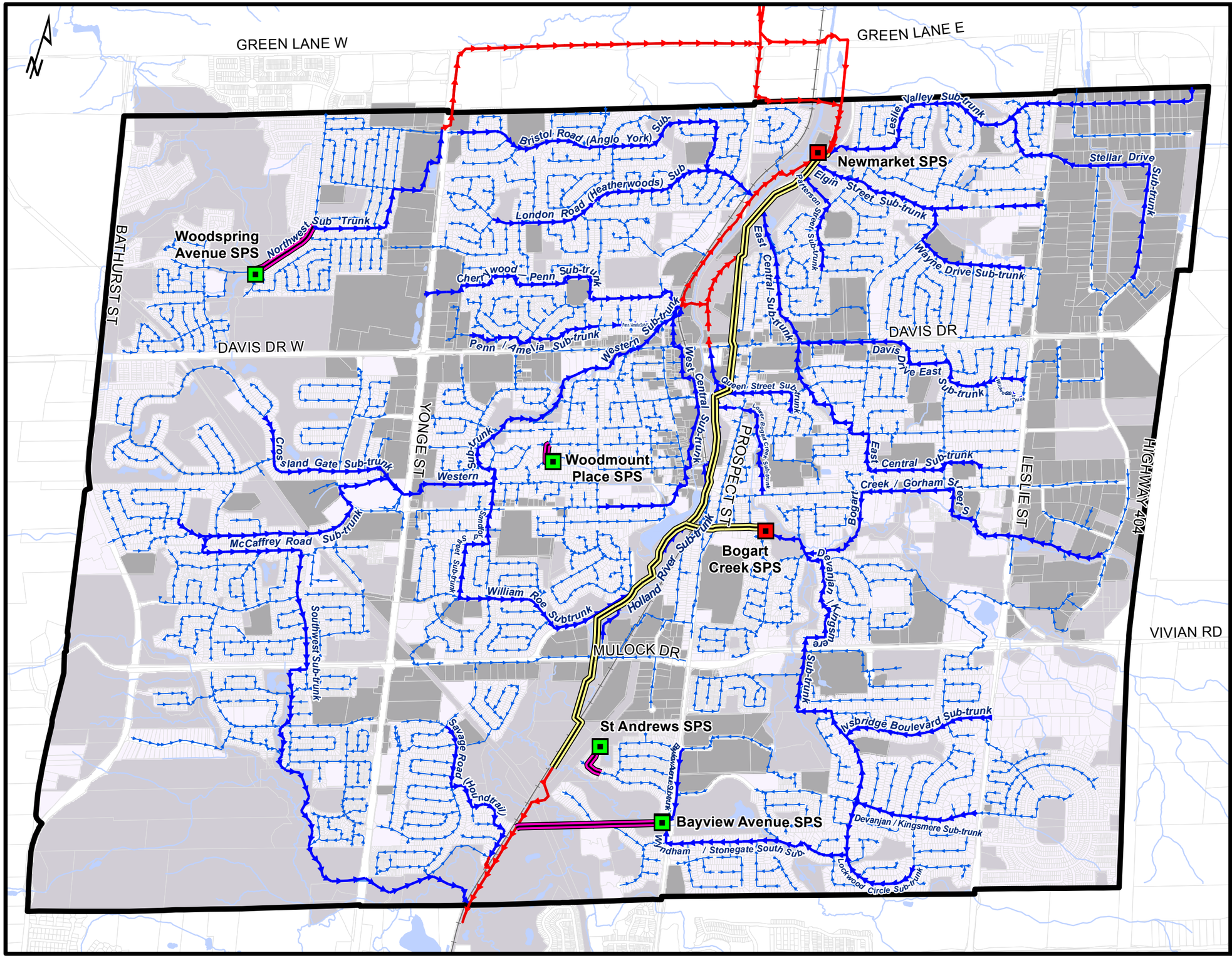
- London Road Sub-trunk services the area bounded by Yonge Street in the west, the Town boundary in the north, the railway in the east, and Kingston Road in the south. The London Road Sub-trunk discharges into the Regional West Holland Trunk Sewer upstream of the Newmarket SPS.

- McCaffery Road, Sandford Street and Western Sub-trunks generally service the area north of Narinia Crescent, west of Lorne Street, south of Davis Drive, and east of the Town boundary. The Western Sub-trunk discharges into the Regional West Holland River Trunk Sewer upstream of the Newmarket SPS. The McCaffery Road and Sandford Street Sub-trunk discharge into the Western Sub-trunk. The Woodmount SPS is located within the Western Sub-trunk service area.

- Patterson Sub-trunk generally services the area located north of Irwin Street, south of Elgin Road, east of Lundy's Lane, and west of Huron Heights Drive. The Patterson Sub-trunk discharges into the Regional East Holland Trunk Sewer upstream of the Newmarket SPS.

- West Central Sub-trunk generally services the area located north of Cane Parkway, west of the Holland River, north of Amelia Street, and west of Carol Avenue. The West Central Sub-trunk discharges into the Regional West Holland Trunk Sewer upstream of the Newmarket SPS.

Wastewater from a small portion of the Town located north of Davis Drive and west of Yonge Street discharges into the Regional North West Trunk Sewer. This area contains the Woodspring SPS.



Legend

- Regional Pumping Station
- Town Pumping Station
- YDSS Forcemain
- Town Forcemain
- YDSS Sanitary Sewer
- Sanitary Sewers
- Trunk Sewers
- Municipal Boundary
- Waterbodies
- Watercourses
- Parcels
- Railway

Land Use

- ICI
- Residential
- Open Space

WSP XCG Environmental Engineers & Scientists

Project No. 151-04561-00

Newmarket Water and Wastewater Master Plan

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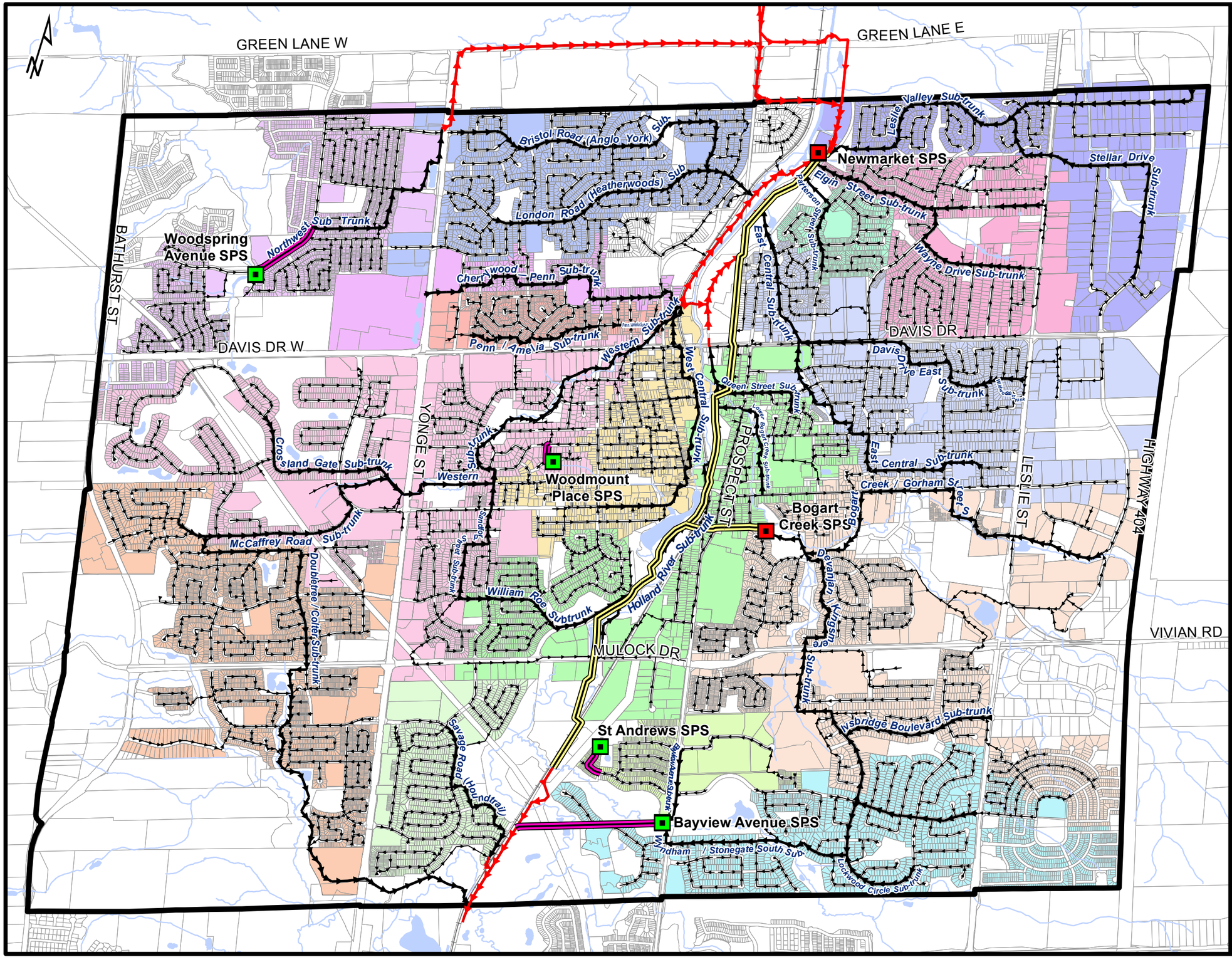
Figure 6.1

Town of Newmarket Existing Wastewater System



Legend

- Regional Pumping Station
- Town Pumping Station
- YDSS Forcemain
- Town Forcemain
- YDSS Sanitary Sewer
- Sanitary Sewers
- Trunk Sewers
- Municipal Boundary
- Parcels

Sub-Trunk Drainage Area

- Western
- Holland River
- Wyndham / Stonegate
- West Central
- Leslie Valley
- East Central
- Savage Road
- Devanjan-Kingsmere
- Penn-Amelia
- Cherrywood-Penn
- Patterson Street
- Bayview Avenue
- Northwest
- London Road
- Doubletree / Colter
- Elgin Street

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Newmarket Water and Wastewater Master Plan

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Figure 6.2

Town of Newmarket
Wastewater Drainage Areas

6.2 WASTEWATER SYSTEM DESIGN CRITERIA

6.2.1 EXISTING AND FUTURE WASTEWATER GENERATION RATES

The criteria used to calculate the projected wastewater generated for the Town of Newmarket are documented in Table 5-1. The criteria in the Town's Engineering Design Standards (Town of Newmarket, February 2015) were considered; however, the recommended average day flow and peaking factors were derived from historical data for the Town's existing wastewater collection system and were found to be aligned with the criteria used for the base year in York Region's current Water and Wastewater Master Plan. Further detail on the selection of wastewater design criteria can be found in Appendix A and in the Wastewater System Existing Conditions Model Update Technical Memorandum.

Table 6-1 Wastewater Design Criteria

	YORK REGION'S WATER AND WASTEWATER MASTER PLAN (2009)	2015 NEWMARKET ENGINEERING DESIGN STANDARDS	NEWMARKET WATER AND WASTEWATER MASTER PLAN
Average Residential Generation	310 L/cap/day	360 L/cap/day	310 L/capita/day
Average Employment Generation	310 L/cap/d	360 L/cap/day	310 L/employee/day
Peaking Factor	Harmon Formula	Harmon Formula	Harmon Formula
Infiltration Allowance	0.26 L/s/Ha	0.30 L/s/Ha	0.30 L/s/Ha

As indicated in Table 5-1, an infiltration allowance for new development areas of 0.30 L/s/ha is recommended for use in the Town of Newmarket Water and Wastewater Master Plan. For existing developments, area specific infiltration allowances were developed based on historical flow monitoring data. Technical Memorandum No. 2, included in Appendix B, documents the development of these area specific infiltration values.

6.3 WASTEWATER SERVICING ALTERNATIVES

MODELING OF EXISTING SYSTEM

An analysis of the performance of the existing wastewater system with future growth was completed using an InfoWorks CS model for the Master Plan. Model set-up activities included detailed GIS data review to identify data gaps and anomalies, collection of survey data to fill data gaps and address anomalies, creation of model sub-catchments, addition of information for Town sanitary pumping stations, and consideration of the impact of the Regional system on the Town's wastewater system. Improvements to Regional trunk sewers, pumping stations and treatment plants were determined by York Region in the Region's current Water and Wastewater Master Plan. Planned improvements in the Regional system were integrated into the analysis of the Town of Newmarket's system by including the predicted hydraulic grade line elevation at each location where a Town owned sewer discharges to a Regional trunk as a boundary condition. Predicted hydraulic grade line elevations for existing and future conditions were provided by the Region for a 25 year storm event. Future wastewater servicing needs were identified based on the analysis of the existing system performance under both existing peak flow conditions and future peak flow conditions.

Discussion on model development and validation is contained in Technical Memorandum No. 2 in Appendix B.

6.3.1 SANITARY SEWERS AND PUMPING STATIONS

The Regional Municipality of York is responsible for major trunk sewers, major pumping stations and forcemains and for providing wastewater treatment. The Region's existing and future wastewater infrastructure is planned for through the Region's Water and Wastewater Master Plan. Since the Town is

responsible for the collection of wastewater from residents and businesses, this Master Plan will focus on planning for the Town's local wastewater collection system to support existing conditions and future growth to 2041. Alternatives related to Regional major trunk sewers, major pumping stations and forcemains and wastewater treatment will not be developed as part of the Town's Master Plan.

6.3.2 WASTEWATER COLLECTION

EXISTING WASTEWATER SYSTEM DEFICIENCES

An analysis of the performance of the Town's wastewater system to support existing conditions and the projected demands to the year 2041 was completed using an InfoWorks CS model. Key findings of the analysis are as follows:

- Surcharge conditions were not predicted in the Bayview Avenue Sub-trunk, Bogart Avenue Sub-trunk, Colter Street Sub-trunk, Davis Drive Sub-trunk, Doubletree Lane Sub-trunk, Elgin Street Sub-trunk, Leslie Valley Sub-trunk, London Road Sub-trunk, McCafferty Road Sub-trunk, Patterson Road Sub-trunk, Sandford Street Sub-trunk, Queen Street Sub-trunk, Wayne Drive Sub-trunk, West Central Sub-trunk and the Wildwood Drive Sub-trunk under both existing and future development conditions. These sub-trunks have sufficient capacity to convey peak flows from future development.

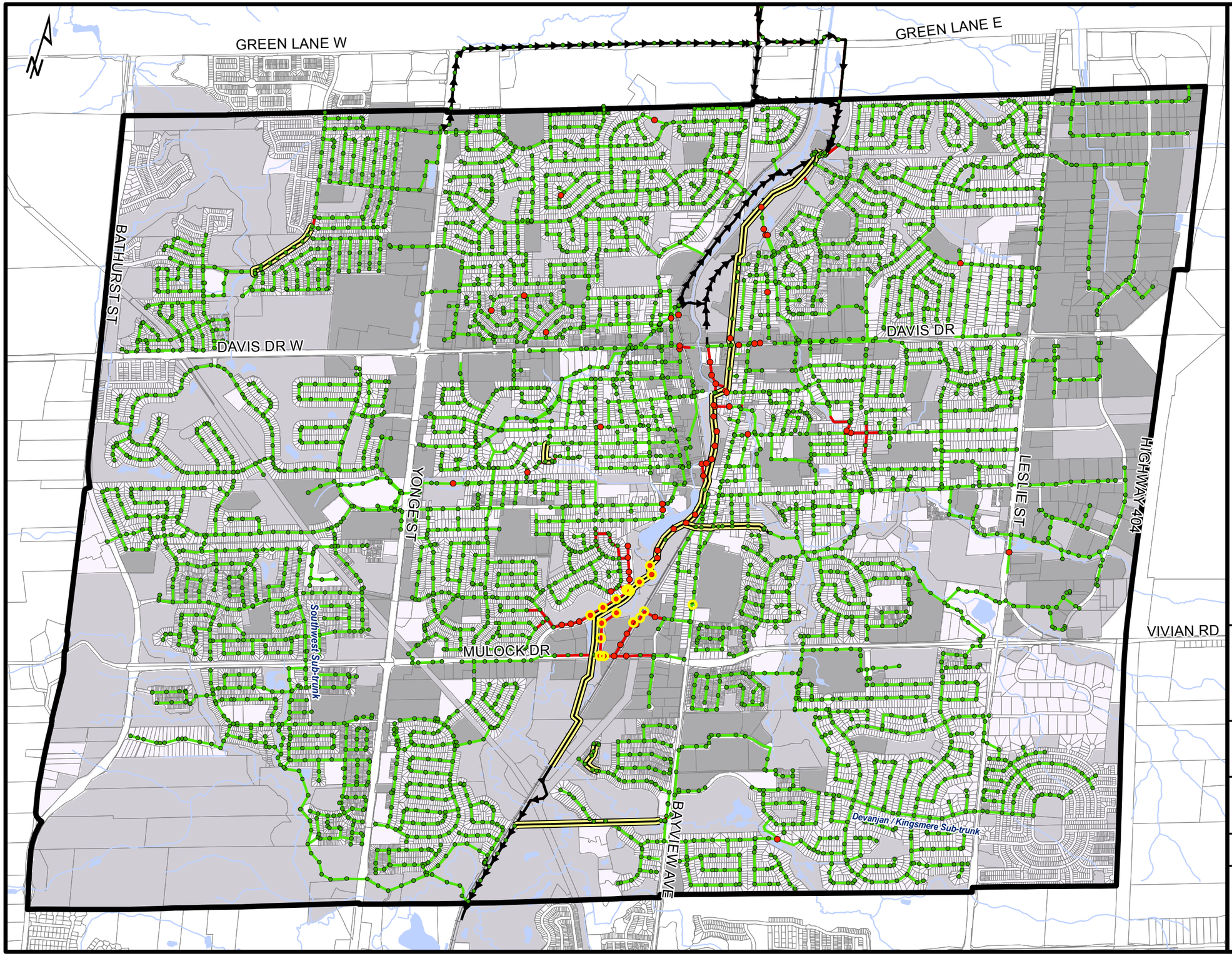
- Surcharge conditions were not predicted in the Cherrywood Penn Sub-trunk under existing development conditions. Under future development conditions, surcharge conditions were predicted from Yonge Street to the intersection of Penn Avenue and Denne Boulevard. This sub-trunk does not have sufficient capacity to convey peak flows from future development. In addition, surcharge levels reached within 1.8m of the ground surface, indicating a risk of basement flooding.

- Surcharge conditions were predicted in the East Central Sub-trunk under both existing and future development conditions from the intersection of Srigley Street and Crusader Way to Roxborough Road south of Queen Street. This sub-trunk does not have sufficient capacity to convey peak flows from existing or future development. Surcharge conditions in the East Central Sub-trunk also restrict the capacity of the upstream Sparrow Road Sub-trunk. Under future development conditions, surcharge conditions were predicted in the Sparrow Road Sub-trunk from the intersection of Alexander Road and Sparrow Road to Srigley Street. In addition, surcharge levels reached within 1.8m of the ground surface, indicating a risk of basement flooding. Further review of the Sparrow Road Sub-Trunk identified that it has sufficient capacity to peak flows but the capacity of the downstream East Central Sub-Trunk results in surcharge conditions.

- Surcharge conditions were predicted in the Holland River Sub-trunk from Mulock Drive to the discharge to the Regional trunk sewer system north of Amelia Street under both existing and future conditions. This is consistent with the findings of the Newmarket Master Sanitary Sewer Hydraulic Study completed in 2008. This sub-trunk does not have sufficient capacity to convey peak flows from existing or future development. In addition, surcharge levels reached the ground surface.

- Surcharge conditions were predicted in the Western Sub-trunk under future development conditions from north of the intersection of Ontario Street and Forest Glen Road to west of the intersection of Niagara Street and Davis Drive. The surcharged sections are located within an easement. Future review of the surcharged areas indicated that surcharge conditions were localized and resulted from a single pipe with a low slope.

Figure 6-3 presents the locations of surcharge conditions in the Town's wastewater collection system under existing conditions.



Legend

- Forcemain
- York Region Sanitary Sewer
- Municipal Boundary
- Waterbodies
- Watercourses
- Parcels
- Railway

Land Use

- ICI
- Residential
- Open Space

Freeboard

- < 2m
- > 2m

Surcharge

- Unsurcharged
- Surcharged
- Surface Flooding

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Newmarket Water and Wastewater Master Plan

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Figure 6.3

Town of Newmarket
Existing Wastewater
System Deficiencies

FUTURE WASTEWATER SYSTEM DEFICIENCIES

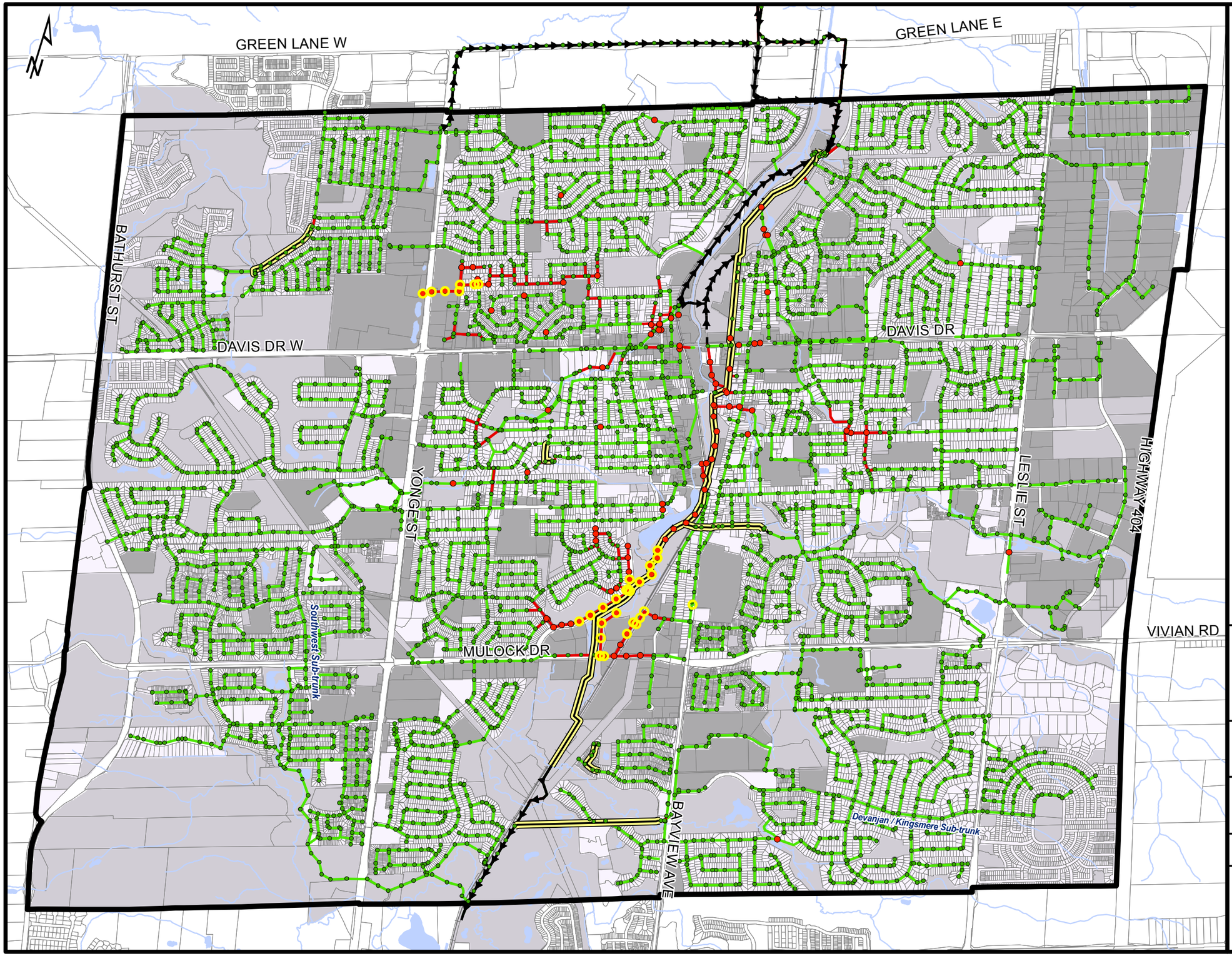
As identified through the modeling exercise, Table 6-2 lists the deficiencies in the existing wastewater collection system under future conditions. It is important to note that the identification of theoretically undersized infrastructure does not necessarily imply that the infrastructure requires replacement immediately. However, if construction is planned in the road easements specified below it is recommended that the Town undertake a detailed evaluation to determine if the replacement of the sewer infrastructure can be or should be completed at the same time.

Table 6-2 Future Wastewater System Deficiencies

SUB-TRUNK	EXTENT	DEFICIENCY	DETAIL OF DEFICIENCY	PROPOSED IMPROVEMENT
Cherrywood Penn	Yonge Street to Penn Avenue at Denne Boulevard	Capacity deficient under future conditions.	Surcharge conditions are within 1.8m of the ground surface indicating a risk of basement flooding.	Section 6.3.2.1 includes development and evaluation of alternatives for Cherrywood Penn and Penn Amelia Sub-trunks.
East Central	MH1030 to MH0942 (along Srigley Street from Orsi Drive to Roxborough Road, on Roxborough Road from Srigley Street to Bogart Avenue, on Bogart Avenue from Roxborough Road to an easement and along the easement to Roxborough Road)	Capacity deficient under existing and future conditions.	The peak hydraulic gradeline is within 1.8m of the ground surface indicating a risk of basement flooding. This section was also identified as capacity deficient under existing conditions.	Section 6.3.2.2 includes development and evaluation of alternatives for East Central and Sparrow Sub-trunks.
Holland River	MH1087 to MH0838 (Mulock Drive to the junction with the Region's trunk sewer at to the north of Amelia Street)	Capacity deficient under existing and future conditions.	*The hydraulic grade line profile is predicted to extend to the ground surface throughout much of the Holland River Sub-trunk.	Section 6.3.2.3 includes development and evaluation of alternatives for Holland River Sub-trunk.
Sparrow	MH12101 to MH10109 (on Srigley Street)	Capacity deficient under existing and future conditions.	These conditions are the result of surcharge conditions in the East Central Sub-trunk.	Section 6.3.2.2 includes development and evaluation of alternatives for East Central and Sparrow Sub-trunks.
Western	MH0665 to MH0667 (along Calgain Road and an existing easement)	Localized surcharge conditions due to low slope pipe.	These conditions are largely the result of a low slope pipe.	Improvements were not investigated for this section as basements are not connected to this section of trunk sewer.

* It should be noted that this result is consistent with the results presented in the 2008 Master Sanitary Sewer Hydraulic Study (R.V. Anderson Associates Limited, May 2008). It should also be noted that the Holland River Sub-trunk is located within the valley lands of the Holland and does not have any direct connections to residential or non-residential buildings. As such, surcharge conditions to within 1.8m of the ground surface may not present a risk of basement flooding.

Figure 6-4 presents the location of surcharge conditions in the Town's wastewater collection system under future development conditions.



Legend

- Forcemain
- York Region Sanitary Sewer
- Municipal Boundary
- Waterbodies
- Watercourses
- Parcels
- Railway

Land Use

- ICI
- Residential
- Open Space

Freeboard

- < 2m
- > 2m

Surcharge

- Unsurcharged
- Surcharged
- Surface Flooding

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Newmarket Water and Wastewater Master Plan

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Figure 6.4

Town of Newmarket
Future Wastewater
System Deficiences

Servicing alternatives to address the capacity issues within the Cherrywood Penn Sub-trunk, Holland River Sub-trunk and the East Central and Sparrow Sub-trunk were developed and are described in the following subsections.

6.3.2.1 CHERRYWOOD PENN SUB-TRUNK

SERVICING ALTERNATIVES

A total of seven alternatives were developed to address capacity issues within the Cherrywood Penn Sub-trunk. Many of these alternatives included optimizing flows between the Cherrywood Penn and Penn Amelia Sub-trunks and a sanitary sewer on Davis Drive. Figure 6-5 presents the location of the following alternatives considered:

- Alternative 1 – Construct a new sanitary sewer on Yonge Street, from north of Davis Drive, that would discharge to the Region's Northwest Trunk Sewer at Stiver Drive and Yonge Street. This new sanitary sewer would be located at an average depth of 8m and would be 855m in length and 375mm in diameter.

- Alternative 2 – Construct a new pumping station located on the west side of Yonge Street north of Davis Drive, and a new forcemain that would discharge to the Region's Northwest Trunk Sewer at Stiver Drive and Yonge Street. The new pumping station would have a firm capacity of 117 L/s. The forcemain would extend 855m in length and would be 375mm in diameter.

- Alternative 3 – Replace the existing 300mm diameter Cherrywood Penn Sub-trunk with a new 450mm diameter sewer. The new Cherrywood Penn Sub-trunk would follow the same alignment as the existing sub-trunk from Yonge Street to the Holland River and would extend 2,000m.

- Alternative 4 – Split peak flow between the Cherrywood Penn and Penn Amelia Sub-trunks by replacing 1,092m of the existing Penn Amelia Sub-trunk with a 450mm diameter sanitary sewer. The new sections would follow the same alignment as the existing Penn Amelia Sub-trunk.

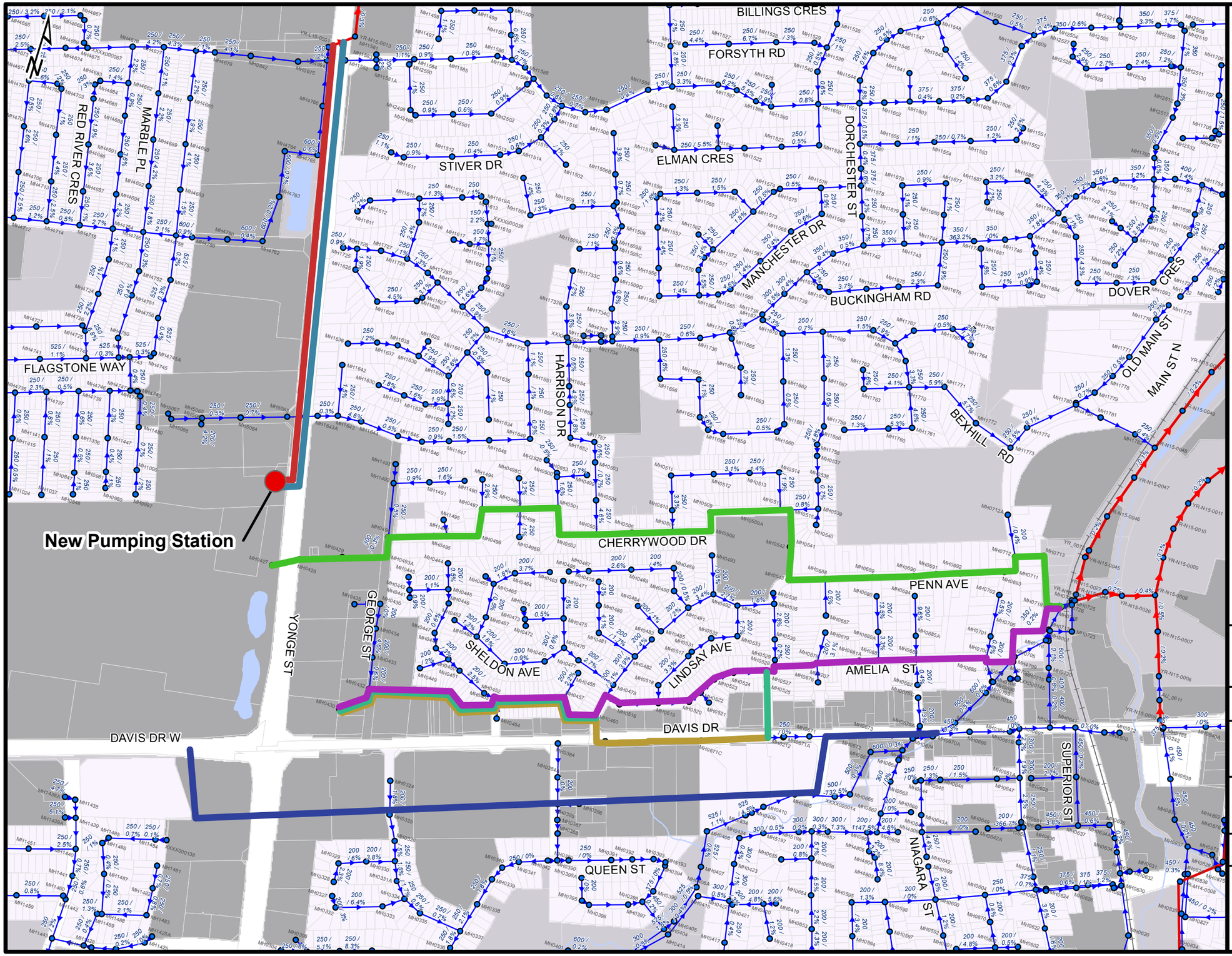
- Alternative 5 – Split peak flow between the Cherrywood Penn and Penn Amelia Sub-trunks by replacing 632m of the existing 250mm diameter Penn Amelia Sub-trunk with new 375mm diameter sanitary sewer in the same alignment and constructing a new 375mm diameter sanitary sewer in an easement and along Davis Drive (308m).

- Alternative 6 – Construct 2,100m of a new 375mm diameter sanitary sewer on a future ring road and future road located south of Davis Drive.

- Alternative 7 – Split peak flow between the Cherrywood Penn and Penn Amelia Sub-trunks, replace 632m of existing Penn Amelia Sub-trunk with a new 375mm diameter sanitary sewer, modify an existing maintenance hole at the intersection of William Roe Blvd and Borden Avenue to direct flow eastward away from the Western Sub-Trunk and construct a new 140m 250mm diameter sanitary sewer along the unopened Hill Street road allowance to Davis Drive to divert flow to Davis Drive.

EVALUATION OF SERVICING ALTERNATIVES

Table 6-3 presents the evaluation of the alternatives for the Cherrywood Penn Sub-trunk. Based on the evaluation of alternatives, Alternative 7 was selected as the preferred alternative as it has the least impacts on local residents and has the lowest cost.



Legend

- Manholes
- Sanitary Sewers
- Waterbodies
- Watercourses
- Parcels
- Railway
- York Region Sanitary Sewer

Land Use

- ICI
- Residential
- Open Space

Alternatives

- Alternative 1 - New sewer on Yonge Street to Northwest Sub-Trunk Sewer
- Alternative 2 - New pumping station and forcemain on Yonge Street to Northwest Sub-Trunk Sewer
- Alternative 3 - Replace Cherrywood Penn Sub-Trunk with new larger sewer
- Alternative 4 - Optimize Cherrywood Penn and Penn-Amelia Sub-Trunks and replace required sections
- Alternative 5 - Upgrade sections of Penn Amelia Sub-Trunk Sewer and build new sewer on Davis Drive
- Alternative 6 - New sewer on Future / Upgraded Ring Road
- Alternative 7 - Upgrade sections of Penn Amelia Sub-Trunk Sewer and new sewer on Hill Street

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Project No. 151-04561-00

Newmarket Water and Wastewater Master Plan

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Figure 6.5

Wastewater Alternatives for Servicing Cherrywood Penn Sub-Trunk

Table 6-3 Evaluation of Alternatives for Cherrywood Penn Sub-trunk

CRITERIA	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3	ALTERNATIVE 4	ALTERNATIVE 5	ALTERNATIVE 6	ALTERNATIVE 7
Natural Environment Considerations							
Natural Features	The new sanitary sewer would be located within an existing road allowance. Any potential impacts to existing trees could be mitigated through good construction practices.	The new pumping station would be located to avoid any potential impacts. The forcemain would be located within an existing road allowance. Any potential impacts to existing trees could be mitigated through good construction practices.	The new sanitary sewer would be constructed within existing road allowances. Any potential impacts to trees on residential streets could be mitigated through good construction practices.	The new sanitary sewer would be constructed within existing road allowances. Any potential impacts to trees on residential streets could be mitigated through good construction practices.	New sanitary sewers would be constructed within existing road allowances. Any potential impacts to trees on residential streets could be mitigated through good construction practices.	The new sanitary sewer would be constructed on future/upgraded ring road and alignment would be selected to avoid any impacts to existing trees.	The new sanitary sewer would be constructed within existing road allowances. Any potential impacts to trees on residential streets could be mitigated through good construction practices.
Watercourses and Aquatics	The new sanitary sewer would be located within an existing road allowance. No stream crossings would be required.	The new pumping station would be located to avoid any potential impacts. The new forcemain would be located within an existing road allowance. No stream crossings would be required.	The new sanitary sewer would be located within an existing road allowance. No stream crossings would be required.	The new sanitary sewer would be located within an existing road allowance. No stream crossings would be required.	The new sanitary sewers would be located within an existing road allowance. No stream crossings would be required.	The new sanitary sewer would be constructed on future/upgraded ring road and alignment would be selected to avoid any impacts to any creeks.	The new sanitary sewer would be located within an existing road allowance. No stream crossings would be required.
Natural Heritage Areas	The new sanitary sewer would be located within an existing road allowance.	The pumping station would be located to avoid any potential impacts. The new forcemain would be located within an existing road allowance.	The new sanitary sewer would be located within an existing road allowance.	The new sanitary sewer would be located within an existing road allowance.	The new sanitary sewers would be located within an existing road allowance.	The new sanitary sewer would be constructed on future/upgraded ring road and alignment would be selected to avoid any impacts to natural heritage areas.	The new sanitary sewer would be located within an existing road allowance.

CRITERIA	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3	ALTERNATIVE 4	ALTERNATIVE 5	ALTERNATIVE 6	ALTERNATIVE 7
Social and Cultural Environment Considerations							
Community	Significant disruption to Regional traffic and transportation due to construction on Yonge Street corridor. Deep construction would likely mean longer construction schedule.	Significant disruption to Regional traffic and transportation due to construction on Yonge Street corridor. Deep construction would likely mean longer construction schedule	Significant disruption to residents on Cardinal, Ash, Cherrywood, Longford and Penn Streets during construction. Total length of construction of residential streets would be 2km.	Significant disruption to residents on Walter, Penn, Amelia and Charlotte Streets during construction. Total length of construction of residential streets would be 1.4m.	Significant disruption to residents on Walter and Penn Streets. Significant disruption to Regional traffic and transportation on Davis Drive during construction. Total length of construction on residential streets would be 0.6km. Length of construction on Davis Drive would be 0.3km.	Disruption to private property owners on future roads. Construction of new sewer will require easements and will impact private property.	Significant disruption to residents on Walter and Penn Streets. Minimal disruption to traffic on Hill Street during construction as road allowance is not open to traffic. Length of construction on residential streets is 0.6km.
Consistency with Land Use Designations, Approved Development Plans and Proposed Land Use Changes	New sanitary sewer would be located along existing road allowance.	New pumping station would be located on private development lands on the west side of Yonge Street and north of Davis Drive.	New sanitary sewer would be located along existing road allowance.	New sanitary sewer would be located along existing road allowance.	New sanitary sewer would be located along existing road allowance.	Easement would be required within private lands to secure alignment for sewer.	New sanitary sewer would be located along existing road allowance.
Technical & Operational Suitability							
Constructability	Deep construction and large number of utilities in Yonge Street alignment would require consideration of microtunneling or other trenchless methods for construction.	Large number of utilities on Yonge Street would require consideration of microtunneling or other trenchless methods for construction.	New Cherrywood Penn would be constructed on local roads within existing neighbourhoods. Could be constructed using open cut methods.	New Penn Amelia sections would be constructed on local roads within existing neighbourhoods. Could be constructed using open cut methods.	New Penn Amelia sections would be constructed on local roads within existing neighbourhoods. Could be constructed using open cut methods.	New future ring road sanitary sewer would be constructed within existing easements. Would like pass through multiple properties.	New Penn Amelia sections would be constructed on local roads within existing neighbourhoods. Could be constructed using open cut methods.

CRITERIA	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3	ALTERNATIVE 4	ALTERNATIVE 5	ALTERNATIVE 6	ALTERNATIVE 7
Ease of Connection to Existing Infrastructure & Ease of Modifications Required to Existing Infrastructure	Alternative will provide additional conveyance capacity. Additional flow will be conveyed to Northwest Trunk Sewer.	Alternative will provide additional conveyance capacity. Additional flow will be conveyed to Northwest Trunk Sewer.	Alternative will provide additional conveyance capacity.	Alternative will provide additional conveyance capacity.	Alternative will provide additional conveyance capacity.	Alternative will provide dedicated conveyance capacity for secondary plan development areas.	Alternative will provide additional conveyance capacity.
Economic Considerations							
Maintenance Costs	Marginal change in O&M requirements and costs anticipated.	Alternative would involve construction of new pumping station which would increase O&M requirements and costs.	Marginal change in O&M requirements and costs anticipated.	Marginal change in O&M requirements and costs anticipated.	Marginal change in O&M requirements and costs anticipated.	Marginal change in O&M requirements and costs anticipated.	Marginal change in O&M requirements and costs anticipated.
Total Capital Costs	**$2.7M**	**$5.6M**	**$2.1M**	**$1.5M**	**$1.0M**	**$2.3M**	**$1.0M**
Additional O&M Requirements	Marginal increase in O&M costs associated with inspection of 855m of new sewer.	New pumping station would increase O&M requirements.	No increase in O&M costs as new sewer would replace existing sewer.	No increase in O&M costs as new sewer would replace existing sewer.	Marginal increase in O&M costs associated with inspection of 308m of new sanitary sewer.	Marginal increase in O&M costs associated with inspection of 2100m of new sanitary sewer.	Marginal increase in O&M costs associated with inspection of 140m of new sanitary sewer.
Overall Rating	**Least Preferred**	**Least Preferred**	**Less Preferred**	**Less Preferred**	**Less Preferred**	**Less Preferred**	**Most Preferred Alternative**

6.3.2.2 EAST CENTRAL SUB-TRUNK

SERVICING ALTERNATIVES

Two alternatives were developed to address capacity constraints in the East Central Sub-trunk. These include the following:

- Alternative 1 – Upgrade existing sewer on Bogart Avenue and in easement located between Bogart Avenue and Roxborough Road.
- Alternative 2 – Construct new large diameter sewer on Bogart Avenue to provide storage and conveyance capacity.

Figure 6-6 presents the location the alternatives considered for the East Central Sub-trunk.

Legend

- Manholes
- Sanitary Sewers
- Waterbodies
- Watercourses
- Parcels
- Railway
- York Region Sanitary Sewer

Land Use

- ICI
- Residential
- Open Space

Alternatives

- Alternative 1 - Upgrade sewer on Bogart Avenue and on easement between Bogart Avenue and Roxborough Avenue
- Alternative 2 - New In-line storage sewer on Bogart Avenue

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Project No. 151-04561-00

Newmarket Water and Wastewater Master Plan

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Figure 6.6

Wastewater Alternatives for Servicing East Central Sub-Trunk

EVALUATION OF SERVICING ALTERNATIVES

Table 6-4 presents the evaluation of the alternatives for the East Central Sub-trunk. Based on the evaluation of alternatives, Alternative 2 was selected as the preferred alternative as it would avoid construction within the existing sewer easement located within the creek valley lands which are heavily wooded and located within the floodplain and LSRCA regulated area.

Table 6-4 Evaluation of Alternatives for East Central Sub-trunk

CRITERIA	ALTERNATIVE 1	ALTERNATIVE 2
Natural Environment Considerations		
Natural Features	Alternative would require construction within vegetated and treed area in easement between Bogart and Roxborough. Construction activities would have impact on natural areas.	Alternative would require construction within existing road allowance. Any potential impacts on trees could be mitigated through good construction practices.
Watercourses and Aquatics	Alternative would require construction within creek floodplain and Lake Simcoe Region Conservation Area regulated area.	Alternative would require construction on existing road allowance. No stream crossings are anticipated.
Natural Heritage Areas	Construction would occur within floodplain, regulated area and heavily vegetated and treed area.	Alternative would require construction on existing road allowance. Any potential impacts could be mitigated through good construction practices.
Social and Cultural Environment Considerations		
Community	Alternative would result in disruption to local residents on Bogart and Roxborough during construction. Impacts would impact traffic, noise, and dust. Potential impact to users of trails along creek.	Alternative would result in disruption and nuisance impacts to local residents on Bogart during construction. These impacts could be mitigated.
Consistency with Land Use Designations, Approved Development Plans and Proposed Land Use Changes	New sanitary sewer would be located on existing road allowance and within easement.	New sanitary sewer would be located along existing road allowance.
Technical & Operational Suitability		
Constructability	Alternative requires construction on Bogart and existing easement. Access to easement required in the long term to complete any operations and maintenance activities. Access for inspection might be limited due to tree cover and topography.	Construction will be on local road. Town will have no issues with long term access to this sewer to complete any required maintenance.
Ease of Connection to Existing Infrastructure & Ease of Modifications Required to Existing Infrastructure	Alternative will provide additional conveyance capacity.	Alternative will provide additional conveyance and storage capacity.
Economic Considerations		
Maintenance Costs	No increase in anticipated O&M activities or costs.	Marginal increase in O&M activities and costs associated with storage facility.

CRITERIA	ALTERNATIVE 1	ALTERNATIVE 2
Total Capital Costs	**$0.32M**	**$1.4M**
Additional O&M Requirements	No additional O&M requirements as existing sanitary sewer will be replaced.	Additional O&M costs associated with more frequent inspection and cleaning of storage. Estimated annual cost of maintaining storage pipe is $3,000/yr.
Overall Rating	**Less Preferred**	**Most Preferred**

Although Alternative 2 is the higher cost alternative, it was selected as most preferred because of natural environment, social and technical concerns.

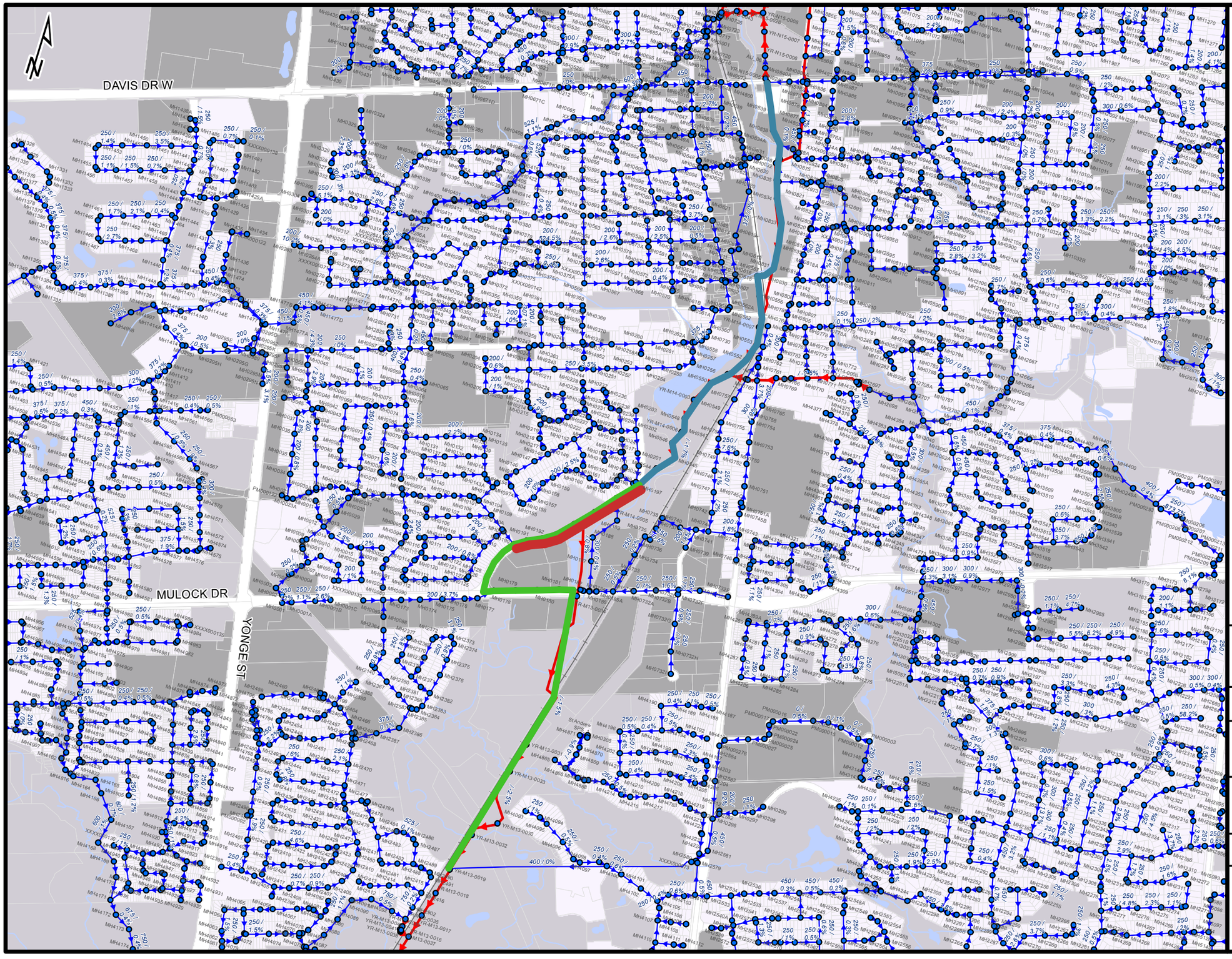
6.3.2.3 HOLLAND RIVER TRUNK SEWER

SERVICING ALTERNATIVES

Three alternatives were developed to address capacity constraints in the Holland River Sub-trunk. These include the following:

- Alternative 1 – Replace the existing Holland River Sub-trunk with a new larger diameter sub-trunk.
- Alternative 2 – Construct a new storage facility on Cane Parkway.
- Alternative 3 – Construct a new sewer on Cane Parkway, Mulock Drive and rail corridor to discharge directly to the York Durham Sewage System (YDSS).

Figure 6-7 presents the location the alternatives considered for the Holland River Sub-trunk.



Legend

- Manholes
- Sanitary Sewers
- Waterbodies
- Watercourses
- Parcels
- Railway
- York Region Sanitary Sewer

Land Use

- ICI
- Residential
- Open Space

Alternatives

- Alternative 1 - Upgrade Holland River Trunk Sewer
- Alternative 2 - New In-line storage sewer on Cane Parkway
- Alternative 3 - New sewer on Cane Parkway, Mulock Drive and rail corridor to YDSS

WSP XCG Environmental Engineers & Scientists

Project No. 151-04561-00

Newmarket Water and Wastewater Master Plan

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Figure 6.7

Wastewater Alternatives for Servicing Holland River Trunk Sewer

Table 6-5 presents the evaluation of the alternatives for the Holland River Sub-trunk. Based on the evaluation of alternatives, Alternative 2 was selected as the preferred alternative as it has fewer potential impacts to the natural environment and is the second lowest cost alternative.

Table 6-5 Evaluation of Alternatives for Holland River Trunk Sewer

CRITERIA	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3
Natural Environment Considerations			
Natural Features	Alternative would require extensive construction along Holland River from Cane Parkway to North of Davis Drive within LSCRA lands. These lands are heavily vegetated and treed.	Alternative would require construction along Holland River in the vicinity of Cane Parkway. Some of these lands are treed and vegetated.	Alternative would require construction along Holland River in the vicinity of Cane Parkway. Some of these lands are treed and vegetated.
Watercourses and Aquatics	Alternative would require construction within Holland River valley lands. New sewer would be constructed within LRSCA regulated area and floodplain.	Alternative would require construction within Holland River valley lands. Small portion of new sewer would be constructed within LRSCA regulated area and floodplain.	Alternative would require construction within Holland River valley lands. Small portion of new sewer would be constructed within LRSCA regulated area and floodplain. Crossing of Holland River would be needed at Mulock Drive.
Natural Heritage Areas	Construction would occur within floodplain, regulated area and heavily vegetated and treed area.	Construction would occur within a small portion of floodplain, regulated area and heavily vegetated and treed area.	Construction would occur within a small portion of floodplain, regulated area and heavily vegetated and treed area.
Social and Cultural Environment Considerations			
Community	Significant disruption to users of parklands and trails located within Holland River valley lands would be expected during construction.	Disruption to local residents and traffic on Cane Parkway during construction. Noise and dust impacts could be mitigated through good construction practices.	Disruption to local residents and traffic on Cane Parkway during construction. Noise and dust impacts could be mitigated through good construction practices. Traffic impacts anticipated on Mulock Drive.
Consistency with Land Use Designations, Approved Development Plans and Proposed Land Use Changes	New sanitary sewer would be located on existing road allowance and within easement.	New sanitary sewer would be located on existing road allowance and within easement.	New sanitary sewer would be located on existing road allowance and within easement.
Technical & Operational Suitability			
Constructability	Alternative will require technically difficult trenchless technology method of construction, such as microtunnelling.	New storage facility would be located to avoid existing and planned Regional YDSS forcemain.	Detailed design of new trunk sewer would need to consider location of existing and planned YDSS forcemain along Cane Parkway and Mulock Drive.

CRITERIA	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3
Ease of Connection to Existing Infrastructure & Ease of Modifications Required to Existing Infrastructure	New sewer would provide additional conveyance capacity.	New storage facility would provide additional storage capacity. Conveyance capacity would remain unchanged.	New sewer would provide additional conveyance capacity.
Economic Considerations			
Maintenance Costs	Minimal increase in O&M requirements and costs.	Increase in O&M requirements and costs associated with new storage facility.	Marginal increase in O&M requirements and costs associated with new sewer.
Total Capital Costs	**$10.3**	**$3.7M**	**$3.0 M**
Additional O&M Requirements	No change in O&M requirements as new sewer will replace existing sewer.	Additional O&M costs associated with more frequent inspection and cleaning of storage. Estimated annual cost of maintaining storage pipe is $7,500/yr.	Marginal increase in O&M requirements associated with CCTV inspection of additional 2,300m of sanitary sewer. This cost increase is small as inspection will only be needed every 5 to 10 years. Annualized cost will be less than $5K.
Overall Rating	**Least Preferred**	**Most Preferred**	**Less Preferred**

Although Alternative 2 has a slightly larger cost than Alternative 3, it was selected as the most preferred alternative largely due to the natural environment and technical concerns associated with Alternative 3.

6.4 FUTURE WASTEWATER INFRASTRUCTURE REQUIREMENTS

The following subsections include a description of the future wastewater infrastructure requirements for servicing the Town of Newmarket, as well as the associated capital costs and proposed infrastructure phasing to 2041.

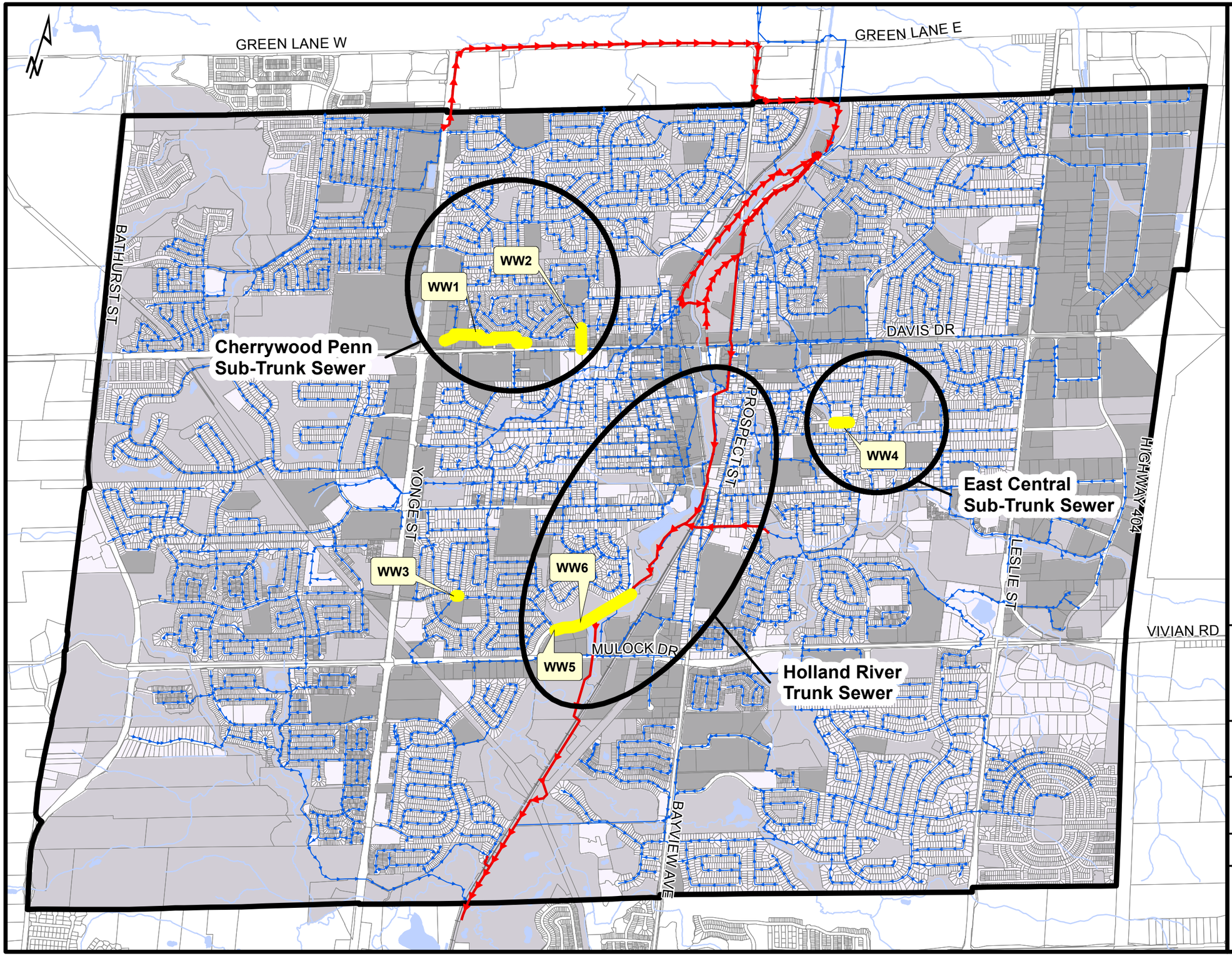
6.4.1 RECOMMENDED WASTEWATER SERVICING NETWORK

The recommended upgrades were determined through a wastewater modeling exercise and will be required to support existing and future development to 2041 in the Town of Newmarket. Wastewater system upgrades to the year 2041 are presented in Table 6-6 and illustrated in Figure 6-8. Prior to implementing infrastructure upgrades, it is recommended that the Town collect flow and rainfall data either prior to or as part of preliminary and detailed design of these improvements.

Table 6-6 Recommended Wastewater Upgrades to Service to 2041

ITEM	PREFERRED ALTERNATIVE	STREET NAME AND EXTENT	LENGTH (M)	CURRENT DIAMETER (MM)	PROPOSED DIAMETER (MM)
WW1	Cherrywood Penn Sub-trunk (Alternative 7)	Walter Avenue (Rye Avenue to Newbury Drive), Newbury Drive (Walter Avenue to Longford Drive), Longford Drive (Newbury Drive to Penn Avenue)	631	300	375
WW2		Hill Street (Penn Avenue to Davis Drive)	140	-	250
WW3		Modifications to existing maintenance hole at William Roe Parkway and Borden Avenue to redirect flow eastward.			

ITEM	PREFERRED ALTERNATIVE	STREET NAME AND EXTENT	LENGTH (M)	CURRENT DIAMETER (MM)	PROPOSED DIAMETER (MM)
WW4	East Central Sub-trunk (Alternative 2)	Bogart Avenue (Roxborough Avenue to cul-de-sac end)	120	300	2m x 3m
WW5	Holland River Trunk Sewer (Alternative 2)	Cane Parkway (north curve to Regional forcemain easement)	175	300	375
WW6		Cane Parkway (north of Mulock to Regional forcemain)	316	-	2m x 3m



Legend

- Recommended Projects
- York Region Sanitary Sewer
- Sanitary Sewers
- Municipal Boundary
- Waterbodies
- Watercourses
- Parcels
- Railway

Land Use

- ICI
- Residential
- Open Space

WSP XCG Environmental Engineers & Scientists

Newmarket Water and Wastewater Master Plan

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Figure 6.8

Recommended Wastewater Upgrades to Service Growth to 2041

6.4.2 COST OF RECOMMENDED WASTEWATER INFRASTRUCTURE

The capital investments required to correct the sanitary sewer deficiencies identified in Table 6-6 are provided in Table 6-7. These cost estimates were developed using WSP's Sewer Unit Cost Table (2016) shown in Appendix C, and include pipe material costs, excavation, road restoration within the trench width for the sewer and engineering (10%) and contingency (25%).

Table 6-7 Recommended Collection System Upgrades Cost to Service to 2041

ITEM	STREET NAME	INFRASTRUCTURE UPGRADES REQUIRED	PIPE LENGTH (M)	TOTAL COST (2016$)
WW1	Walter Avenue, Newbury Drive, Longford Drive, Penn Avenue	Replace existing 300mm with 375mm diameter sanitary sewer	631	$692,000
WW2	Hill Street	New 250mm diameter sanitary sewer	140	$289,000
WW3	William Roe Parkway and Borden Avenue	Modifications to existing maintenance hole to redirect flow eastward		$10,000
WW4	Bogart Avenue	Replace existing 300mm with new 2m x 3m storage sewer	120	$1,360,000
WW5	Cane Parkway	Replace existing 300mm with 375mm diameter sanitary sewer	175	$149,000
WW6	Cane Parkway	New 2m x 3m storage sewer	316	$3,580,000
Capital Cost to Service Town of Newmarket				**$6,081,000**

6.4.3 WASTEWATER INFRASTRUCTURE PHASING

The infrastructure upgrades discussed above, as determined by wastewater modeling exercises, should be implemented as the need arises and as development progresses.

Estimated project construction timelines and the Class EA Schedule for each recommended wastewater servicing project are provided in Table 6-8**.**

Table 6-8 Estimated Wastewater Infrastructure Construction Phasing Timelines

ITEM	STREET NAME AND EXTENT	CLASS EA SCHEDULE	ESTIMATED CONSTRUCTION YEAR INTERVAL
WW1	Walter Avenue (Rye Avenue to Newbury Drive), Newbury Drive (Walter Avenue to Longford Drive), Longford Drive (Newbury Drive to Penn Avenue), Penn Avenue (Longford Drive to Hill Street)	A+	2022-2026
WW2	Hill Street (Penn Avenue to Davis Drive)	A+	2022-2026
WW3	William Roe Parkway and Borden Avenue Maintenance Hole	A+	2017-2021
WW4	Bogart Avenue (Roxborough Avenue to cul-de-sac end)	A+	2017-2021
WW5	Cane Parkway (north curve to Regional forcemain easement)	A+	2017-2021
WW6	Cane Parkway (north of Mulock to Regional forcemain)	A+	2017-2021

The study uses Master Plan Approach #1 whereby Phases 1 and 2 of the Class EA process are completed and all Schedule A and A+ projects may proceed to be implemented without further study. All of the recommended wastewater servicing projects identified in the Master Plan have been categorized as Schedule A+, and therefore do not require further study.

The capital costs to service the Town of Newmarket to support existing and future growth to 2041 are summarized by time interval in Table 6-9.

Table 6-9 Estimated Wastewater System Capital Costs by Timeframe

YEAR INTERVAL	ITEMS	TOTAL ESTIMATED COST (2014$)
2017-2021	WW4, WW5, WW6	$5,100,000
2022-2026	WW1, WW2, WW3	$981,000
2027-2031	-	-
2032-2036	-	-
2037-2041	-	-
Total		**$6,081,000**

7 PUBLIC, AGENCY AND INDIGENOUS COMMUNITIES CONSULTATION

Consultation with the public, which includes stakeholders, interested parties and government review agencies, is a necessary and important component of the Municipal Class Environmental Assessment (Class EA) process. To meet the Class EA consultation requirements for this study, the Town of Newmarket ensured that the public and review agencies were informed of the study and given the opportunity to provide input (both written and verbal) on the assessment and evaluation process for the Master Plan.

Copies of specific documentation (notices, information bulletins, etc.) from the public and agency consultation program are included in Appendix D. The following section provides a summary of the key points of contact that were undertaken throughout the course of the project, as well as comments received.

7.1 PUBLIC CONSULTATION

7.1.1 STAKEHOLDER CONTACTS

A stakeholder contact list was developed at the beginning of the Master Plan project to keep track of the individuals and agencies receiving copies of specific documentation (notices, information bulletins, etc.) as part of the public and agency consultation program. The stakeholder contact list included the stakeholders contacted during the development of the Town's Urban Centres Secondary Plan, and other contacts from various agencies including, but not limited to: the Canadian Environmental Assessment Agency, Department of Fisheries and Oceans, Environment Canada, Ministry of Transportation, Ministry of the Environment and Climate Change, Ministry of Tourism and Culture, Ministry of Natural Resources, Ministry of Municipal Affairs and Housing, Ministry of Public Infrastructure Renewal, the Chippewas of Georgina Island and the Regional Municipality of York.

7.1.2 NOTICE OF STUDY COMMENCEMENT

The Notice of Study Commencement was developed to target the ministries, organizations, agencies and other stakeholders that may be affected by the Master Plan. The Notice was mailed to all applicable parties on the stakeholder contact list included in Appendix D. Additionally, the Notice of Study Commencement was published in Newmarket's local newspaper, The Era, on September 17, 2015.

7.1.3 PUBLIC INFORMATION CENTRE

The purpose of the Public Information Centre (PIC) was to present to the public and relevant stakeholders of the status and findings of the Master Plan and to address any concerns they may have. Notices for the PIC were mailed to all applicable stakeholders on the contact list. Stakeholders remained on the mailing

list for the duration of the project unless they requested to be removed. Individuals attending the PIC were asked to identify themselves on the sign-in sheet and complete the comment sheet to ensure that their input was documented. A copy of the Notice of PIC is included in Appendix D.

The PIC was held on June 21st, 2016 from 6:00 to 8:00 pm in the Council Chambers of the Town's Municipal Offices building. The PIC consisted of display boards that presented an overview of the Master Plan's purpose and background, the alternative and recommended servicing solutions, and the evaluation criteria use to determine the recommended servicing solutions. The purpose of the PIC was to present the alternative servicing strategies and to solicit input on the preferred alternative. Information was presented on display boards, and staff from both the Town and WSP were available to present the information and answer any questions from the public. A comment sheet was provided for attendees to provide written feedback. A copy of the PIC's display boards is included in Appendix D.

7.1.4 NOTICE OF STUDY COMPLETION

The Notice of Study Completion is filed with the finalized Master Plan Document. This notice informs the public, agencies and stakeholder of the outcome of the Study, where the Study can be reviewed during the viewing period and the manner in which public comment can be received.

The Notice will be mailed to all applicable parties on the stakeholder contact list included in Appendix D. Additionally; it will be published in Newmarket's local newspaper, The Era, on two publication dates, and on the Town of Newmarket website.

7.2 INDIGENOUS COMMUNITIES CONSULTATION

Federal and provincial websites including Indigenous and Northern Affairs Canada (INAC) and Aboriginal and Treaty Rights Information System (ATRIS), respectively, were consulted to develop a list of all Indigenous communities affected by the Town of Newmarket's Water and Wastewater Master Plan. The list of Indigenous communities consulted during the development of the Master Plan was provided to the Ministry of Indigenous Relations and Reconciliation (MIRR).

In addition to mailing out notices to all Indigenous communities, the Town and WSP will present the project and preliminary findings to the Georgina Island First Nation on September 29, 2016. The Georgina Island First Nation requested a meeting to discuss their questions and concerns regarding Newmarket's Water and Wastewater Master Plan, following the PIC held on June 21st, 2016.

7.3 COMMENTS AND RESPONSES REGARDING THE MASTER PLAN

A record of all public and agency responses regarding the Master Servicing Plan is included in Appendix D.

Appendix A

WATER & WASTEWATER DESIGN CRITERIA

Town of Newmarket Water and Wastemater Master Plan

Water Unit Rates

Recommended Rates

	York Region MP	2015 Newmarket Engineering Design Standards	Recommended Rates (Base Year)
Maximum Day Factor	1.7	2.0	1.7
Average Day (L/cap/day)	220	300	220
Peak Hour Factor	2.5	3.0	2.5

Notes:
1. Recommended Average Day Rate was selected based on York Region's W&WW Master Plan.
2. Recommended Maximum Day Factor was selected based on York Region's W&WW Master Plan.
3. Recommended Peak Hour Factor was selected based on York Region's W&WW Master Plan (1.7 x 1.45 = 2.5)

Average Day Rate Calculations [1]

	Population			York SCADA Data		
Year	**Residential**	**Employment**	**Total [2]**	**Total Consumption (m3/day)**	**Avg Day (L/cap/day) - Based on dividing by Residential Population Only**	**Avg Day (L/cap/day) - Based on dividing by Residential and Employment Population**
2012	85,453	43,292	128,745	26,766	313	208
2013	86,819	43,750	130,569	26,477	305	203
2014	89,015	44,692	133,707	25,231	283	189

Maximum Day and Peak Hour Factor Calculations [1]

Average Day for 2012 [3] (m3/day)	**26,771**

	2012					
	Max Day	**Max Flow (m3/day)**	**Max Day Factor [4]**	**Peak Hour Time**	**Peak Hour Flow (m3/day)**	**Peak Hour Factor**
1	June 29th, 2012	31,255	1.17	10:00	55,296	2.07
2	June 30th, 2012	30,767	1.15	10:00	52,538	1.96
3	June 20th, 2012	30,370	1.13	8:00	66,938	2.50
4	June 19th, 2012	30,281	1.13	11:00	53,813	2.01
5	June 27th, 2012	30,269	1.13	10:00	59,753	2.23
6	August 28th, 2012	30,090	1.12	10:00	45,662	1.71
7	December 14th, 2012	29,305	1.09	2:00	56,707	2.12
8	June 22nd, 2012	29,166	1.09	13:00	54,137	2.02
9	July 17th, 2012	28,921	1.08	17:00	61,243	2.29
10	July 5th, 2012	28,736	1.07	23:00	55,886	2.09
	Average	29,916	1.12		56,197	2.10

Average Day for 2013 [3] (m3/day)	**26,486**

	2013					
	Max Day	**Max Flow (m3/day)**	**Max Day Factor [4]**	**Peak Hour Time**	**Peak Hour Flow (m3/day)**	**Peak Hour Factor**
1	July 17th, 2013	39,126	1.48	20:00	60,602	2.29
2	August 12th, 2013	38,676	1.46	14:00	60,098	2.27
3	July 19th, 2013	38,182	1.44	7:00	57,676	2.18
4	August 22nd, 2013	37,691	1.42	20:00	57,383	2.17
5	July 22nd, 2013	37,356	1.41	17:00	56,410	2.13
6	August 19th, 2013	37,320	1.41	20:00	60,486	2.28
7	August 10th, 2013	37,150	1.40	18:00	58,604	2.21
8	August 6th, 2013	37,017	1.40	19:00	58,481	2.21
9	July 23rd, 2013	36,902	1.39	9:00	54,225	2.05
10	August 9th, 2013	36,270	1.37	8:00	56,482	2.13
	Average	37,569	1.42		58,045	2.19

Average Day for 2014 [3] (m3/day)	**25,235**

2014

	Max Day	Max Flow (m3/day)	Max Day Factor [4]	Peak Hour Time	Peak Hour Flow (m3/day)	Peak Hour Factor
1	August 6th, 2014	38,667	1.53	18:00	60,926	2.41
2	June 10th, 2014	37,279	1.48	19:00	55,944	2.22
3	August 27th, 2014	37,149	1.47	11:00	66,968	2.65
4	August 28th, 2014	36,743	1.46	10:00	61,754	2.45
5	July 22nd, 2014	35,573	1.41	12:00	59,342	2.35
6	May 25th, 2014	35,567	1.41	19:00	61,114	2.42
7	May 30th, 2014	35,314	1.40	8:00	57,072	2.26
8	June 24th, 2014	35,308	1.40	7:00	62,909	2.49
9	July 21st, 2014	35,116	1.39	8:00	53,095	2.10
10	July 23rd, 2014	34,146	1.35	1:00	65,730	2.60
	Average	36,086	1.43		60,485	2.40

Note:

[1]SCADA data provide by the York Region was used to calculate average day per capita flows as well as Maximum Day and Peak Hour factors. Data provided by the Region included totalized flows per day and instantaneous flows at all well sources, major valves and for 15 minute intervals were provided.

[2] Total Flows were calculated by adding the flows coming in from Aurora, net flow from Queensville, the flows from the Newmarket Wells were added and the East Gwillimbury flows were deducted and then the final value was divided by the number of days in each year

[3] Average Day Flows were calculated by adding the total flows coming in from Aurora, net flow from Queensville and the flows from the Newmarket Wells were added (East Gwillimbury flows were not deducted) and then the final value was divided by the number of days in each year. East Gwillimbury (EG) flows were not deducted in the Average Day Flows as there were inconsistencies between the 2012, 2013 and 2014 flows into EG. Since residential and ICI consumption in the section of EG supplied by the water feeds in question is assumed to be similar to the consumption in Newmarket (i.e. the area is assumed to have the same kind of Maximum Day and Peak Hour factors) this approach was used to determine Max Day and Peak Hour Factors.

[4] Max Day Factors and Peak Hour Factors were calculated by dividing the Max Day Flows and Peak Hour Flows by the Average Day Flows (as calculate per item 3 in the notes).

Town of Newmarket Water and Wastemater Master Plan
Wastewater Unit Rates

Data Source	Data Source Type	Unit Wastewater Flow Rate (Residential Land Use) (Lpcd)	DWF Peaking Factor (Residential)	Residential -Infiltration Allowance - New Development (L/s/ha)	Residential - Infiltration Allowance - Residential with foundation drainage to sanitary sewer system (L/s/ha)	Residential - Infiltration Allowance - Residential with foundation drainage to storm (L/s/ha)	Residential - Infiltration Allowance - Residential with foundation drainage to sump pump (L/s/ha)	Unit Wastewater Flow Rate (Employment Land Use) (Lpcd)	DWF Peaking Factor (Employment)	Employment - Infiltration Allowance (L/s/ha)
Town of Newmarket Design Standards	Town Standards	360	Harmon	0.3				4 L/d/m2-60 L/d/m2		0.3
Master Sanitary Sewer Hydraulic Study	Previous Study completed for Town, 2008	325	Harmon	0.2	1.25	0.2	0.7	0.26 L/s/ha	1.98	0.2-1.25 (Rate selected based on Servicing Standards figure)
Southeast Sanitary Draiange Study Update	Previous Study completed for Town, 2014	277	Harmon	0.3						
Bogart Pumping Station	Analysis of data collected between 2010 and 2014	229.5			0.5	0.5	0.5	229.5		0.5
Newmarket Mag Meter	Analysis of data collected between 2010 and 2014	286			0.38	0.38	0.38	286		0.38
Temporary monitoring data	Regional Program - 2014, 2015 data	349			0.1-1.0					
Regional Unit Rates	Ongoing Regional W/WW Master Plan Update	310		0.26	calibrated model	calibrated model	calibrated model	248		0.26
Newmarket Master Plan	Recommended for Town's W&WW Master Plan	310	Harmon	0.3	1	0.2	0.7	310	Harmon	0.3

Notes:

1. Recommended Residential land Use unit wastewater rate of 322 Lpcd selected based on York Region's W&WW Master Plan.
2. Recommended I/I allowance for residential and employment land use new development areas set to 0.3 L/s/ha based on Town design standards.
3. Peak I/I allowance for residential areas with foundation drains discharged to sanitary sewer system of 1.0 L/s/ha based temporary monitoring data.
4. Harmon peaking factor to be used for residential and employment land use.
5. Peak I/I allowance for residential areas with foundation drains discharged to sanitary sewer system of 0.7 L/s/ha based 2008 Master Sanitary Sewer Hydraulic Study.
6. Recommended Employment land Use unit wastewater rate of 248 Lpcd selected based on York Region's W&WW Master Plan.
7. Master Sanitary Sewer Hydraulic Study selected peak unit wastewater rate of 0.26 L/s/ha for employment lands
8. Master Sanitary Sewer Hydraulic Study selected an infiltration allowance for employment lands of between 0.2 L/s/ha to 1.25 L/s/ha based on connection of foundation drains to storm or sanitary sewer system
9. Final recommended unit rates will be validated by comparison existing conditions modelling results to observed data.

Appendix B

MASTER PLAN TECHNICAL MEMORANDA

Technical Memorandum No. 1 – Water Existing Conditions

Technical Memorandum No. 2 – Wastewater Existing Conditions

TOWN OF NEWMARKET

WATER SYSTEM EXISTING CONDITIONS MODEL UPDATE

WATER SYSTEM EXISTING CONDITIONS MODEL UPDATE

Town of Newmarket

TECHNICAL MEMORANDUM

Project nº: 151-04561-00
Date: January 2017

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100 Commerce Valley Drive West
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1 INTRODUCTION

1.1 PROJECT BACKGROUND

The Town of Newmarket has retained WSP to undertake a Water and Wastewater Master Plan (henceforth referred to as the Master Plan). The purpose of the Master Plan is to identify the required improvements to the Town's water distribution system and wastewater collection system to support the proposed growth within the Town, including the Urban Centres Secondary Plan area. A hydraulic modelling exercise has been completed as part of the Master Plan to examine the Town's water distribution system in order to determine potential existing and future system deficiencies, as well as identify opportunities for operational improvements. The following report provides the details regarding the updates made to the Town's water model.

The Town of Newmarket is expected to grow significantly to 2041. The majority of this growth will occur through the redevelopment of the Davis Drive and Yonge Street corridors, which comprises of the Urban Centres area. The Town of Newmarket's Urban Centres Secondary Plan calls for a well-integrated, sustainable, mixed use area, accommodating a broad range of land uses. Increased density will be achieved through intensification of the area. Due to the anticipated population growth the town may need to expand on its existing water infrastructure.

The supply and treatment of water to the Town of Newmarket and the storage of water within Newmarket and surrounding municipalities is within the Region of York's jurisdiction. The Town of Newmarket is currently supplied by both groundwater from various wells in Newmarket and East Gwillimbury, as well as surface water from Peel Region through supplies on Bathurst Street, Yonge Street, Bayview Avenue and Leslie Street from Aurora. The Town of Newmarket is responsible for the distribution of water within the Town's boundaries from the Regional storage facilities and water supplies. The Town of Newmarket Distribution System is comprised of four pressure districts (West, Central, East and Aurora East Reduced Pressure Districts).

The Urban Centre Secondary Plan is serviced by both the West Pressure District (WPD) and Central Pressure District (CPD); however most of the water supply is from the Region's Sharon and Queensville wells and from the Leslie Street watermain via the East Pressure District (EPD). For this reason, it was necessary to determine the impact that the proposed growth will have on all pressure districts.

1.2 PROJECT SCOPE

The intent of this project is to provide the Town of Newmarket with recommendations for the water distribution system based on modeling undertaken by WSP. The Town of Newmarket had a working water model in H2ONet that was last updated in 2012. The modeling approach to be undertaken included updating the existing system model to include any changes made to the system since the 2012 update and loading the model with future development and population scenarios. 2011 census data was used to confirm water demands and update the model as required.

This Master Plan will include the evaluation of existing Town wide infrastructure, the identification of deficiencies and the development of short-term and long-term implementation plans for improvements for a financially sustainable program. WSP worked with the Region of York to ensure that this study is in tandem with the Region of York's 2015 Water and Wastewater Master Plan Update.

With an updated existing condition model, Town's development and planning information would be used to prepare a future growth condition scenario for, the 2041 horizon year. Using this model, distribution system shortfalls were determined and alternative solutions were confirmed.

2 REVIEW OF MODELS AND UPDATES

2.1 MODELING APPROACH

The Town of Newmarket provided a copy of the 2012 H2ONet water model of the Town's system in April 2015. As H2ONet is an Autocad based version of the hydraulic software created by Innovyze. With approval from the Town, it was decided to import the model into the GIS version of the software, InfoWater. The existing model would be reviewed and edits made as required to create an up-to-date model for the modelling exercises to be undertaken as part of the Master Plan.

2.2 REVIEW OF NEWMARKET MODELS

The water model was first imported into InfoWater before the data and scenarios could be reviewed. The model database was compared to the GIS information provided by the Town and the existing Regional information for the Regional facilities.

The information generally was correct for the pumping stations, wells and storage but most of the watermains had lost the data related to curves and bends in the pipes. At this point, Town staff were contacted to discuss the options to update the model. The bends could be recreated for each pipe or the entire model reconstructed from the Town's GIS information.

2.3 STAFF CONSULTATION

The Town was consulted via meetings and conference calls to provide input on the model creation, fire flows, unit rates and proposed upgrades. The Town decided that the reconstructing the model from the GIS was appropriate. This option would integrate the model with the Town's GIS information to allow a transfer of data between the two databases.

Historical water usage for the years 2012, 2013 and 2014 were used to calculate a water rate per person. The calculated values were discussed, compared to the Regional Master Plan rates, Town of Newmarket's engineering standards and the rates generated by the Wastewater team. It was decided that an average day rate of 220 L/cap/day would be used for both the residential and ICI development. Peaking factors were based on historical data and Regional Master Plan information. A summary of the data used to calculate the average day is included in Appendix A.

Fire flows were reviewed against the Town of Newmarket's engineering standards, the Fire Underwriters' Survey, other similar sized community standards and the Region's criteria. Fire flows were agreed to be the following:

- 7,000 L/min for single family dwellings
- 10,000 L/min for townhomes
- 15,000 L/min for apartments
- 15,900 L/min for commercial and industrial lands

2.4 DATA COLLECTION

As noted in Section 2.3, the Town provided background information on the existing infrastructure, historic flows, hydrant test pressure data and system operation. Information was also provided by the Region as the Region oversees the water supply to the municipalities and operates the wells, pumping stations, valves and storage facilities.

The data was provided by the Town was used to re-create the model, assess the per capita water usage, pressure district boundaries and confirm the model pressures. The Regional data was used to set the flows from the neighbouring municipalities and update operational settings for valves, pumping stations and storage.

2.5 WSP MODEL UPDATES

The GIS information for watermains was provided by both the Town and the Region. The Town information was used to recreate the pipes and nodes within the Town boundaries. Regional information was used to confirm the Town's data and provide the external supply watermains, pumping stations and storage as required. The information was adjusted to suit the needs of the model i.e. piping around pumping stations and wells are not clear without moving pipes to avoid overlap, etc. Any anomalies were noted and sent to the Town to confirm before proceeding.

The revised GIS information was imported into the InfoWater software. Connectivity was checked and zone boundaries set. Node elevations were extracted from the contour GIS shapefile and checked for inconsistencies.

The nodes to have demands allocated to them were identified. Demands are not placed on nodes within pumping stations or other points where supply is not directly required i.e. next to a park or on either side of a pressure reducing valve. With the demand nodes selected, Thiesson polygons were created around these nodes using the pressure district boundaries as the outer limit. The polygons were then used along with the population data, approved usage criteria to calculate the demands for each demand node. The demand data was then imported back into the model, the scenarios run, zone demands checked to confirm no zone errors and demands adjusted to suit if required.

Data for the pumping stations, storage and system operation, both internal and external to the Town, was input and checked. A pressure reducing valve was added to the Leslie Street Regional watermain to create the Aurora East Reduced Zone for the residential area east of Leslie Street.

With all data input and checked, the model was run and the pressures confirmed against the hydrant testing information. Adjustments were done as required before loading up the fire demands. Scenarios were created for each type of fire flow demand. The nodes were assigned the highest fire flow of the nearby developments.

3 HYDRAULIC MODELING RESULTS

3.1 MODEL RESULTS

With the model updated and checked against the existing pressure data, the system could be checked for any areas that required upgrades. Fire flows tend to be the demand that dictates the watermain size. Generally speaking the system pressures are adequate in the existing system. Fire flows could be met except near the London Elevated Tank. This is partly due to the existing system operation to maintain water quality in the system.

The Newmarket system has water quality issues. To assist with the turnover of water, the Region operates the London Tower using only the lower portion of the available storage. The water quality is being examined by others.

3.2 PROPOSED SOLUTIONS - EXISTING CONDITIONS SCENARIO

The Newmarket existing system is relatively robust and the Region provides adequate supply to the system. There are a few upgrades required to meet the fire flows under existing conditions as documented in Table 3-1.

Table 3-1 Existing Upgrades

PROJECT LABEL	STREET NAME	EXTENT	EXISTING SIZE (MM)	PROPOSED SIZE (MM)
W4	Willow Lane	From existing 250 mm to Longford Drive	150	250
W9	Calgain Road	Lorne Avenue to end of street	150	200
W10	Lorne Avenue	Davis Drive to Calgain Road	150	200

3.3 PROPOSED SOLUTIONS - FUTURE CONDITIONS SCENARIO

With a robust existing system supplying Newmarket and adequate supply from the Region, the additional demand doesn't overly stress the existing system. There are a few upgrades required to meet the future fire flows as documented in Table 3-2.

Table 3-2 Future Upgrades

PROJECT LABEL	STREET NAME	EXTENT	EXISTING SIZE (MM)	PROPOSED SIZE (MM)
W1	Bristol Road	Main Street North to Stiver Drive	200	300
W2	Main Street N	From Regional Main to Bristol	200	300
W3	George Street	Kingston Road to Davis Drive	150	200
W5	Huron Heights Drive	Davis Drive to existing 200 mm WM	150	200
W6	Willstead Drive	Queen Street to Davis Drive	150	200
W7	Queen Street	Millard Avenue to Parkside	150	200
W8	Parkside Drive	Queen Street to existing 200 mm WM	150	200
W11	Charles Street	Davis Drive to Queen Street	150	200
W12	Glenway Circle	Eagle St. to existing 200 mm WM on Glenway Circle	150	200
W13	Millard Avenue	Yonge Street to Queen Street	150	200

4 CONCLUSIONS

The Newmarket existing system is adequate to supply the existing community. The Region provides ample supply to the system to meet the needs of the system. Three upgrades are required to meet the fire flow demands.

5 RECOMMENDATIONS

- Newmarket and York should continue to maintain the current working relationship that is providing adequate water supply to the community.
- The water quality issues should be addressed by the report by others.
- The three upgrades should be completed to address the existing fire flow shortfall
- There are ten upgrades required to meet future fire flow demands.

APPENDIX A

Water Design Criteria

Town of Newmarket Water and Wastemater Master Plan

Water Unit Rates

Recommended Rates

	York Region MP	2015 Newmarket Engineering Design Standards	Recommended Rates (Base Year)
Maximum Day Factor	1.7	2.0	1.7
Average Day (L/cap/day)	220	300	220
Peak Hour Factor	2.5	3.0	2.5

Notes:
1. Recommended Average Day Rate was selected based on York Region's W&WW Master Plan.
2. Recommended Maximum Day Factor was selected based on York Region's W&WW Master Plan.
3. Recommended Peak Hour Factor was selected based on York Region's W&WW Master Plan (1.7 x 1.45 = 2.5)

Average Day Rate Calculations [1]

	Population			York SCADA Data		
Year	**Residential**	**Employment**	**Total [2]**	**Total Consumption (m3/day)**	**Avg Day (L/cap/day) - Based on dividing by Residential Population Only**	**Avg Day (L/cap/day) - Based on dividing by Residential and Employment Population**
2012	85,453	43,292	128,745	26,766	313	208
2013	86,819	43,750	130,569	26,477	305	203
2014	89,015	44,692	133,707	25,231	283	189

Maximum Day and Peak Hour Factor Calculations [1]

Average Day for 2012 [3] (m3/day)	**26,771**

	2012					
	Max Day	**Max Flow (m3/day)**	**Max Day Factor [4]**	**Peak Hour Time**	**Peak Hour Flow (m3/day)**	**Peak Hour Factor**
1	June 29th, 2012	31,255	1.17	10:00	55,296	2.07
2	June 30th, 2012	30,767	1.15	10:00	52,538	1.96
3	June 20th, 2012	30,370	1.13	8:00	66,938	2.50
4	June 19th, 2012	30,281	1.13	11:00	53,813	2.01
5	June 27th, 2012	30,269	1.13	10:00	59,753	2.23
6	August 28th, 2012	30,090	1.12	10:00	45,662	1.71
7	December 14th, 2012	29,305	1.09	2:00	56,707	2.12
8	June 22nd, 2012	29,166	1.09	13:00	54,137	2.02
9	July 17th, 2012	28,921	1.08	17:00	61,243	2.29
10	July 5th, 2012	28,736	1.07	23:00	55,886	2.09
	Average	29,916	1.12		56,197	2.10

Average Day for 2013 [3] (m3/day)	**26,486**

	2013					
	Max Day	**Max Flow (m3/day)**	**Max Day Factor [4]**	**Peak Hour Time**	**Peak Hour Flow (m3/day)**	**Peak Hour Factor**
1	July 17th, 2013	39,126	1.48	20:00	60,602	2.29
2	August 12th, 2013	38,676	1.46	14:00	60,098	2.27
3	July 19th, 2013	38,182	1.44	7:00	57,676	2.18
4	August 22nd, 2013	37,691	1.42	20:00	57,383	2.17
5	July 22nd, 2013	37,356	1.41	17:00	56,410	2.13
6	August 19th, 2013	37,320	1.41	20:00	60,486	2.28
7	August 10th, 2013	37,150	1.40	18:00	58,604	2.21
8	August 6th, 2013	37,017	1.40	19:00	58,481	2.21
9	July 23rd, 2013	36,902	1.39	9:00	54,225	2.05
10	August 9th, 2013	36,270	1.37	8:00	56,482	2.13
	Average	37,569	1.42		58,045	2.19

Average Day for 2014 [3] (m3/day)	**25,235**

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Note:

[1]SCADA data provide by the York Region was used to calculate average day per capita flows as well as Maximum Day and Peak Hour factors. Data provided by the Region included totalized flows per day and instantaneous flows at all well sources, major valves and for 15 minute intervals were provided.

[2] Total Flows were calculated by adding the flows coming in from Aurora, net flow from Queensville, the flows from the Newmarket Wells were added and the East Gwillimbury flows were deducted and then the final value was divided by the number of days in each year

[3] Average Day Flows were calculated by adding the total flows coming in from Aurora, net flow from Queensville and the flows from the Newmarket Wells were added (East Gwillimbury flows were not deducted) and then the final value was divided by the number of days in each year. East Gwillimbury (EG) flows were not deducted in the Average Day Flows as there were inconsistencies between the 2012, 2013 and 2014 flows into EG. Since residential and ICI consumption in the section of EG supplied by the water feeds in question is assumed to be similar to the consumption in Newmarket (i.e. the area is assumed to have the same kind of Maximum Day and Peak Hour factors) this approach was used to determine Max Day and Peak Hour Factors.

[4] Max Day Factors and Peak Hour Factors were calculated by dividing the Max Day Flows and Peak Hour Flows by the Average Day Flows (as calculate per item 3 in the notes).

TOWN OF NEWMARKET

WASTEWATER SYSTEM EXISTING CONDITIONS MODEL UPDATE

WASTEWATER SYSTEM EXISTING CONDITIONS MODEL UPDATE

Town of Newmarket

TECHNICAL MEMORANDUM

Project nº: 151-04561-00
Date: March 2017

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1 INTRODUCTION

1.1 PROJECT BACKGROUND

The Corporation of the Town of Newmarket has retained WSP to undertake a Water and Wastewater Master Plan to identify the required improvements and/or expansion to the Town's water distribution and wastewater collection systems to support existing and proposed growth within the Town, including the intensification of the Urban Centres Secondary Planning Area. A hydraulic modelling exercise was completed as part of the Master Plan to examine the Town's wastewater collection system in order to determine potential existing and future system deficiencies, as well as identify opportunities for operational improvements.

This study included the evaluation of existing Town wide infrastructure, the identification of existing and future deficiencies and the development of a long-term implementation plan for system improvements to meet servicing demands to 2041. WSP worked with York Region to ensure that this study was in tandem with the Region's 2016 Water and Wastewater Master Plan Update.

In 2008, the Town completed the Master Sanitary Sewer Hydraulic Study which evaluated hydraulically deficiencies in the portion of the Town's wastewater system that discharges to the Region's Newmarket Pumping Station. The work completed in 2008 was reviewed, updated and incorporated into the analysis completed for this project. In addition, areas not considered in the 2008 Master Sanitary Sewer Hydraulic Study were included in this study. These additional areas included:

- Northwest Newmarket which is generally located north of Davis Drive and west of Yonge Street. This area is serviced by the Town's Northwest Sub-trunk which discharges to a Regional sewer located in East Gwillimbury. This area is currently serviced through the Newmarket Pumping Station.
- Southwest Newmarket which is generally located west of the CNR tracks and south of Narinia Street. Wastewater from this area is conveyed by the Colter Sub-Trunk to the Regional York Durham trunk sanitary sewer.
- Southeast Newmarket which is generally located south of Stonehaven Avenue and east of the CNR tracks. Wastewater from this area is conveyed by the Bayview Avenue Sub-Trunk to the Bayview Pumping Station. Wastewater is then pumped into the Regional York Durham trunk sanitary sewer.
- Central Southeast Newmarket which is generally located south of Gorham Road and north of Stonehaven Avenue east of the CNR tracks. Wastewater from this area is generally conveyed by the Bogart Creek Sub-Trunk to the Region's Bogart Creek Pumping Station where is it pumped to the Region's Newmarket Pumping Station forcemain.

1.2 PROJECT SCOPE

Once the existing condition model was updated, WSP used the Town's development and planning information to prepare a future growth condition scenario for, the 2041 horizon year. Using this model, wastewater collection system capacity shortfalls were determined and alternative solutions were developed and confirmed.

A key task of this project focused on developing baseline information for the sanitary system. Key activities included preparation of an updated sanitary plan, assessment of available flow data, assessment of the Town's design criteria, and review of the Town's foundation drainage area plan.

2 REVIEW OF MODELS AND UPDATES

2.1 MODEL SET UP AND VALIDATION

A model of the sanitary sewer system was created in InfoWorks CS using the Town's GIS data as a basis. Model set-up activities included detailed GIS data review to identify data gaps and anomalies, collection of survey data to fill data gaps and address anomalies, creation of model sub-catchments, addition of information for Town pumping stations, and consideration of the impact of the Regional system on the Town's wastewater system.

As an initial step, a detailed review of the Town's GIS data was completed to identify any data anomalies and data gaps. The results of the anomalies/ gaps analysis identified a number of locations where critical sanitary sewer system invert information was needed. Prior to undertaking a detailed survey, the Region also provided their all pipes model GIS data layer and this layer was reviewed to identify if the data contained could be used to fill any data gaps. Upon completion of this effort, there remained a number of locations where detailed survey data collected was necessary. This information was then collected through a detailed survey and the Town's GIS files were updated accordingly. Figure 2.1 presents the locations where survey data was collected.

Following the completion of the survey, the pipe and node data for the model was updated using the survey data and was imported directly into the InfoWorks CS model. As-constructed drawings of the Region's new sanitary sewer on Davis Drive were reviewed and the information used to update the model. The physical data for the model was finalized with the additional of the Town's pumping stations in the model. Information for model set-up, including pump rates, wet well volumes and inlet details were obtained from as-constructed drawings and information provided by the Town. Forcemains were also included in the model as per the Town's GIS data.

A series of sub-catchments were created to generate flows in the model. Sub-catchments were created on a manhole by manhole basis using an automated GIS tool and manually reviewed to correct any issues. Sub-catchments were developed by assigning each parcel to a nearby sanitary sewer maintenance hole. Parcels associated with a single maintenance hole were reviewed, and where a common land use was identified, multiple parcels were grouped to form a single sub-catchment. No road area was included in the sub-catchments.

Figure 2.1
Town of Newmarket
Data Gaps

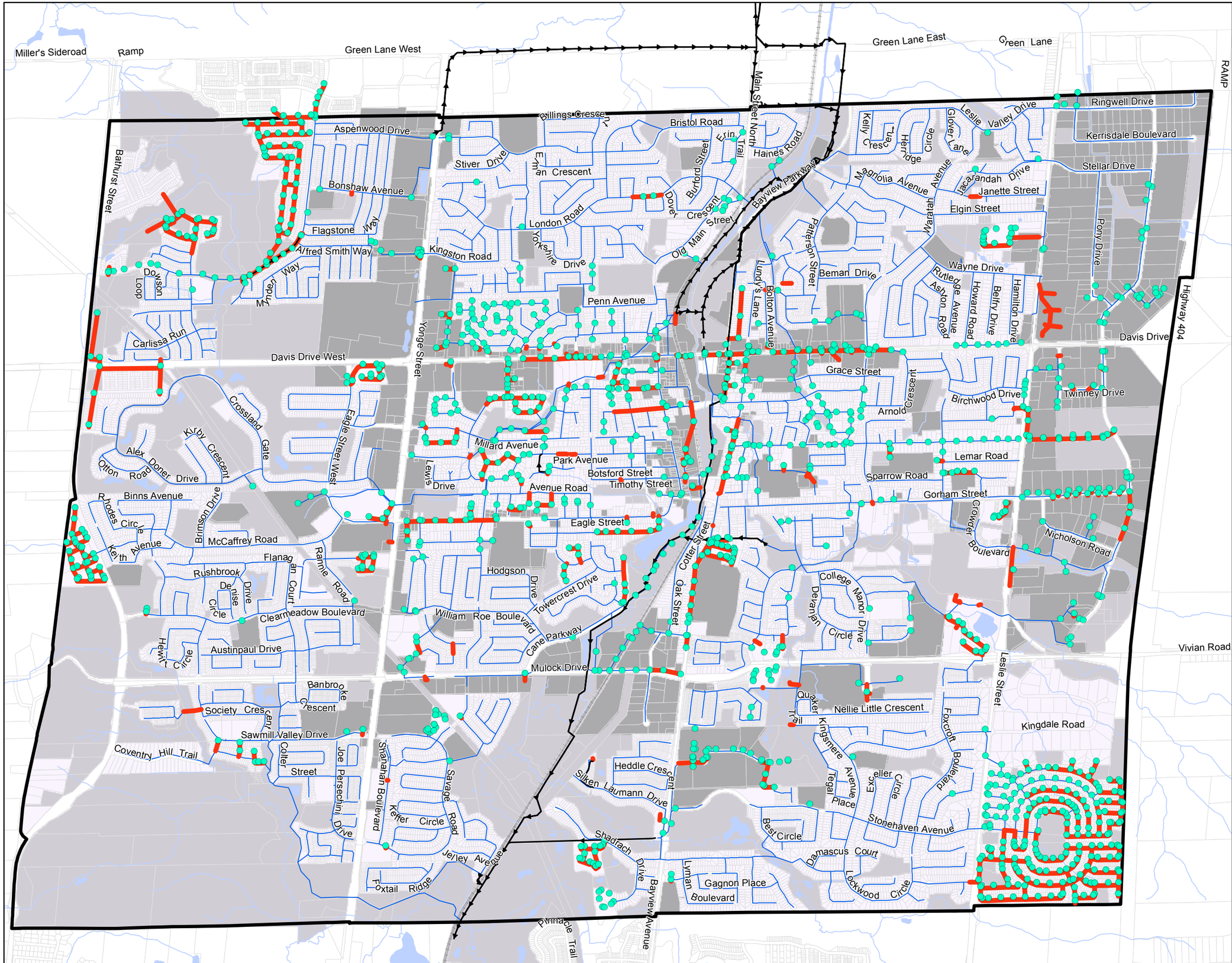
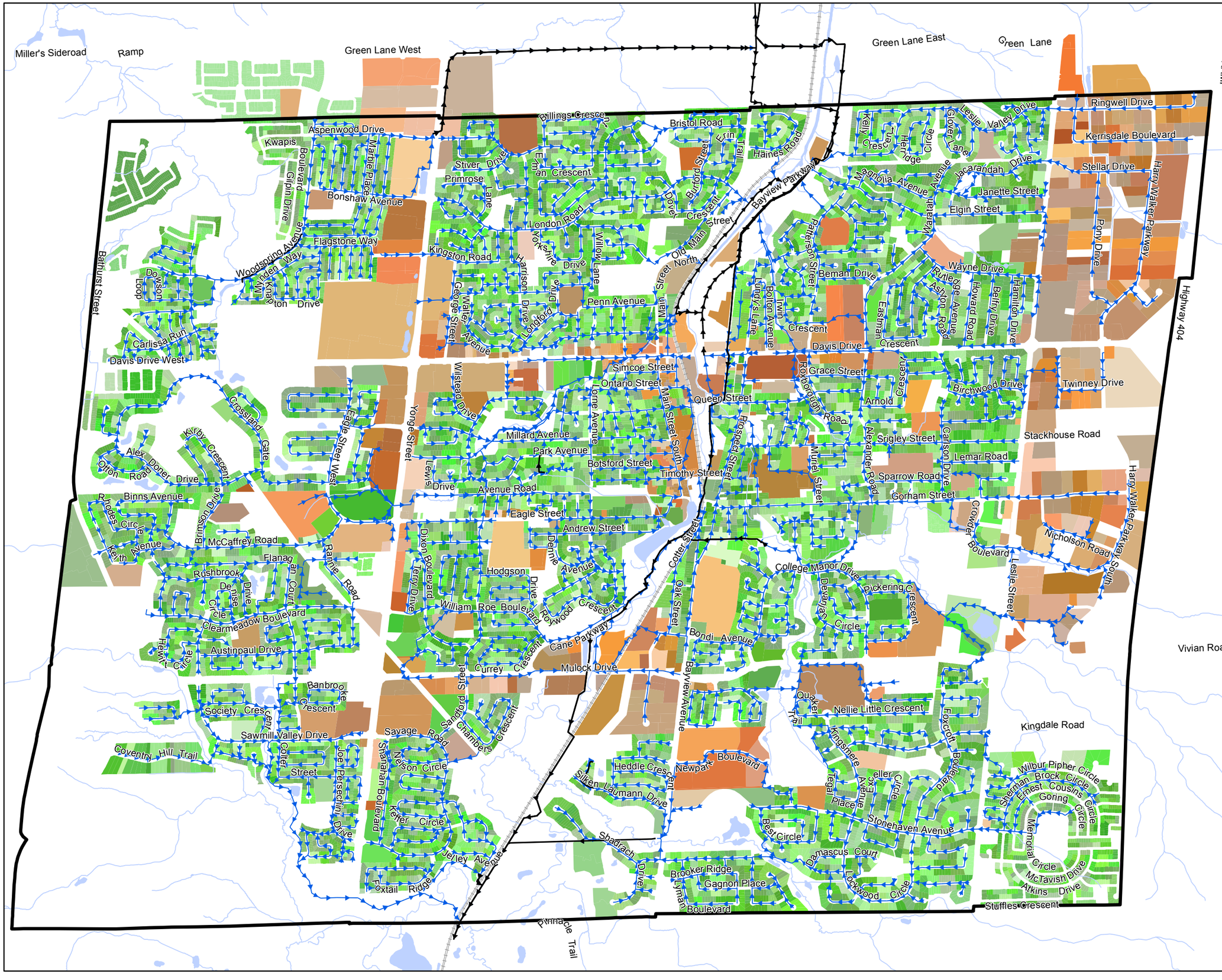


Figure 2.2
Town of Newmarket
Model Subcatchments



Sub-catchment data were populated using data obtained from the Town's GIS layer. Area was calculated and residential populations were estimated using the parcel layer. Non-residential populations or employment populations were also estimated using the Town's GIS data. Sub-catchment structure was also compared against the Town's 2008 Master Sanitary Sewer Hydraulic Study and the Southeast Sanitary Drainage Area Study results for confirmation.

Pumping stations and forcemains were also included in the model. The Town has six pumping stations, Bayview Pumping Station (PS), St. Andrews PS, Woodmount PS, Woodspring PS, Northwest PS, and Seniors PS. Information for four of these pumping stations, including pump capacity, wet well volume, pump on-off levels, and forcemain profiles, were obtained from existing ECA/C of A documents as well as Town staff, and included in the model. The Town also provided SCADA data for these stations. Table 2-1 presents detailed information for the four pumping stations included in the model. The Northwest PS and Seniors PS are small pumping stations and were not included in the model.

Table 2-1 Town of Newmarket Pumping Stations

STATION	NUMBER OF PUMPS	FIRM CAPACITY(L/S)	MODELLING DETAILS
Bayview PS	2	175	Modelled as a fixed pump with lead pump on level of 246.5m and lead pump off level of 246m. Wet well storage volume of 25m3. Forcemain is 400mm diameter.
St. Andrews PS	2	28.4	Station has two pumps, each with a capacity of 28.4 L/s. Wet well storage area is 10.2 m2. 100mm diameter forcemain. Modelled as a fixed pump with lead pump on level of 244.97m and lead pump off level of 244.72m. Wet weather storage area is 10m2. Forcemain is 100mm in diameter.
Woodmount PS	2	11	Station has two pumps, each with a capacity of 11 L/s. Wet well storage area is 1.8m2. Forcemain is 100mm in diameter.
Woodspring PS	2	271	Station has two pumps, each with a capacity of 271 L/s. Wet well storage area is 18.5m2. Forcemain is 350mm in diameter.

The operation of these stations was modelled with on/off levels and pump discharge rates.

A small area within East Gwillimbury discharges wastewater into Town of Newmarket sanitary sewers. An industrial area located north of Ringwell Road and east of Kerrisdale Road in East Gwillimbury is serviced through the Town's Leslie Valley Sub-trunk sewer. This area was also included within model.

A critical aspect of the model was the connections to the Regional York Durham Sanitary Sewerage System (YDSS). Wastewater from Newmarket is ultimately conveyed to the YDSS through many connection points. Figure 2.3 presents the drainage area tributary to each connection point.

Figure 2.3
Town of Newmarket
Model Drainage Areas

- Waterbodies
- Watercourses
- Railway
- York Region Sanitary Sewer
- Pipe

SubTrunk

- Western
- Holland River
- Wyndham / Stonegate
- West Central
- Leslie Valley
- East Central
- Savage Road
- Devanjan-Kingsmere
- Penn-Amelia
- Cherrywood-Penn
- Patterson Street
- Bayview Avenue
- Northwest
- London Road
- Doubletree / Colter
- Elgin Street

N

0 250 500 1,000 Meters

Miller's Sideroad
Ramp
Green Lane West
Green Lane East
Green Lane
RAMP
Highway 404
Vivian Road
Kingdale Road
Bathurst Street
Yonge Street
Bayview Parkway
Bayview Avenue
Leslie Street
Harry Walker Parkway
Pinnacle Trail
Aspenwood Drive
Kwapis Boulevard
Gipin Drive
Marble Place
Bonshaw Avenue
Flagstone Way
Woodspring Avenue
Golden Way
Knapton Drive
Dowson Loop
Carlissa Run
Davis Drive West
Crossland Gate
Kirby Crescent
Alex Doner Drive
Orlon Road
Binns Avenue
Rhodes Circle
Keith Avenue
Brimson Drive
McCaffrey Road
Rushbrook Drive
Denise Circle
Clearmeadow Boulevard
Austinpaul Drive
Hewitt Circle
Flanagan Court
Rannie Road
Banbrooke Crescent
Society Crescent
Sawmill Valley Drive
Coventry Hill Trail
Colter Street
Joe Persechini Drive
Savage Road
Shanahan Boulevard
Nelson Circle
Keller Circle
Jersey Avenue
Foxtail Ridge
Sandford Chambers Crescent
Currey Crescent
Mulock Drive
Cane Parkway
Rosewood Crescent
Dennett Avenue
Hodgson Drive
William Roe Boulevard
Jerry Drive
Dixon Boulevard
Andrew Street
Eagle Street
Avenue Road
Lewis Drive
Park Avenue
Millard Avenue
Botsford Street
Timothy Street
Lorne Avenue
Main Street South
Wistead Drive
Simcoe Street
Ontario Street
Queen Street
Penn Avenue
George Street
Walter Avenue
Harrison Drive
Longford Drive
Wilson Avenue
Willow Lane
London Road
Kingston Road
Old Main Street North
Stiver Drive
Primrose Lane
Millington Crescent
Bristol Road
Burford Street
Dove Crescent
Erin Trail
Haines Road
Kelly Crescent
Jennifer Hedge
Glover Circle
Glover Lane
Leslie Valley Drive
Ringwell Drive
Kerrisdale Boulevard
Stellar Drive
Pony Drive
Magnolia Avenue
Jacaranda Drive
Janette Street
Elgin Street
Maple Avenue
Patterson Street
Beman Drive
Wayne Drive
Rutledge Avenue
Howard Road
Belfry Drive
Hamilton Drive
Ashton Road
Eastman Crescent
Davis Drive
Grace Street
Arnold Crescent
Birchwood Drive
Twinney Drive
Stackhouse Road
Srigley Street
Lemar Road
Sparrow Road
Gorham Street
Crowder Boulevard
Nicholson Road
Tundry's Lane
Boston Avenue
Irwin Crescent
Roxborough Road
Alexander Road
Muriel Street
Colter Street
Oak Street
College Manor Drive
Devanjan Circle
Pickering Crescent
Bondi Avenue
Quaker Trail
Nellie Little Crescent
Foxcote Boulevard
Kingsmere Avenue
Regal Place
Heddle Crescent
Newpark Boulevard
Silken Laumann Drive
Shadrach Drive
Brooker Ridge
Gagnon Place
Lyman Boulevard
Damascus Court
Best Circle
Stonehaven Avenue
Lockwood Circle
Wilbur Pipher Circle
Sherman Brock Circle
Ernest Cousins Circle
Goring Circle
Memorial Circle
McTavish Drive
Arkins Drive
Stuffles Crescent

The Region's wastewater system was not included in the model of the Town's sanitary sewer system. Instead, locations where the Town's system discharges into the Regional system were defined as boundary locations and a boundary condition was assigned to each location. A boundary condition was set at each location to represent the downstream peak HGL level in the Regional system. Boundary condition values were provided by the Region as 25-year design storm hydraulic grade line profiles for the East Holland Trunk Sewer, West Holland Trunk Sewer, Green Lane Sewer, and YDSS. The use of these boundary conditions eliminated the need to explicitly model the Region's pumping stations, including both the Newmarket PS and the Bogart Creek PS.

A detailed analysis of existing data and information was completed to select unit wastewater generation rates for use in modelling. The following information/reports/data were reviewed:

- Town of Newmarket Design Standards;
- 2008 Master Sanitary Sewer Hydraulic Study;
- Southeast Sanitary Drainage Area Study Update;
- SCADA data from the Bogart Pumping Station;
- SCADA data obtained from the Newmarket Mag Meter;
- Region's temporary monitoring programs from 2014 and 2015;
- Temporary monitoring data, collected to support Development proposals, within the Town's sanitary sewers; and
- York Region's 2016 Water and Wastewater Master Plan Unit Rates.

For each of these information sources, data was compared for residential areas unit wastewater generation rates, residential areas dry weather peaking factors, employment areas dry weather peaking factors, residential new development areas infiltration allowance, residential areas infiltration allowance for older areas with foundation drain connections to the sanitary sewer system, residential areas infiltration allowance for older areas with foundation drain connections to the storm sewer system, residential areas infiltration allowance for older areas with foundation drains and sump pumps discharged to surface and infiltration allowance for older employment areas. Based on review of available information, recommendations were made for initial unit rates that would be used in this study. Table 2.1 presents the comparison of the results and recommended unit rates. It was acknowledged that the use of these rates would be verified through the model validation process. It was also agreed that the Town's design standards would be used to project future flows. Unit rates shown in Table 2.1 were applied to existing development areas only and used to assess system performance.

Table 2-2 Unit Wastewater Rates

Data Source	Data Source Type	Unit Wastewater Flow Rate (Residential Land Use) (Lpcd)	DWF Peaking Factor (Residential)	Residential -Infiltration Allowance - New Development (L/s/ha)	Residential - Infiltration Allowance - Residential with foundation drainage to sanitary sewer system (L/s/ha)	Residential - Infiltration Allowance Residential with foundation drainage to storm (L/s/ha)	Residential - Infiltration Allowance - Residential with foundation drainage to sump pump (L/s/ha)	Unit Wastewater Flow Rate (Employment Land Use) (Lpcd)	DWF Peaking Factor (Employment)	Employment - Infiltration Allowance (L/s/ha)
Town of Newmarket Design Standards	Town Standards	360	Harmon	0.3				4 L/d/m2-60 L/d/m2		0.3
Master Sanitary Sewer Hydraulic Study	Previous Study completed for Town, 2008	325	Harmon	0.2	1.25	0.2	0.7	0.26 L/s/ha	1.98	0.2-1.25 (Rate selected based on Servicing Standards figure)
Southeast Sanitary Draiange Study Update	Previous Study completed for Town, 2014	277	Harmon	0.3						
Bogart Pumping Station	Analysis of data collected between 2010 and 2014	229.5			0.5	0.5	0.5	229.5		0.5
Newmarket Mag Meter	Analysis of data collected between 2010 and 2014	286			0.38	0.38	0.38	286		0.38
Temporary monitoring data	Regional Program - 2014, 2015 data	349			0.1-1.0					
Regional Unit Rates	Ongoing Regional W/WW Master Plan Update	310		0.26	calibrated model	calibrated model	calibrated model	248		0.26
Newmarket Master Plan	Recommended for Town's W&WW Master Plan	310	Harmon	0.3	1	0.2	0.7	310	Harmon	0.3

The rationale for selection of these rates is as follows:

- A unit wastewater generation for residential development of 310 Lpcd was selected. This value is lower than the Town's design standard for unit wastewater flow for residential areas but higher than data analysis results for the Newmarket mag meter and Bogart Pumping Station. The value is the same as the unit rate being utilized by the Region.
- The Harmon peaking factor was selected to generate peak dry weather flows. The use of the Harmon peaking factor matches well with historical studies.
- An infiltration allowance for new residential development areas of 0.3 L/s/ha was selected as this is the Town's design standard.
- An initial infiltration allowance of 1 L/s/ha was selected for residential areas with foundation drain connections to the sanitary sewer system. This value represents the highest value seen in the historical data although it is lower than the value used in the 2008 Master Sanitary Sewer Hydraulic Study. This parameter would be adjusted through the model validation process.
- An infiltration allowance of 0.2 L/s/ha was selected for existing residential areas with foundation drain connections to storm sewers.
- An initial infiltration allowance of 0.7 L/s/ha was selected for existing residential areas with foundation drain connections to sump pumps. It was agreed that this value should be higher than the value for residential areas with foundation drain connections to storm sewers as a portion of the infiltrated foundation drainage would enter the sanitary sewer system through cracks and defects. This value would also be adjusted through model validation.
- For employment areas, a per capital flow of 310 Lpcd was adopted to match residential areas, the Harmon peaking factor was selected and an infiltration allowance of 0.3 L/s/ha was selected. These are conservative values and considered reasonable for employment areas.

It is important to note that dry weather flows are generated in the model through the use of population, land use, the unit wastewater flow rates for different land uses and peaking factors, listed in Table 2-1. Adjustments to per capita wastewater generation data were not made through the model validation process as these data were initially defined by monitored data. An adjustment to dry weather flow was made in the upstream area of the Cherrywood Penn Sub-trunk to match measured dry weather flows from the Upper Canada Mall. Infiltration allowances were validated through the model validation process.

As development has proceeded in Newmarket, the nature of foundation drain connections has changed. The earliest development had foundation drains connected to the sanitary sewer system. For a short

period, this was changed and foundation drains were connected to the storm sewer system. Following the adoption of the 1992 Building Code, all foundation drains were to be connected to a sump pump with a discharge to the surface. Figure 2.4 presents the information on the nature of foundation drain connections in the Town. This figure was first developed for the 2008 Newmarket Master Sanitary Hydraulic Study for the portion of Newmarket tributary to the Newmarket Pumping Station. The information was extended as part of this study to include the entire Town.

After completion of model set-up activities, a model validation exercise was begun. A review of available flow and rainfall monitoring data identified the following data sets:

- Flow data recorded for 2014 at the Region's permanent flow meters at the Bogart Pumping Station, Newmarket Pumping Station and the Newmarket Mag meter.
- Flow data collected at the Newmarket Pumping Station on March 13, 2006. This event was previously identified as a significant storm event during the 2008 Master Sanitary Sewer Hydraulic Study.
- Flow data collected by the Region as part of the ongoing I/I Audit Basin Flow Monitoring Program. This data was made available by the Region and records exist at a total of 16 sites beginning from late 2014 to the end of June 2015. This program also includes the collection of rainfall data at four rainfall gauges in the Newmarket.
- Flow data collected as part of Development Application processes in Town of Newmarket sanitary sewers. One consultant, Cole Engineering, completed flow monitoring in the Penn Amelia and Cherrywood Penn Sub-trunks in 2013 and 2014. These programs included collection of rainfall data at a nearby gauge. This data was reviewed and utilized to validate the model for the Penn Amelia and Cherrywood Penn Sub-trunks.

This data provided the information necessary to validate the model for the majority of the Town's sanitary sewer system.

Figure 2.4
Town of Newmarket
Foundation Drain Connections

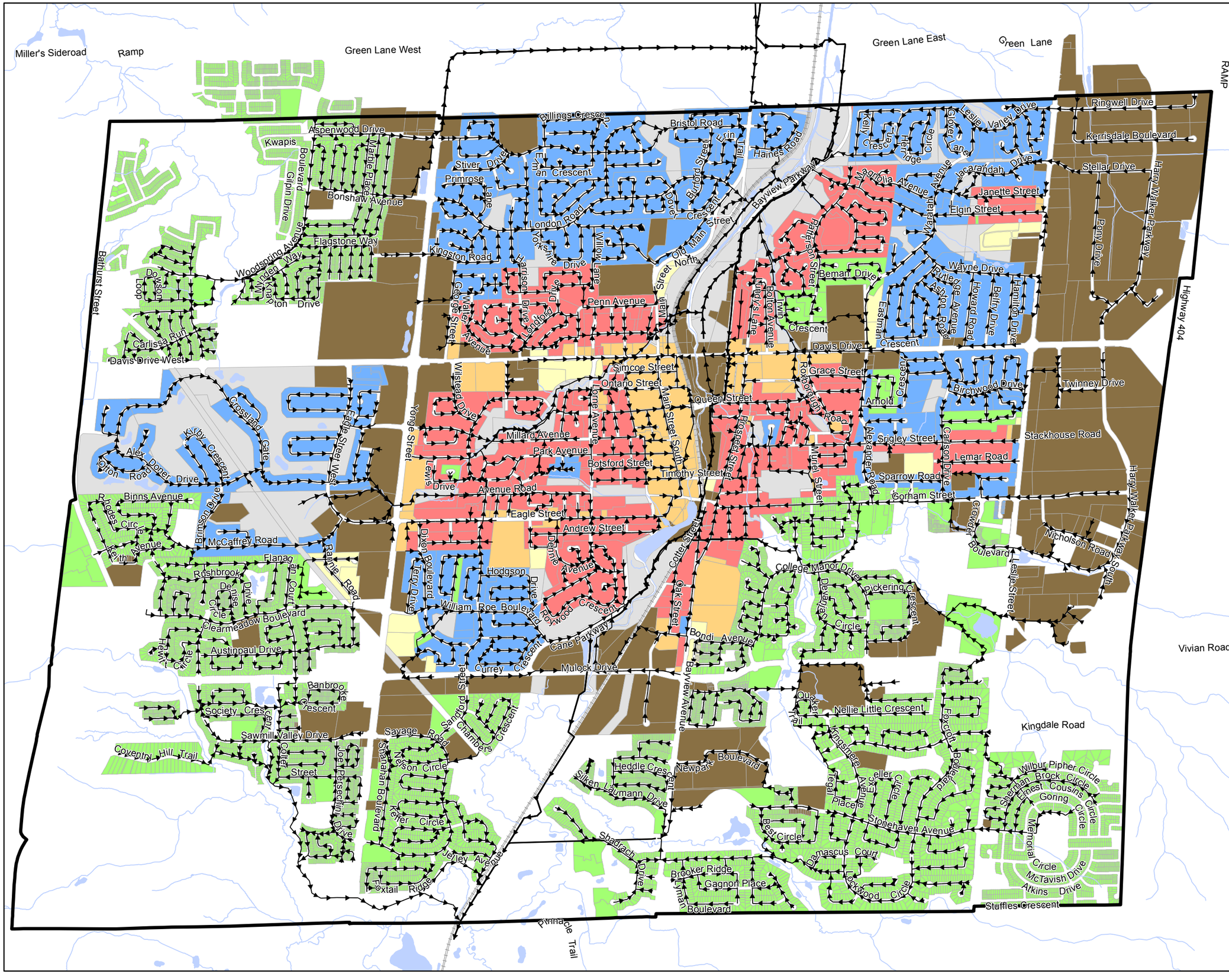
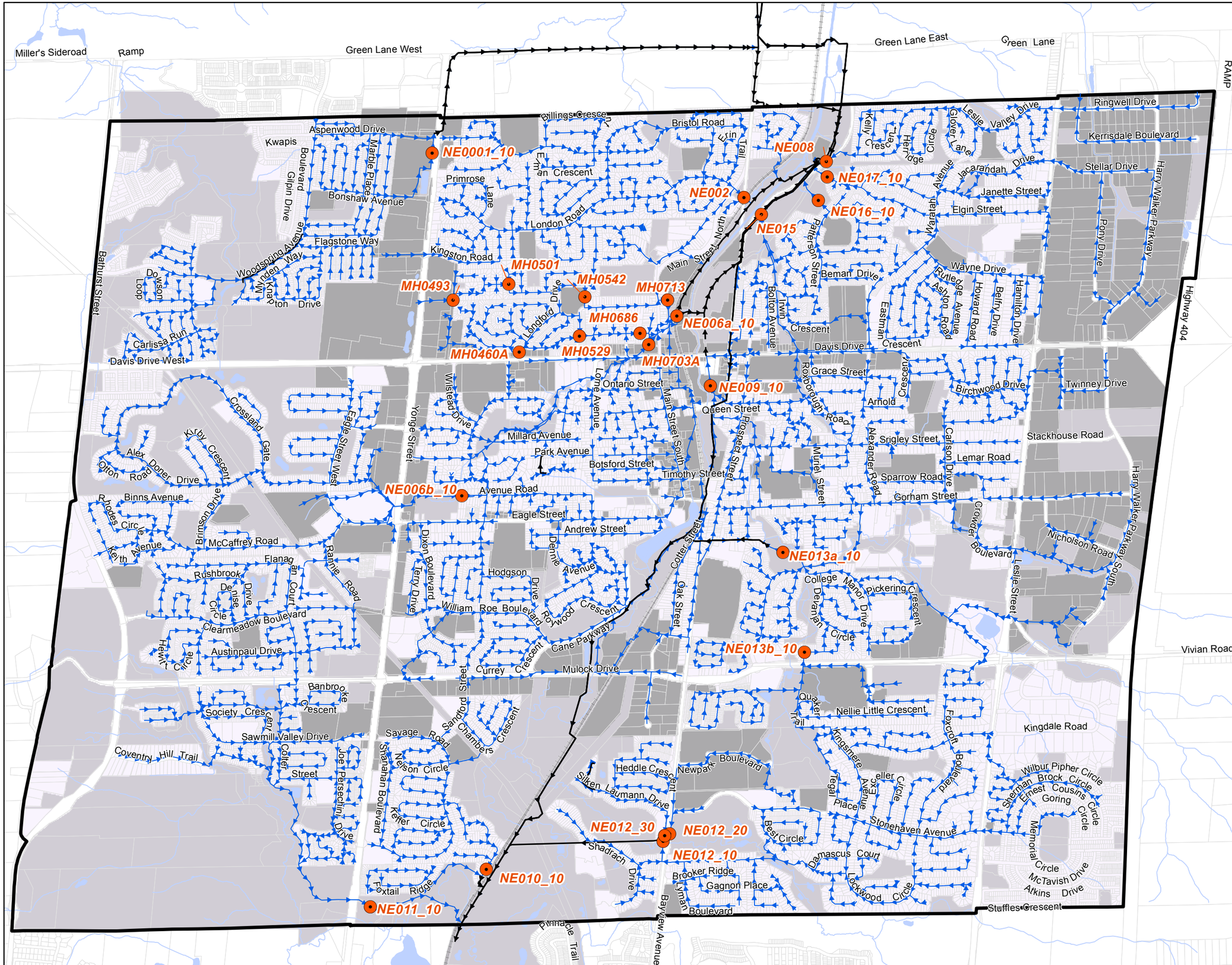


Figure 2.5
Town of Newmarket
Flow Monitor Locations



In addition to the flow and rainfall data listed above, York Region also provided hydraulic modelling results at Regional and Town pumping stations for a 25- year storm event. These results were input into the model as boundary conditions at locations where the Town's system discharged to the Regional system.

Prior to undertaking model validation, it was recognized that the response to the system to significant rainfall events was important for the selection of parameters. An analysis of available rainfall gauge data was completed to select significant storm events. Table 2.3 presents the rainfall characteristics for the most significant events that occurred. This table also indicates how many flow monitors collected data during these events.

Table 2-3 Significant Rainfall Events

DATE	RAINFALL EVENT VOLUME (MM)	RAINFALL PEAK INTENSITY (MM/HR)	RAINFALL DURATION (HRS:MIN)	NUMBER OF FLOW MONITORS WITH DATA FOR THE EVENT
May 21, 2013	49.5	81	5:30	Data available at 2 sites located in Penn Amelia and Cherrywood Penn Sub-Trunks. Rainfall data available from rain gauge installed at Denison Secondary School.
May 31, 2013	18.75	75	6:15	Data available at 2 sites in Penn Amelia and Cherrywood Penn Sub-Trunks. Rainfall data available from rain gauge installed at Denison Secondary School.
July 8, 2013	27.25	63	8:50	Data available at 2 sites in Cherrywood Penn Sub-Trunks. Rainfall data available from rain gauge installed at Denison Secondary School.
June 17, 2014	39	18.75mm/hr measured at one gauge	8:00	Data available at 3 sites located in Penn Amelia, London Road and Western Sub-Trunks. Rain data available for gauge installed at Denison Secondary School.
June 22, 2015	39.6mm – 51.2mm as measured at three gauges in Newmarket	86.4mm/hr to 170.4 mm/hr as measured at three rain gauges in Newmarket	3:25	Data available at a total of 18 sites (Northwest, London, Western, Queens, Leslie Valley, Doubletree, Bayview, Bogart Creek, East Central, Patterson and Elgin Sub-trunks. Rainfall data available at three Regional rain gauges that covered the Town.

The model validation process was a stepped process and involved adjustments to two key wet weather flow parameters and one dry weather flow parameter to better match peak flows. These parameters were the inflow and infiltration allowance for existing development areas with foundation drains connected to the sanitary sewer system and the inflow and infiltration allowance for existing development areas with

foundation drains connected to the sump pumps. The focus of the approach was to ensure that the model over predicted measured flows within a reasonable margin. Table 2.4 presents the comparison of measured and modelled peak flows for the peak rainfall event selected at each site and also identifies the final values selected for the infiltration allowance for foundation drainage connections.

Table 2-4 Model Validation Results

FLOW MONITORING LOCATION	EVENT DATE	MEASURED PEAK FLOW (L/S)	MODELLED PEAK FLOW (L/S)	FINAL VALUE SELECTED FOR I/I ALLOWANCE FOR RESIDENTIAL AREAS WITH FOUNDATION DRAINAGE TO SANITARY SEWERS	FINAL VALUE SELECTED FOR I/I ALLOWANCE FOR RESIDENTIAL AREAS WITH FOUNDATION DRAINAGE TO SUMP PUMPS	DRY WEATHER FLOW ADJUSTMENTS
600mm dia. Northwest Sub-Trunk (YR NE001_10)	June 22, 2015	71.3	191.5	0.6	0.4	None
600mm dia. London Road Su-Trunk (YR NE002_10)	June 22, 2015	86.8	132.1	0.6	0.4	None
Western Sub-Trunk D/S of West Central (NE006a_10)	June 22, 2015	326.8	331.0	0.6-1.25	0.4	Peak dry weather flow from Upper Canada mall reduced from 41 L/s to 16 L/s to match measured flows
450mm dia. Western Sub-Trunk east of Yonge (NE006b_10)	June 22, 2015	68.4	108.0	0.6	0.4	None
525mm dia. Leslie Valley Sub-Trunk (NE008)	June 22, 2016	61.3	136.1	0.6	0.4	None
450mm dia. Queens Sub-Trunk/ Holland River Trunk (NE009_10)	June 22, 2015	139,0	193.2	0.6	0.4	None

FLOW MONITORING LOCATION	EVENT DATE	MEASURED PEAK FLOW (L/S)	MODELLED PEAK FLOW (L/S)	FINAL VALUE SELECTED FOR I/I ALLOWANCE FOR RESIDENTIAL AREAS WITH FOUNDATION DRAINAGE TO SANITARY SEWERS	FINAL VALUE SELECTED FOR I/I ALLOWANCE FOR RESIDENTIAL AREAS WITH FOUNDATION DRAINAGE TO SUMP PUMPS	DRY WEATHER FLOW ADJUSTMENTS
750mm dia. On Bosworth Crt (NE010_10)	June 22, 2015	46.4	75.9	0.6	0.4	None
750mm dia. Doubletree Sub-Trunk south of Widdifield (NE011_10)	June 22, 2015	71.3	188.1	0.6	0.4	None
Bayview Sub-Trunk (NE012_11)	June 22, 2015	25.9	119.1	0.6	0.4	None
450mm dia. Bayview Ave. north of Bayview Sub-Trunk (NE012_20)	June 22, 2015	12.5	25.6	0.6	0.4	None
250mm dia. Bayview north of Bayview Sub-Trunk (NE-012_30)	June 22, 2015	12.0	23.5	0.6	0.4	None
675mm dia. Bogart creek Sub-trunk (NE013a_10)	June 22, 2015	108.0	247.9	0.6	0.4	None
450mm dia. Bogart Creek Sub-Trunk at Firth (NE013b_10)	June 22, 2015	54.9	101.3	0.6	0.4	None
600mm dia. East Central Sub-Trunk (NE015)	June 22, 2015	83.2	186.9	0.6	0.4	None

FLOW MONITORING LOCATION	EVENT DATE	MEASURED PEAK FLOW (L/S)	MODELLED PEAK FLOW (L/S)	FINAL VALUE SELECTED FOR I/I ALLOWANCE FOR RESIDENTIAL AREAS WITH FOUNDATION DRAINAGE TO SANITARY SEWERS	FINAL VALUE SELECTED FOR I/I ALLOWANCE FOR RESIDENTIAL AREAS WITH FOUNDATION DRAINAGE TO SUMP PUMPS	DRY WEATHER FLOW ADJUSTMENTS
450mm dia. Patterson Sub-Trunk (NE016_10)	June 22, 2015	39.3	41.5	0.9	0.4	None
600mm dia. Elgin Street Sub-Trunk (NE017_10)	June 22, 2015	81.4	113.4	0.6	0.4	None
MH0713 Cherrywood Penn Sub-trunk	May 21, 2013	33.2	41.0	0.6	0.4	Peak dry weather flow from Upper Canada mall reduced from 41 L/s to 16 L/s to match measured flows
MH0542 Cherrywood Penn Sub-trunk	May 31, 2013	26.2	33.9	0.6	0.4	Peak dry weather flow from Upper Canada mall reduced from 41 L/s to 16 L/s to match measured flows
MH0501 Cherrywood Penn Sub-trunk	July 8, 2013	9.5	22.7	0.6	0.4	Peak dry weather flow from Upper Canada mall reduced from 41 L/s to 16 L/s to match measured flows
MH0493 Cherrywood Penn Sub-trunk	July 8, 2015	4.1	16.5	0.6	0.4	Peak dry weather flow from Upper Canada mall reduced from 41 L/s to 16 L/s to match measured flows

FLOW MONITORING LOCATION	EVENT DATE	MEASURED PEAK FLOW (L/S)	MODELLED PEAK FLOW (L/S)	FINAL VALUE SELECTED FOR I/I ALLOWANCE FOR RESIDENTIAL AREAS WITH FOUNDATION DRAINAGE TO SANITARY SEWERS	FINAL VALUE SELECTED FOR I/I ALLOWANCE FOR RESIDENTIAL AREAS WITH FOUNDATION DRAINAGE TO SUMP PUMPS	DRY WEATHER FLOW ADJUSTMENTS
MH0686 Penn Amelia Sub-trunk	May 21, 2013	54.7	59.5	1.25	0.4	None
MH0529 Penn Amelia Sub-trunk	May 31, 2013	49.9	49.8	1.25	0.4	None
MH0460A Penn Amelia Sub-trunk	May 31, 2013	31.4	18.4	1.25	0.4	None
MH17756A London Road Sub-trunk	June 17, 2014	112.0	132.0	0.6	0.4	None
MH0703A Western Sub-Trunk	June 17, 2014	250	248.5	1.0	0.4	None

A review of Table 2.4 identifies that the model generally over predicts measured peak flows with the exception of the following location:

- At three sites in the Penn Amelia Sub-trunk (MH0529, MH0523, and MH0406A), the model predicts a value that is lower than the measured peak flow. It should be noted that at sites located downstream in the Penn Amelia Sub-trunk, the model does over predict peak flows. This area is known to have foundation drains connected to the sanitary sewer system. An infiltration allowance of 1.25 L/s/ha has been assigned to residential areas where foundation drains are connected to the sanitary sewer system.
- At one site in the Western Sub-Trunk (MH0703A), the modelled peak flow is marginally lower than the measured peak flow.

In general, the model was found to over predict peak flows, within a reasonable margin. As this model will be used to assess current and future needs and high peak wet weather flows do occur in Newmarket, this part of the validation exercise generated a model capable of predicting these flows.

Upon completion of this validation step, a final comparison of modelled values with peak flows measured through the Region's SCADA system as well as peak flows generated by the York Region Hydraulic Wastewater Model for a 25 year storm event was completed. Table 2.5 presents the results. Table 2.5 also presents the modelled peak flows generated by the Newmarket model with the initial selected I/I allowances as shown in Table 2.2.

Table 2-5 Final Comparison of Validated Model Results

LOCATION	2014 OBSERVED PEAK FLOW (L/S)	YORK REGION HYDRAULIC MODEL PEAK PREDICTED FLOW (L/S)	NEWMARKET MODEL PEAK FLOW GENERATED WITH INITIAL I/I ALLOWANCES (L/S0	FINAL NEWMARKET MODE PEAK FLOWS (L/S)
Bogart Creek PS	229	254	248	248
Newmarket PS	1,007	1,386	1,430	1,445
Newmarket Mag Meter	1,079	1,351	1,620	1,620
Bayview Ave. PS	-	69	169	169
St. Andrew PS	-	0.7	2	2
Woodmount PS	-	3	4	4
Woodspring PS	-	125	83	83

Notes:
1. Flows are not recorded through SCADA at Bayview, St. Andrew, Woodmount and Woodspring PSs.

Review of the results contained in Table 2.5 indicates that the final Newmarket model generally over predicts peak measured flows from 2014 and matches within reason, the peak 25 year flows generated by the York Region hydraulic model. On the basis of the model validation completed, the final Newmarket model is a reasonable planning level tool suitable to complete master planning.

It should be noted that the coverage of flow monitoring locations within the Town has allowed flows from all serviced areas in the Town to be calibrated for the purposes of capacity evaluation. Additional flow monitoring may be required in future to improve calibration and to assess flows at specific locations where capital projects are planned.

Once the existing conditions model was completed, a future growth scenario representing conditions in 2041 was created. The Town's Planning Department provided two sources of information. Through the Newmarket Growth Centres Secondary Plan, the Town identified that the Yonge-Davis Urban Growth Centre would be where significant amount of the Town's future population and employment growth and intensification would occur. The long term vision for this area is a vibrant urban community with a population of 33,000 and 32,000 jobs at buildout. The second source of information was the identification of twelve separate developments within the Town including the developments at 955 Mulock, Forest Green Homes, George Street/ Davis Drive, Glenway, Main Street Clock Tower, Mosiak, National Homes, St. Andrews (Phase 5), Yonge and Millard, Woodland Hills Phase 7, Cooper Hills, and Sundial/ Toth. The Town's Planning Department identified an estimated additional population from these 12 developments of 9,132 persons. A common approach for distributing future populations into model areas was completed for both water and wastewater systems. The approach and the results are documented in the Water System Existing Conditions Model Update Technical Memorandum.

3 HYDRAULIC MODELING RESULTS

The developed Newmarket model was used to assess the performance of the existing Newmarket sanitary sewer system under both existing and future conditions. This Technical Memorandum presents the results of the existing conditions system capacity assessments.

3.1 MODEL RESULTS

3.1.1 PERFORMANCE CRITERIA

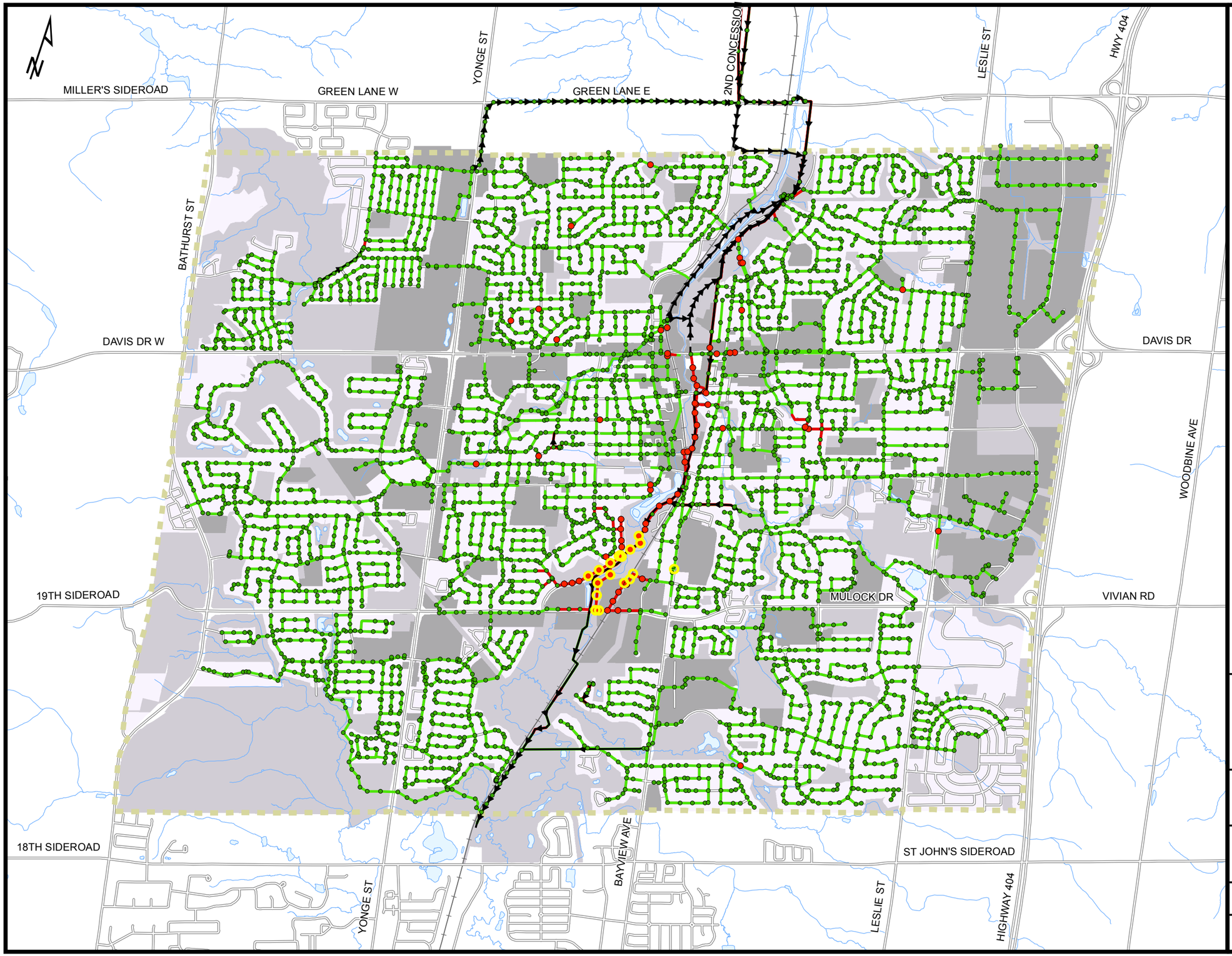
Performance criteria, used in previous Town of Newmarket studies, were reviewed and updated. For peak flow conditions, thematic mapping was developed. Peak flow conditions were defined based on the unit wastewater rates shown in Table 2-2, along with the validated I/I allowances shown in Table 2-4. Thematic maps identified the following:

- Sewers where surcharge conditions were predicted under peak flow conditions.
- Maintenance holes where the peak hydraulic grade line was predicted to be within 1.8m of the ground surface under peak flow conditions. In some areas of Newmarket, shallow maintenance holes are present where the depth of the maintenance hole is less than 1.8m. Each maintenance hole was reviewed and shallow maintenance holes where the peak hydraulic grade line was within the pipe were removed from further consideration.

3.1.2 EXISTING CONDITIONS

Model runs were completed to assess existing capacity constraints in the model and a series of hydraulic gradeline profiles was prepared for the results. Figure 3.1 presents a summary of results and shows locations where the following was noted:

- Surcharge conditions in pipes are noted as red in the thematic map shown in Figure 3.1. These pipes have predicted peak flows in excess of the full flow capacity.
- Manholes where the predicted peak water level reached to within 1.8m of the ground surface are identified as red in Figure 3.1. This means that there would be a risk of basement flooding.
- Manholes where the predicted peak water level reached ground surface area identified as large red circles in Figure 3.1.



Legend

- York Region Sanitary Sewer
- Roadway
- Railway
- Waterbody
- Watercourse
- Town of Newmarket

Land Use

- ICI
- Residential
- Open Space

Freeboard

- < 2m
- > 2m

Surcharge

- Unsurcharged
- Surcharged
- Surface Flooding

WSP XCG Environmental Engineers & Scientists

Newmarket Water and Wastewater Master Plan

0 500 1,000 1,500 m

1:30,000

Figure 3.1

Existing Conditions

Appendix A contains the hydraulic gradeline profiles of the Bayview Avenue Sub-Trunk, the Bogart Avenue Sub-Trunk, Cherrywood Penn Sub-Trunk, Colter Street to Yonge Street Sub-Trunk, Davis Drive Sub-Trunk, Double Tree Lane Sub-Trunk, East Central Sub-Trunk, Elgin Street Sub-Trunk, Holland River Sub-Trunk, Leslie Valley Sub-Trunk, London Road Sub-Trunk, McCaffery Road Sub-Trunk, Patterson Street Sub-Trunk, Penn-Amelia Sub-Trunk, Sanford Street Sub-Trunk, Sparrow Road Sub-Trunk, Wayne Drive Sub-Trunk, West Central Sub-Trunk, Western Sub-Trunk, and the Wildwood Drive Sub-Trunk. Appendix A also contains a map showing the configuration of the Penn Amelia, Cherrywood Penn, Western, and West Central Sub-Trunks in the area known as spaghetti junction. The following provides the results for each sub-trunk.

- Surcharge conditions were not predicted under existing conditions in the Bayview Avenue SPS, the Bogart Creek SPS Sub-Trunk, Cherrywood Penn Sub-Trunk, Colter Street to Yonge Street Sub-Trunk, Davis Drive Sub-Trunk, Doubletree Lane Sub-Trunk, Elgin Street Sub-Trunk, Leslie Valley Sub-Trunk, London Road Sub-Trunk, McCaffery Road Sub-Trunk, Patterson Street Sub-Trunk, Penn Amelia Sub-Trunk, Queen Street Sub-Trunk, Sanford Street Sub-Trunk, Sparrow Road Sub-Trunk, Stellar Drive Sub-Trunk, Wayne Drive, West Central Sub-Trunk and Wildwood Drive Sub-Trunk.
- Surcharge conditions were predicted in the East Central Sub-Trunk from MH1030 to MH0942. This section is 250mm diameter in and is located along Srigley from Orsi to Roxborough, on Roxborough from Srigley to Bogart, on Bogart from Roxborough to an easement and along the easement to Roxborough. The peak hydraulic gradeline is not within 1.8m of the ground surface. As a result, although surface conditions exist, there is minimal risk of basement flooding.
- Surcharge conditions were predicted throughout the Holland River Sub-Trunk from MH1086 to MH0838. This section extends from Mulock Drive to the junction with the Region's trunk sewer to north of Amelia Street. The hydraulic grade line profile is predicted to extend to the ground surface throughout much of the Holland River Sub-Trunk. It should be noted that this result is consistent with the results presented in the 2008 Master Sanitary Sewer Hydraulic Study. It should also be noted that the Holland River Sub-Trunk is located within the valley lands of the Holland River and does not have any direct connections to residential or non-residential buildings. As such, surcharge conditions to within 1.8m of the ground surface may not present a risk of basement flooding.
- Surcharge conditions were predicted in the Western Sub-Trunk between MH0666 to MH0667. This section is located along Calgain and an existing easement. These conditions are largely the result of a low slope pipe.

3.2 FUTURE CONDITIONS

Model runs were completed to assess the ability of the existing sanitary sewer system to convey peak flows from future development. Figure 3.2 presents a summary of results and shows locations where the following was noted:

- Surcharge conditions in pipes are noted as red in the thematic map shown in Figure 3.2. These pipes have predicted peak flows in excess of the full flow capacity.
- Manholes where the predicted peak water level reached to within 1.8m of the ground surface are identified as red in Figure 3.2. This means that there would be a risk of basement flooding.
- Manholes where the predicted peak water level reached ground surface area identified as large red circles in Figure 3.2.

Figure 3-2 Wastewater System Future Conditions

Appendix B contains the hydraulic gradeline profiles of the Bayview Avenue Sub-Trunk, the Bogart Avenue Sub-Trunk, Cherrywood Penn Sub-Trunk, Colter Street to Yonge Street Sub-Trunk, Davis Drive Sub-Trunk, Double Tree Lane Sub-Trunk, East Central Sub-Trunk, Elgin Street Sub-Trunk, Holland River Sub-Trunk, Leslie Valley Sub-Trunk, London Road Sub-Trunk, McCaffery Road Sub-Trunk, Patterson Street Sub-Trunk, Penn-Amelia Sub-Trunk, Queen Street Sub-Trunk, Sanford Street Sub-Trunk, Sparrow Road Sub-Trunk, Stellar Drive Sub-Trunk, Wayne Drive Sub-Trunk, West Central Sub-Trunk, Western Sub-Trunk, and the Wildwood Drive Sub-Trunk. The following provides the results for each sub-trunk.

The following provides the results for each sub-trunk.

- Surcharge conditions were not predicted under future conditions in the Bayview Avenue SPS, the Bogart Creek SPS Sub-Trunk, Colter Street to Yonge Street Sub-Trunk, Davis Drive Sub-Trunk, Doubletree Lane Sub-Trunk, Elgin Street Sub-Trunk, Leslie Valley Sub-Trunk, London Road Sub-Trunk, McCaffery Road Sub-Trunk, Patterson Street Sub-Trunk, Penn Amelia Sub-Trunk, Queen Street Sub-trunk, Sanford Street Sub-Trunk, Sparrow Road Sub-Trunk, Stellar Drive Sub-Trunk, Wayne Drive and Wildwood Drive Sub-Trunk.
- Surcharge conditions were predicted in the East Central Sub-Trunk from MH1030 to MH0936. This section is 250mm diameter in and is located along Srigley from Orsi to Roxborough, on Roxborough from Srigley to Bogart, on Bogart from Roxborough to an easement and along the easement to Roxborough. The peak hydraulic gradeline is not within 1.8m of the ground surface. As a result, although surcharge conditions exist, there is minimal risk of basement flooding.
- Surcharge conditions were predicted throughout the Holland River Sub-Trunk from MH1087 to MH0838. This section extends from Mulock Drive to the junction with the Region's trunk sewer to the north of Amelia Street. The hydraulic grade line profile is predicted to extend to the ground surface throughout much of the Holland River Sub-Trunk. It should be noted that this result is consistent with the results presented in the 2008 Master Sanitary Sewer Hydraulic Study. It should also be noted that the Holland River Sub-Trunk is located within the valley lands of the Holland River and does not have any direct connections to residential or non-residential buildings. As such, surcharge conditions to within 1.8m of the ground surface may not present a risk of basement flooding.
- Surcharge conditions were predicted in the West Central Sub-Trunk from MH0630 to MH0175. This section is located from the intersection of Queen and Duncan, along Duncan to Ontario, along Ontario to Superior, along Superior to an easement and along the easement to south of Amelia Street. The peak hydraulic gradeline is not within 1.8m of the ground surface. As a result, although surcharge conditions exist, there is minimal risk of basement flooding.
- Surcharge conditions were predicted in the Western Sub-Trunk between MH0666 to MH0667. This section is located along Calgain and an existing easement. These conditions are largely the result of a low slope pipe.
- Surcharge conditions were predicted in the Cherrywood Penn Sub-Trunk from MH429 to MH689 (Yonge Street to Hillview Avenue).

4 SUMMARY

This technical memorandum was prepared to document model development and existing and future scenario results for the Town of Newmarket's sanitary sewer system. As part of this study, an extensive data review and collection process was completed to develop concise physical data for modelling. This included detailed analysis of the Town's GIS data, identification of missing data, and the completion of a field survey to collect additional data. In addition, a sub-catchment layer was created and all parcels within the Town were included within a sub-catchment area. To develop flow contributors, the nature of each sub-

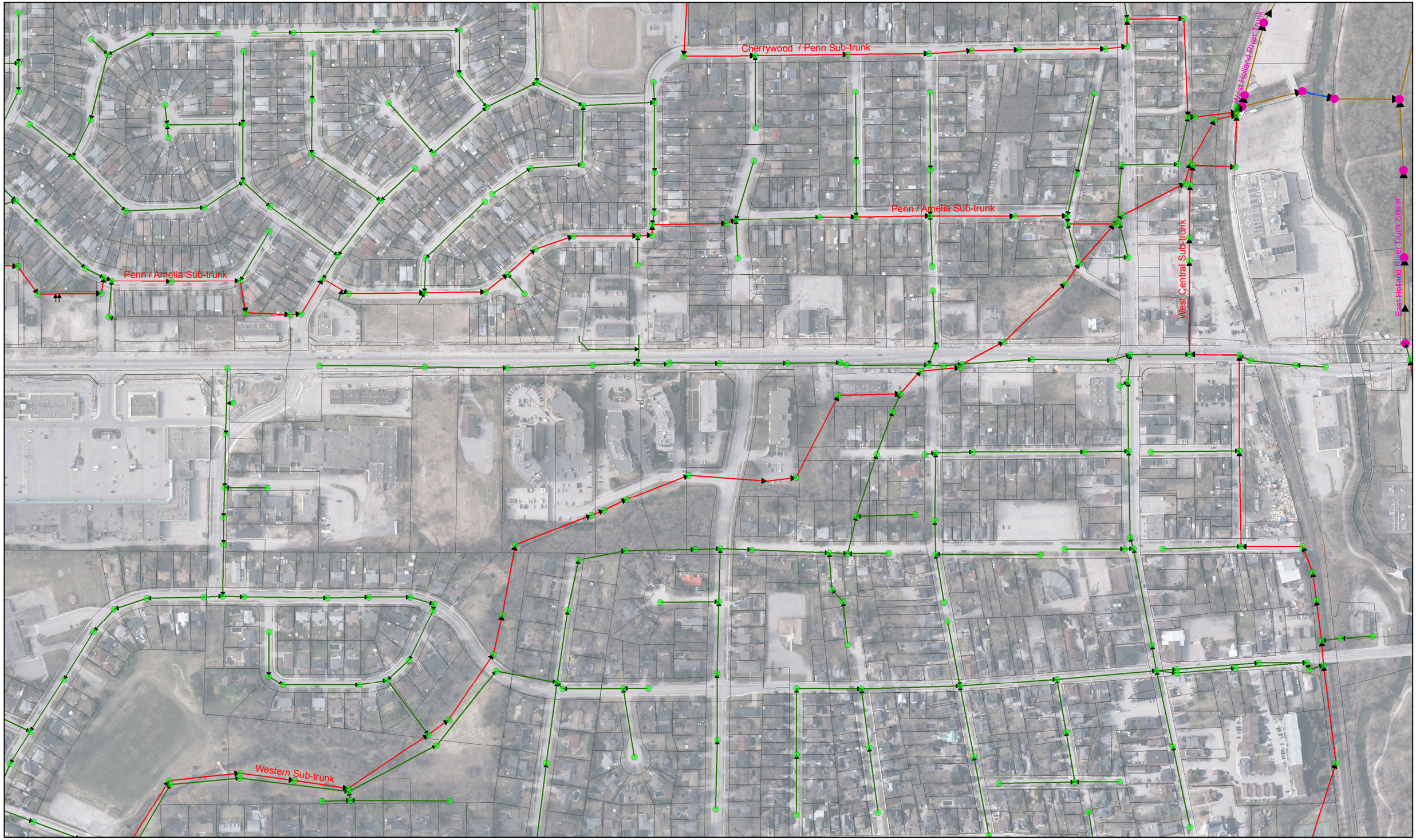
catchment was considered including whether foundation drains are connected to the sanitary sewer, storm sewer or have sump pumps discharged to surface. For each of these, an initial peak flow estimate was developed and applied. Model parameters were adjusted to achieve a good match between measured and modelled peak flows at a total of 25 flow monitoring locations. Flow monitoring records were reviewed, along with collected rainfall data, to select suitable peak flow events for model calibration. Calibrations were completed for five rainfall events that occurred between 2013 and 2015. The events were selected as they represent the most significant rainfall events that occurred during the periods in each monitoring data was available. Upon completion of the model calibrations, model validation was completed and modelled peak flows were compared against measured values obtained from SCADA. The developed model is considerable reasonable and suitable for master planning.

System capacity was assessed under existing conditions and under future conditions. Information on future conditions was obtained from the Town's Planning Department. The Town's Planning Department provided two sources of information. Through the Newmarket Growth Centres Secondary Plan, the Town identified that the Yonge-Davis Urban Growth Centre would be where significant amount of the Town's future population and employment growth and intensification would occur. The long term vision for this area is a vibrant urban community with a population of 33,000 and 32,000 jobs at buildout. The second source of information was the identification of twelve separate developments within the Town including the developments at 955 Mulock, Forest Green Homes, George Street/ Davis Drive, Glenway, Main Street Clock Tower, Mosiak, National Homes, St. Andrews (Phase 5), Yonge and Millard, Woodland Hills Phase 7, Cooper Hills, and Sundial/ Toth. The Town's Planning Department identified an estimated additional population from these 12 developments of 9,132 persons. A common approach for distributing future populations into model areas was completed for both water and wastewater systems. The approach and the results are documented in the Water System Existing Conditions Model Update Technical Memorandum.

Capacity assessment results for existing conditions identified four sub-trunk sewers where surcharge conditions were predicted. These included the East-Central Sub-Trunk along Srigley and Roxborough Road, the Holland River Sub-Trunk from Mulock to the Regional trunk, the West Central Sub-Trunk in the vicinity of Superior Avenue, and the Western Sub-Trunk along Calgain. A risk of basement flooding was identified in the East Central Sub-Trunk and the Holland River Sub-Trunk. Under future conditions, surcharge conditions were also identified in the Cherrywood Penn Sub-trunk due to growth in the Yonge-Davis Urban Growth Centre.

APPENDIX A

Existing Conditions Hydraulic Grade Profiles



Legend

- SANITARY_MANHOLES
- SANITARY_LINKS
- SANITARY SUBTRUNKS
- YORK.WWManhole
- YORK.WWSiphonMain
- YORK.WWGravityMain
- YORK.WWForceMain

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Newmarket

Printed: Date: 5/12/2015

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SANITARY NETWORK
Spaghetti Junction

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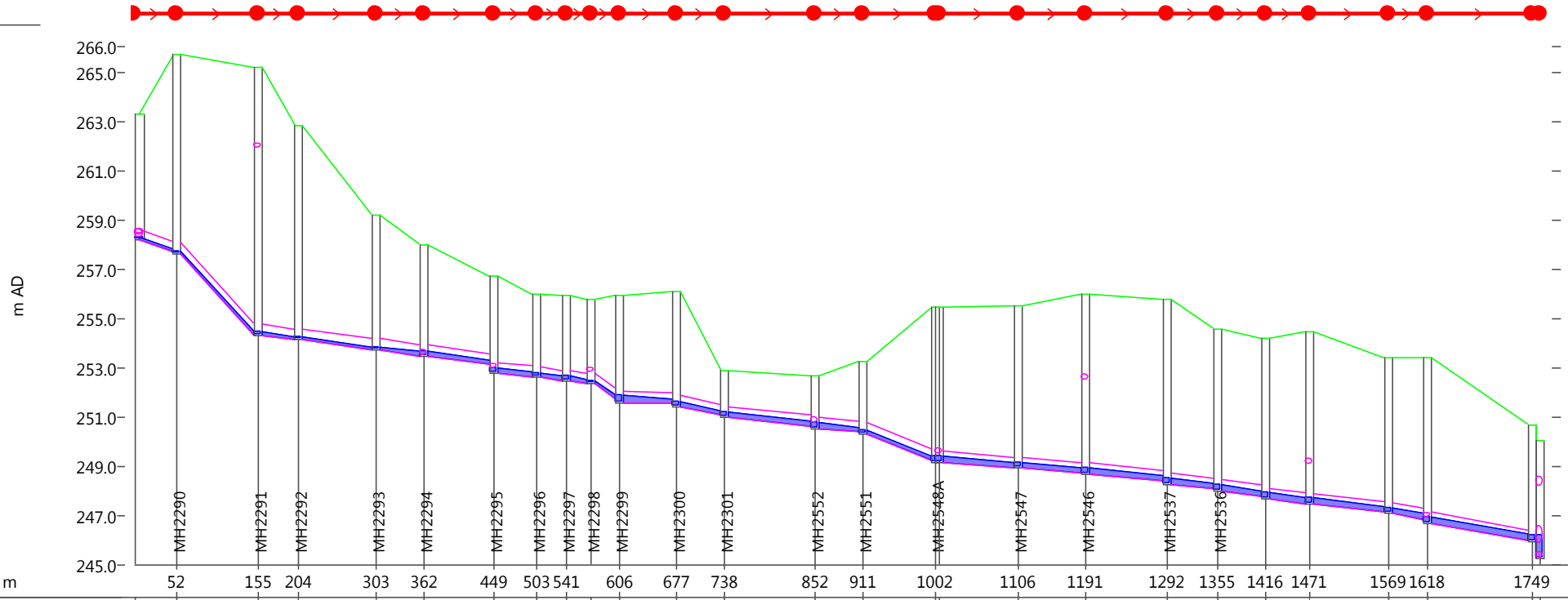
Bayview Avenue Sub-Trunk



m: 52 155 204 303 362 449 503 541 606 677 738 852 911 1002 1106 1191 1292 1355 1416 1471 1569 1618 1749

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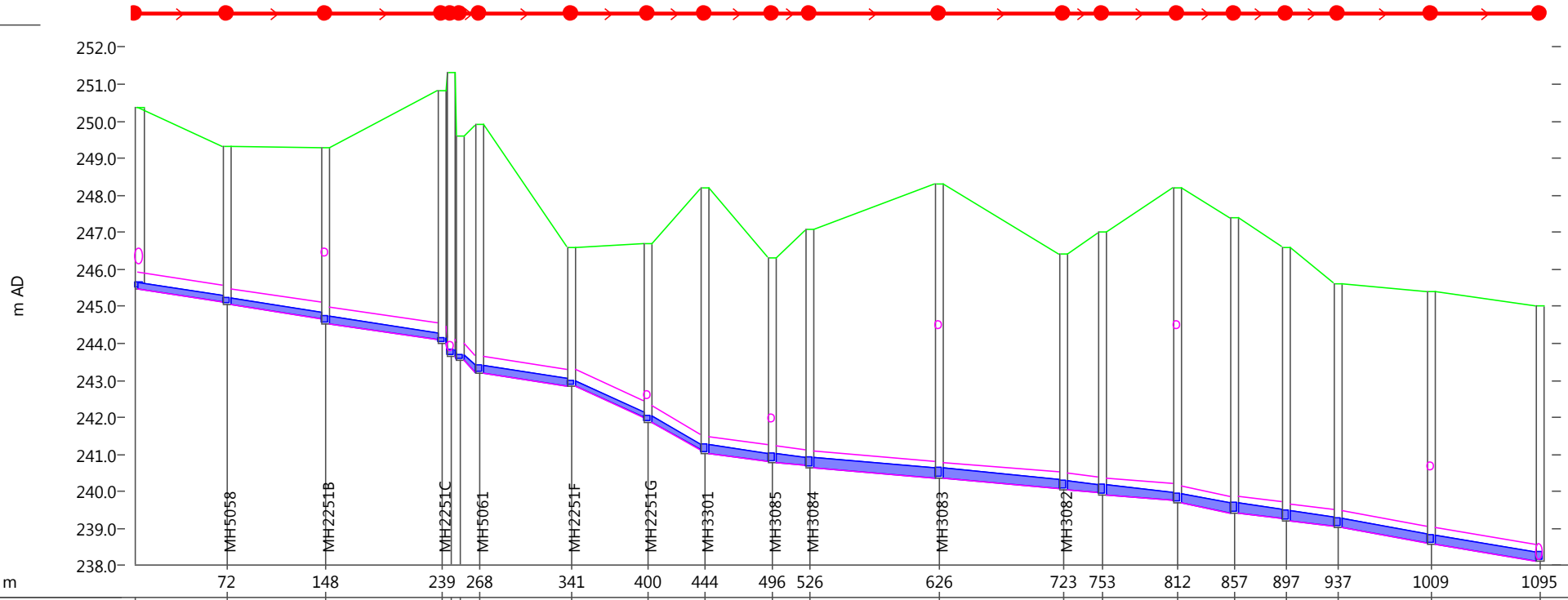
US Node ID	-	MH2290	-	MH2292	-	MH2294	-	-	-	-	-	-	MH2301	-	MH2551	MH2548	MH2547	MH2546	-	-	-	MH2534	-	MH2578
ds node	-	MH2291	-	MH2293	-	MH2295	-	-	-	-	-	-	MH2552	-	-	MH2547	MH2546	MH2537	-	-	-	MH2533	-	MH2579
length (m)	52.5	102.1	49.6	98.5	59.5	86.7	54.5	-	-	-	71.1	60.6	113.9	59.5	90.2	98.7	84.7	101.4	62.9	61.0	54.7	98.7	48.6	131.0			
width (mm)	450	450	450	450	450	450	450	450	-	450	450	450	450	450	450	450	450	450	450	450	450	450	450	450			
grad (m/m)	-	0.03241	-	0.00406	-	0.00415	-	-	-	-	-	-	0.00281	-	0.01165	0.00245	0.00245	0.00286	-	-	-	0.00324	-	0.00527			
DS Depth (m)	0.103	0.131	0.131	0.132	0.187	0.176	0.179	-	-	-	0.182	0.181	0.183	0.197	0.172	0.260	0.237	0.213	0.214	0.215	0.230	0.223	-	0.241			
DS Flow (m3/s)	-	0.03125	-	0.03317	-	0.06428	-	-	-	-	-	-	0.06981	-	0.08075	0.08910	0.08963	0.09403	-	-	-	0.10212	-	0.11802			
Node	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	MH2547	MH2546	-	-	-	-	-	-	-	-	-
Node ID	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	MH2547	MH2546	-	-	-	-	-	-	-	-	-
ground (m AD)	-	-	-	-	-	-	-	-	-	-	-	-	252.880	252.700	-	-	255.500	256.000	-	-	-	-	-	253.400	-		

Bogart Creek Sub-Trunk



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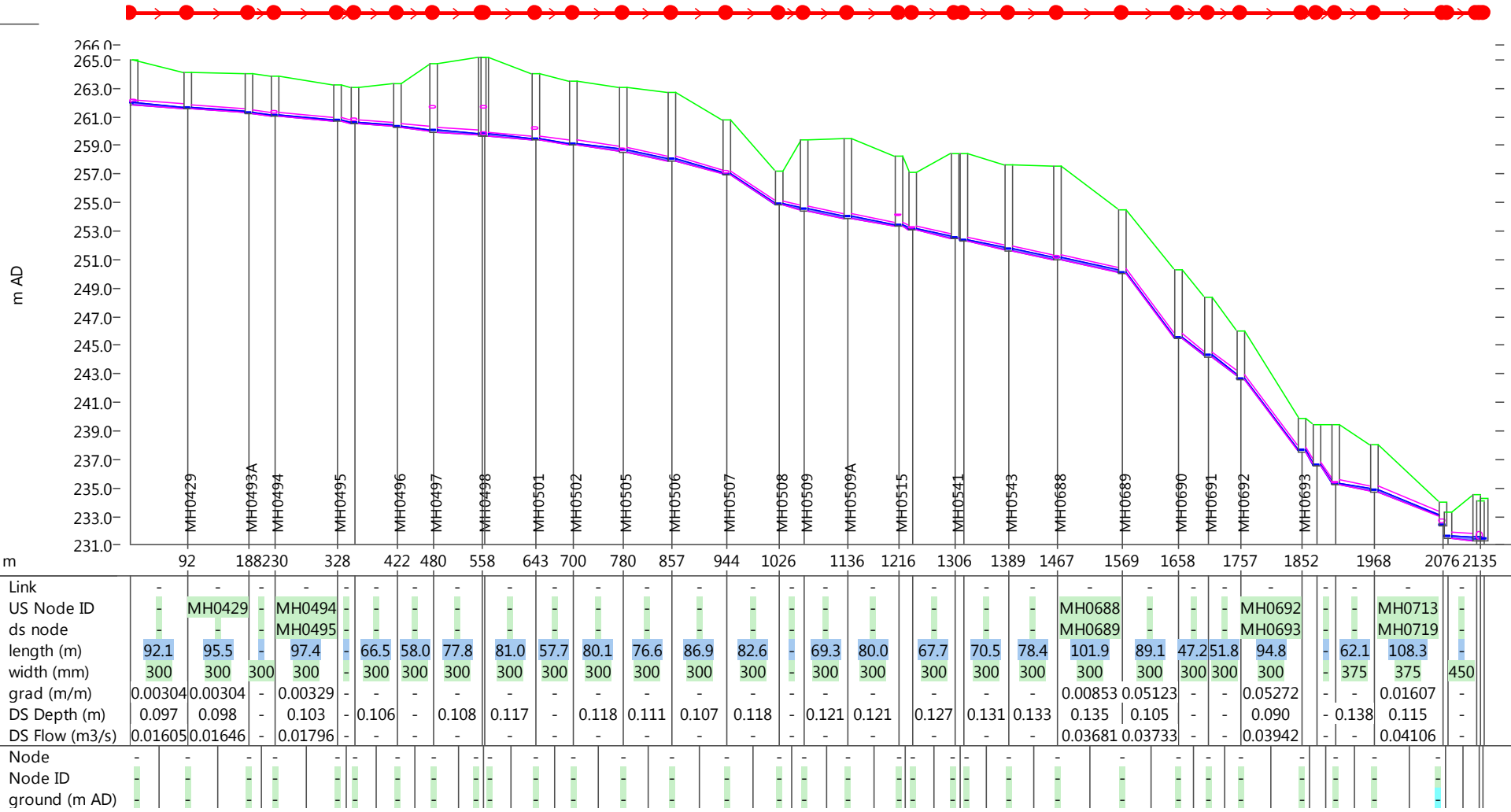
US Node ID	MH5057	MH5058	MH2251B		-	MH5061	MH2251F	-	MH3301	-	MH3084	MH3083	-	MH3081	-	-	-	MH3076	MH3070
ds node	MH5058	MH2251B	MH2251C		-	MH2251F	MH2251G	-	MH3085	-	MH3083	MH3082	-	MH3080	-	-	-	MH3070	MH3062A
length (m)	71.9	76.5	91.0		-	72.3	59.4	43.9	52.1	29.9	100.2	97.0	30.2	58.5	45.2	39.6	40.5	72.2	85.4
width (mm)	450	450	450		-	450	450	450	450	450	450	450	450	450	450	450	450	450	450
grad (m/m)	0.00487	0.00484	0.00461		-	0.00484	0.01413	-	0.00422	-	0.00289	0.00258	-	0.00273	-	-	-	0.00586	0.00509
DS Depth (m)	0.178	0.178	0.188		-	0.206	0.162	0.166	0.235	-	0.275	0.225	-	0.226	0.258	0.241	0.241	0.238	0.246
DS Flow (m3/s)	0.06592	0.06592	0.07342		-	0.08756	0.08756	-	0.10046	-	0.10198	0.10415	-	0.10457	-	-	-	0.11936	0.12246

Node	-	MH5058	MH2251B		-	-	-	MH2251F	-	-	-	MH3084	MH3083	MH3082	-	-	-	-	MH3076	MH3070	-
Node ID	-	MH5058	MH2251B		-	-	-	MH2251F	-	-	-	MH3084	MH3083	MH3082	-	-	-	-	MH3076	MH3070	-
ground (m AD)	-	249.330	249.300		-	-	-	246.580	-	-	-	247.100	248.300	246.400	-	-	-	-	245.600	245.400	-

Cherrywood Penn Sub-Trunk



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US Node ID	-	MH0429	-	MH0494	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	MH0688	-	-	-	MH0692	-	-	MH0713	-						
ds node	-	-	-	MH0495	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	MH0689	-	-	-	MH0693	-	-	MH0719	-						
length (m)	92.1	95.5	-	97.4	-	66.5	58.0	77.8	81.0	57.7	80.1	76.6	86.9	82.6	-	69.3	80.0	67.7	70.5	78.4	101.9	89.1	47.2	51.8	94.8	-	62.1	108.3	-								
width (mm)	300	300	300	300	-	300	300	300	300	300	300	300	300	300	-	300	300	300	300	300	300	300	300	300	300	-	375	375	450								
grad (m/m)	0.00304	0.00304	-	0.00329	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.00853	0.05123	-	-	0.05272	-	-	0.01607	-								
DS Depth (m)	0.097	0.098	-	0.103	-	0.106	-	0.108	0.117	-	0.118	0.111	0.107	0.118	-	0.121	0.121	0.127	0.131	0.133	0.135	0.105	-	-	0.090	-	0.138	0.115	-								
DS Flow (m3/s)	0.01605	0.01646	-	0.01796	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.03681	0.03733	-	-	0.03942	-	-	0.04106	-								
Node	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
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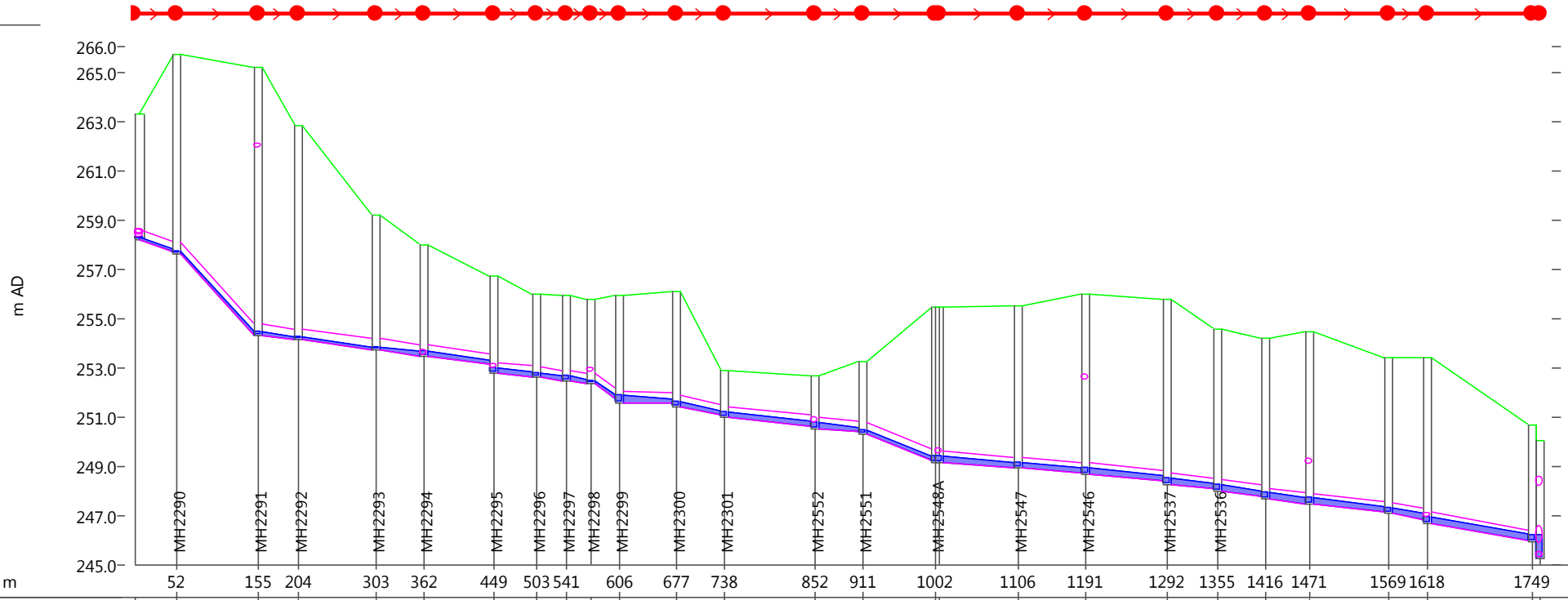
ground (m AD)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Colter Street Sub-Trunk



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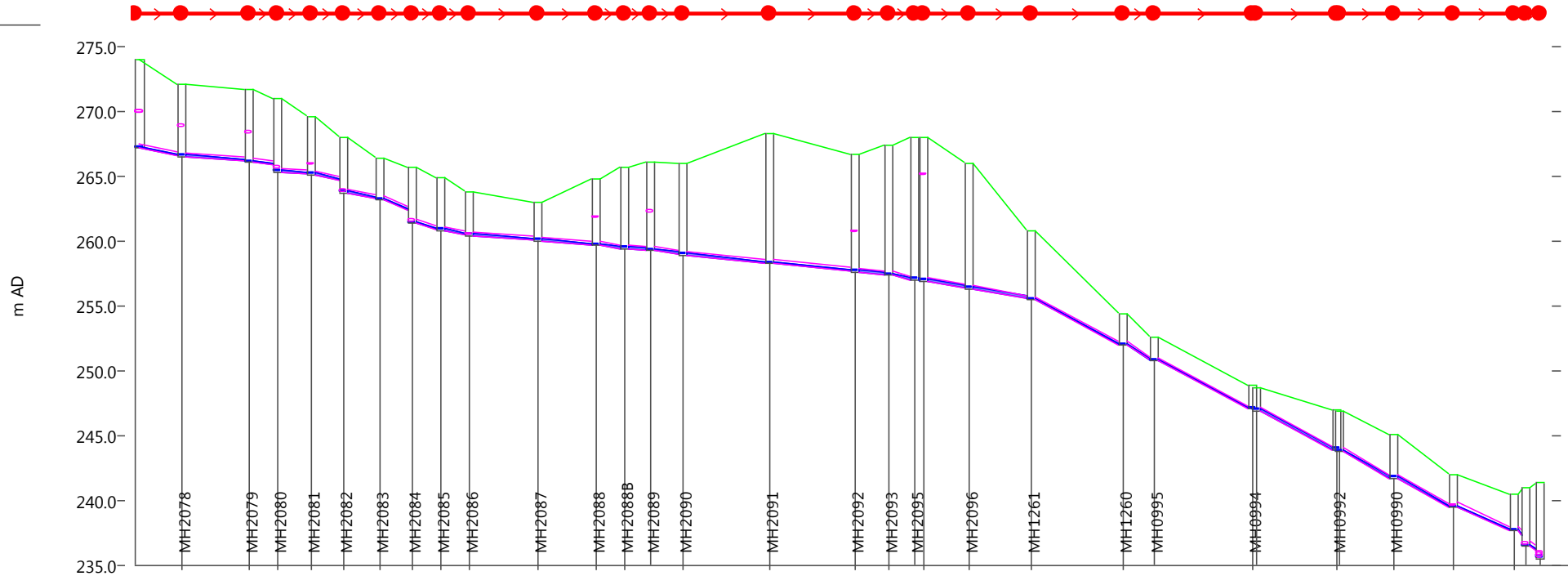
ds node	-	MH2291	-	MH2293	-	MH2295	-	-	-	-	-	-	MH2552	-	-	MH2547	MH2546	MH2537	-	-	-	MH2533	-	MH2579				
length (m)	52.5	102.1	49.6	98.5	59.5	86.7	54.5	-	-	-	71.1	60.6	113.9	59.5	90.2	98.7	84.7	101.4	62.9	61.0	54.7	98.7	48.6	131.0				
width (mm)	450	450	450	450	450	450	450	450	-	450	450	450	450	450	450	450	450	450	450	450	450	450	450	450				
grad (m/m)	-	0.03241	-	0.00406	-	0.00415	-	-	-	-	-	-	0.00281	-	0.01165	0.00245	0.00245	0.00286	-	-	-	0.00324	-	0.00527				
DS Depth (m)	0.103	0.131	0.131	0.132	0.187	0.176	0.179	-	-	-	0.182	0.181	0.183	0.197	0.172	0.260	0.237	0.213	0.214	0.215	0.230	0.223	-	0.241				
DS Flow (m3/s)	-	0.03125	-	0.03317	-	0.06428	-	-	-	-	-	-	0.06981	-	0.08075	0.08910	0.08963	0.09403	-	-	-	0.10212	-	0.11802				
Node	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	MH2547	MH2546	-	-	-	-	-	-	-	-	-	-
Node ID	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	MH2547	MH2546	-	-	-	-	-	-	-	-	-	-
ground (m AD)	-	-	-	-	-	-	-	-	-	-	-	-	252.880	252.700	-	-	255.500	256.000	-	-	-	-	-	253.400	-	-	-	-

Davis Drive Sub-Trunk



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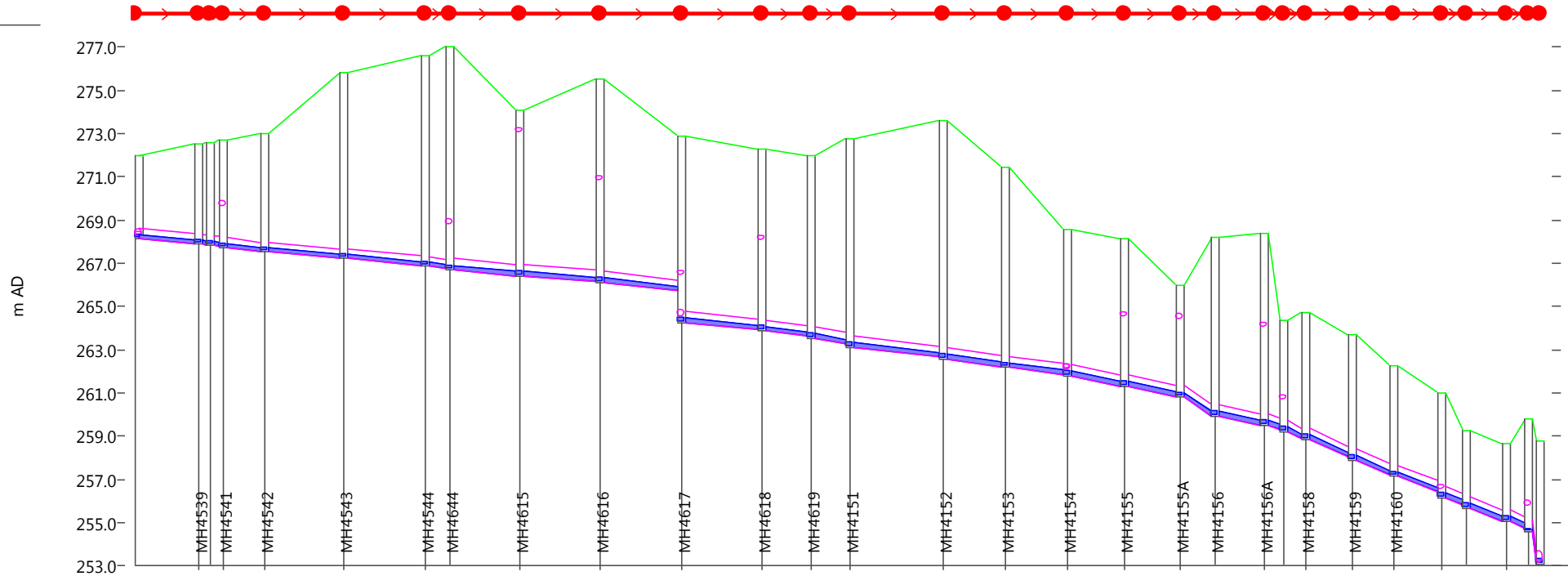
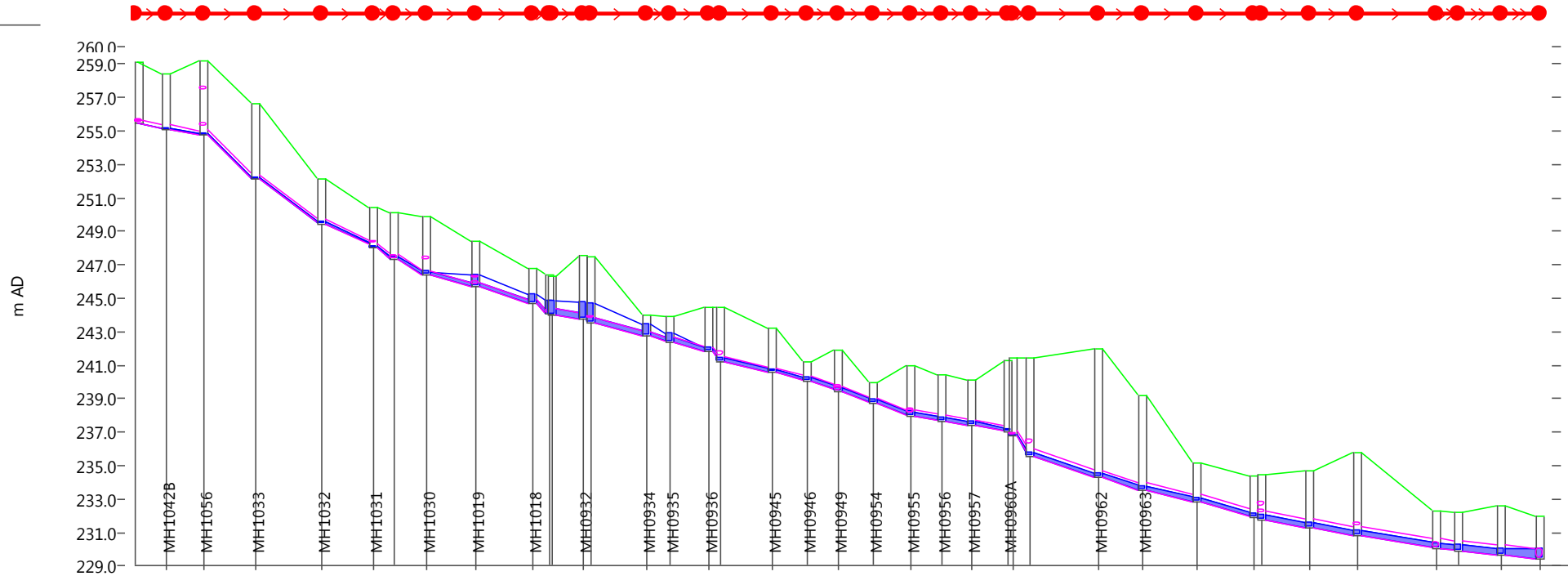
Link	-	-	-	-	-	-	-	-	-	-	-	-	-	MH2090.1	MH2091.1	-	-	-	-	MH1261.1	-	MH0995.1	MH0993.1	-	-	-
US Node ID	-	MH2078	-	-	-	-	-	-	-	MH2086	-	-	-	MH2090	MH2091	-	-	-	-	MH1261	-	MH0995	MH0993	-	-	-
ds node	-	MH2079	-	-	-	-	-	-	-	MH2087	-	-	-	MH2091	MH2092	-	-	-	-	MH1260	-	MH0994	MH0992	-	-	-
length (m)	59.7	86.2	-	42.6	41.3	46.5	41.3	-	-	87.9	75.1	-	40.9	110.8	109.6	43.4	-	57.5	80.2	116.9	41.0	125.9	101.9	69.7	75.8	77.5
width (mm)	300	300	300	300	300	300	300	300	300	300	300	300	-	300	300	300	-	300	250	250	250	250	250	250	250	375
grad (m/m)	-	0.00424	-	-	-	-	-	-	-	0.00340	0.00426	-	-	-	0.00594	0.00559	-	-	-	0.00885	0.02955	-	0.02955	0.02955	-	0.02955	0.02369
DS Depth (m)	0.109	0.130	-	-	-	-	-	-	-	0.155	0.172	-	-	-	0.176	0.177	-	-	0.170	0.191	0.134	-	0.135	0.136	0.137	0.134	0.123
DS Flow (m3/s)	-	0.02855	-	-	-	-	-	-	-	0.03999	0.04017	-	-	-	0.04698	0.04753	-	-	-	0.05422	0.05422	-	0.05422	0.05484	-	0.05530	0.05608
Node	-	-	-	-	-	-	-	-	-	-	-	-	-	MH2091	-	-	-	-	MH1261	-	-	-	-	-	-	-	-
Node ID	-	-	-	-	-	-	-	-	-	-	-	-	-	MH2091	-	-	-	-	MH1261	-	-	-	-	-	-	-	-
ground (m AD)	-	-	-	-	-	-	-	-	-	-	-	-	-	268.330	-	-	-	-	260.890	-	-	-	-	-	-	-	-

Doubletree Lane Sub-Trunk



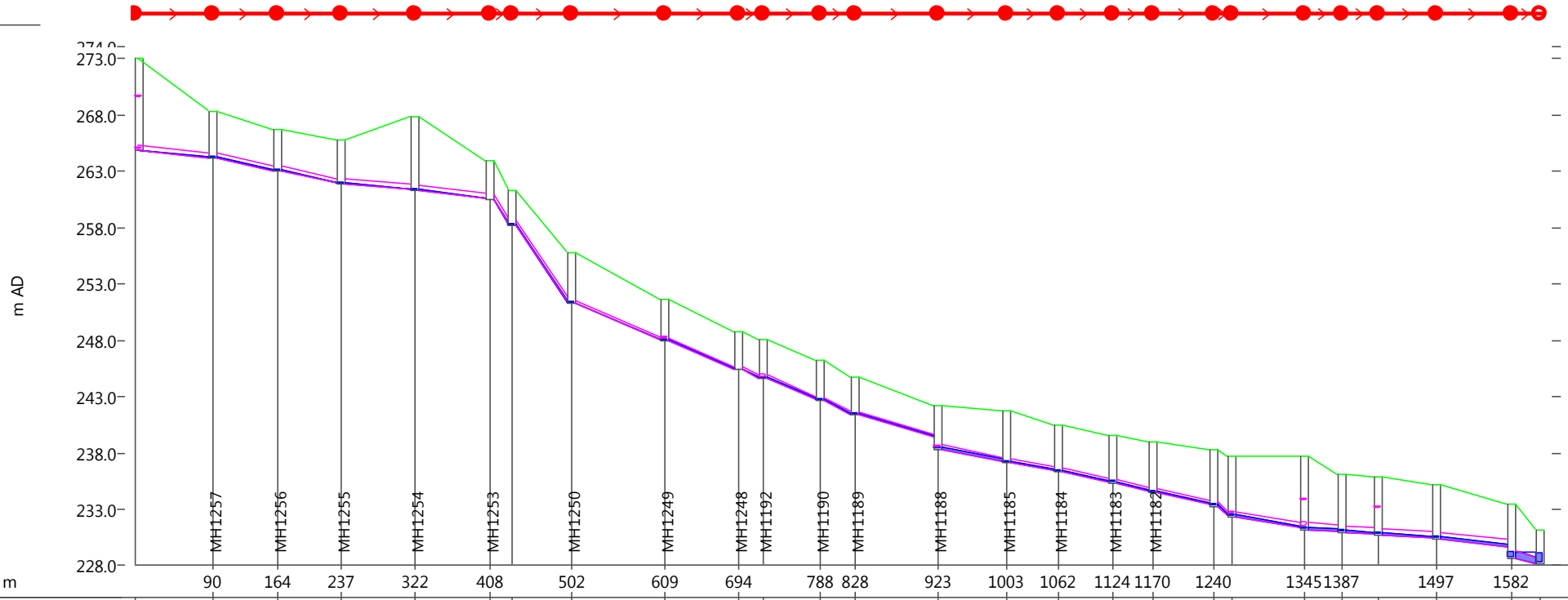
m	79	111	163	261	362	479	580	682	783	843	892	1007	1086	1163	1235	1304	1408	1459	1518	1570	1629	1710
Link	-	-	MH4542.1	MH4543.1	-	-	MH4615.1	MH4616.1	MH4617.1	-	-	MH4151.1	-	-	-	-	-	-	-	-	-	-
US Node ID	MH4538	-	MH4542	MH4543	-	MH4644	MH4615	MH4616	MH4617	-	-	MH4151	-	-	-	-	-	-	-	-	-	-
ds node	MH4539	-	MH4543	MH4544	-	MH4615	MH4616	MH4617	MH4618	-	-	MH4152	-	-	-	-	-	-	-	-	-	-
length (m)	79.3	51.8	98.4	100.6	-	86.7	100.3	102.0	100.8	60.1	49.8	114.9	78.8	77.3	71.2	69.4	42.6	61.7	-	-	59.0	51.9	58.9	-	50.1	-
width (mm)	450	450	450	450	-	525	525	525	525	525	525	525	525	525	525	525	525	525	-	-	525	525	525	-	525	-
grad (m/m)	0.00328	-	0.00295	0.00318	-	0.00334	0.00229	0.00412	0.00327	-	-	0.00383	0.00444	0.00427	-	-	-	-	-	-	-	-	-	-	-	-
DS Depth (m)	0.157	0.189	0.167	0.164	-	0.208	0.188	0.190	0.221	0.222	-	0.222	0.222	0.222	0.223	0.216	-	0.228	-	-	0.198	0.203	0.208	-	0.226	-
DS Flow (m3/s)	0.05085	-	0.05554	0.05630	-	0.07768	0.08020	0.08186	0.10975	-	-	0.11034	0.11034	0.11034	-	-	-	-	-	-	-	-	-	-	-	-
Node	-	-	-	-	MH4543	-	-	MH4615	MH4616	MH4617	-	-	-	MH4152	-	-	-	-	-	-	-	-	-	-	-	-
Node ID	-	-	-	-	MH4543	-	-	MH4615	MH4616	MH4617	-	-	-	MH4152	-	-	-	-	-	-	-	-	-	-	-	-
ground (m AD)	-	-	-	-	275.800	-	-	274.100	275.500	272.900	-	-	-	273.600	-	-	-	-	-	-	-	-	-	-	-	-

East Central Sub-Trunk



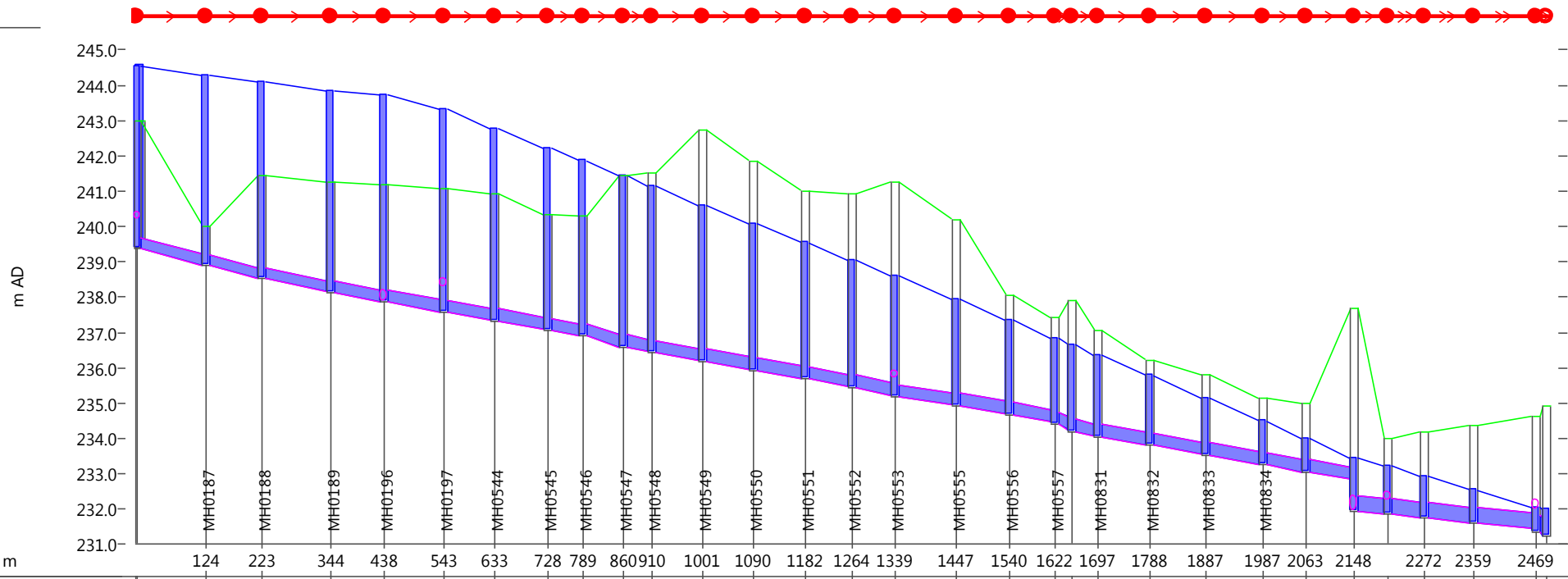
m	58	128	223	344	438	536	628	733	824	942	1056	1174	1294	1428	1539	1615	1772	1855	1955	2059	2160	2249	2394	2513	2586
Link	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	MH0968.1	-	-	-
US Node ID	-	-	-	MH1033	-	-	-	-	-	-	-	-	-	-	-	-	MH0961	-	-	-	-	MH0968	-	-	-
ds node	-	-	-	MH1032	-	-	-	-	-	-	-	-	-	-	-	-	MH0962	-	-	-	-	MH1099	-	-	-
length (m)	58.4	70.1	94.4	121.5	93.9	-	59.0	91.6	104.5	-	55.5	104.0	-	69.9	95.3	62.9	57.1	64.1	70.7	56.7	-	66.7	-	125.6	83.0	100.0	104.6	86.3	89.5	145.0	-	77.3	72.5
width (mm)	250	250	300	250	250	-	250	250	250	-	375	250	-	250	300	300	300	300	300	375	375	375	-	450	450	450	450	525	525	525	-	600	600
grad (m/m)	-	-	-	0.02181	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.01004	-	-	-	-	-	0.00483	-	-	-
DS Depth (m)	-	-	0.077	0.089	0.101	-	-	0.683	0.529	-	-	0.685	-	-	0.204	-	-	-	-	-	-	-	-	0.239	0.248	0.264	0.252	0.284	0.284	0.286	-	0.402	-
DS Flow (m3/s)	-	-	-	0.02084	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.15236	-	-	-	-	-	0.17986	-	-	-
Node	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Node ID	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ground (m AD)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Elgin Street Sub-Trunk



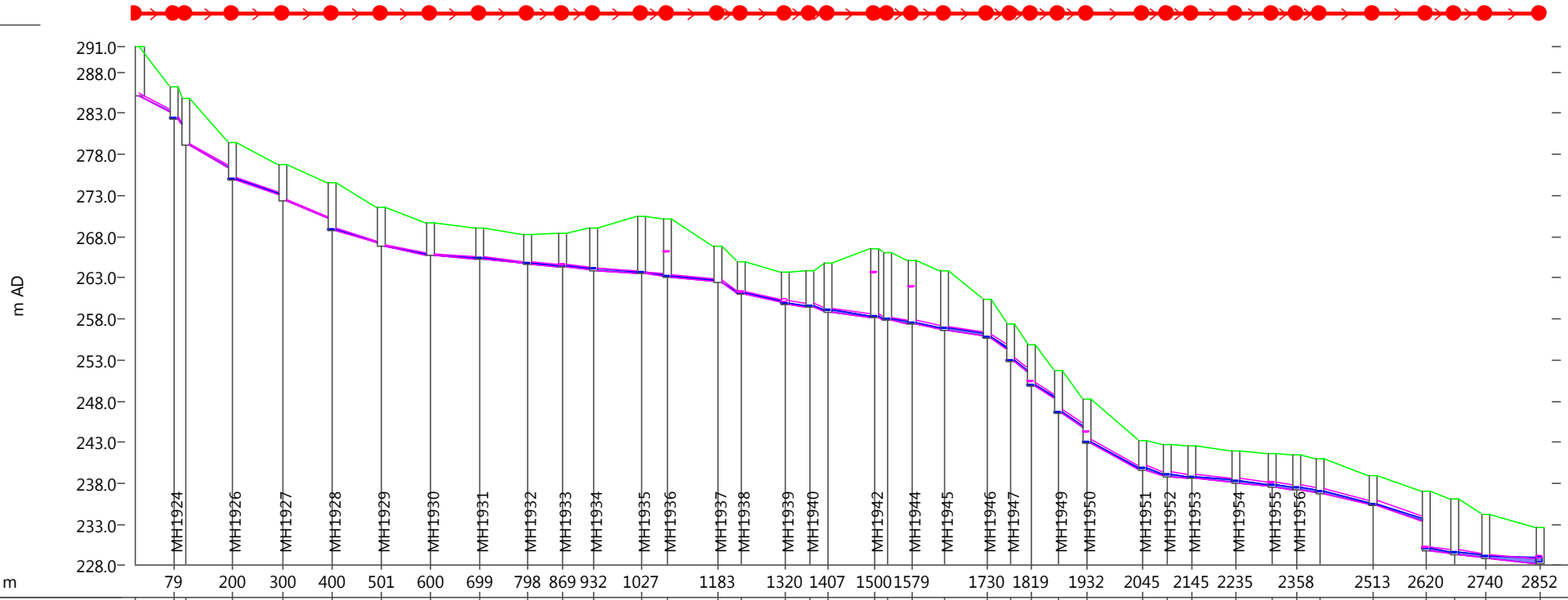
Link	-	-	-	-	-	-	-	MH1250.1	-	-	-	-	MH1189.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
US Node ID	MH1258A	MH1257	MH1256	MH1255	MH1254	-	-	MH1250	MH1249	-	-	-	MH1189	MH1188	-	-	-	-	-	MH1180	-	-	-	MH1171	-		
ds node	MH1257	MH1256	MH1255	MH1254	MH1253	-	-	MH1249	MH1248	-	-	-	MH1188	MH1185	-	-	-	-	-	MH1176	-	-	-	MH1170	-		
length (m)	90.0	74.4	72.3	85.7	85.4	-	67.6	107.2	85.1	-	65.5	40.1	95.0	79.7	59.3	61.9	46.5	69.9	-	83.3	43.0	42.2	67.3	84.9	-		
width (mm)	450	450	450	450	450	-	450	250	250	-	300	300	300	375	375	375	375	375	-	450	600	600	600	600	600		
grad (m/m)	0.00667	0.01512	0.01560	0.00601	0.00888	-	0.10250	0.03013	0.02921	-	-	-	0.02072	0.01342	-	-	-	0.01503	-	0.01189	-	-	0.00431	0.00754	-		
DS Depth (m)	0.076	0.075	0.076	0.084	0.078	-	0.061	0.074	0.077	-	0.151	-	0.169	0.171	0.179	0.167	0.165	0.168	-	0.190	-	-	0.214	0.188	-		
DS Flow (m3/s)	0.01358	0.01423	0.01503	0.01565	0.01650	-	0.01710	0.01778	0.01882	-	-	-	0.08126	0.08291	-	-	-	0.08491	-	0.10818	-	-	0.11083	0.11137	-		
Node	-	-	-	-	MH1254	-	-	MH1250	MH1249	-	-	-	-	MH1188	-	-	-	-	-	-	-	-	-	-	-		
Node ID	-	-	-	-	MH1254	-	-	MH1250	MH1249	-	-	-	-	MH1188	-	-	-	-	-	-	-	-	-	-	-		
ground (m AD)	-	268.320	-	265.790	267.800	-	-	255.730	251.690	-	-	-	-	242.170	-	-	-	-	-	-	-	-	-	-	-		

Holland River Sub-Trunk



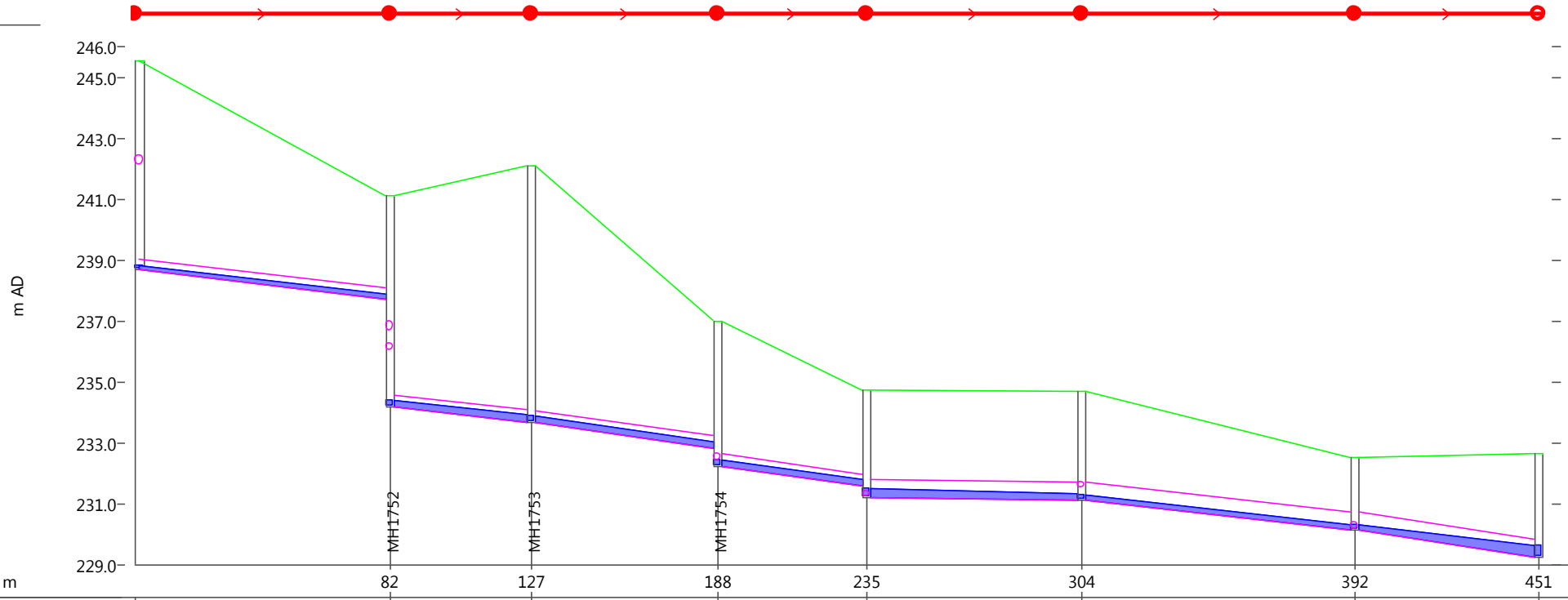
Link	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
US Node ID	MH0186	-	MH0188	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ds node	MH0187	-	MH0189	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
length (m)	119.9	98.8	121.2	93.6	105.8	90.0	94.5	60.5	71.1	-	91.4	88.5	92.1	82.1	75.6	107.4	93.1	81.9	-	-	90.6	99.1	100.1	76.2	85.3	59.2	64.5	86.8	109.7	
width (mm)	300	300	300	350	350	350	350	350	350	350	350	350	350	350	350	350	350	350	-	-	350	350	350	350	350	450	450	450	450	
grad (m/m)	0.00384	-	0.00322	-	0.00255	-	-	-	-	-	-	-	-	-	-	0.00195	-	-	-	-	-	-	-	-	-	-	-	-	0.00137	
DS Depth (m)	5.377	5.548	5.682	5.885	5.727	5.447	5.150	-	4.861	-	4.414	4.132	3.848	3.593	3.394	2.985	2.652	2.379	-	-	1.972	1.602	1.226	0.950	0.607	-	-	0.953	0.614	
DS Flow (m3/s)	0.04387	-	0.04387	-	0.09191	-	-	-	-	-	-	-	-	-	-	0.11396	-	-	-	-	-	-	-	-	-	-	-	-	0.18722	
Node	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Node ID	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ground (m AD)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Leslie Valley Sub-Trunk



m	79	200	300	400	501	600	699	798	869	932	1027	1183	1320	1407	1500	1579	1730	1819	1932	2045	2145	2235	2358	2513	2620	2740	2852
Link	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
US Node ID	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ds node	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
length (m)	79.3	95.1	100.7	100.1	100.2	99.2	99.3	98.7	70.9	63.2	95.4	-	102.5	-	90.6	-	-	93.3	-	65.4	85.6	-	-	-	113.0	-	-	90.5	73.4	-	-	107.8	106.7	-	63.0	112.1
width (mm)	250	250	250	250	250	250	250	250	250	300	300	-	300	-	300	-	-	450	-	450	450	-	-	450	450	450	-	-	525	525	-	-	525	525	525	525	525
grad (m/m)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DS Depth (m)	-	0.039	0.050	0.059	0.069	0.083	0.100	0.100	-	-	0.144	-	0.149	-	0.136	-	-	0.216	-	-	0.220	-	-	-	-	0.161	-	-	0.233	-	-	-	0.192	0.179	-	-	0.681
DS Flow (m3/s)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Node	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Node ID	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ground (m AD)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

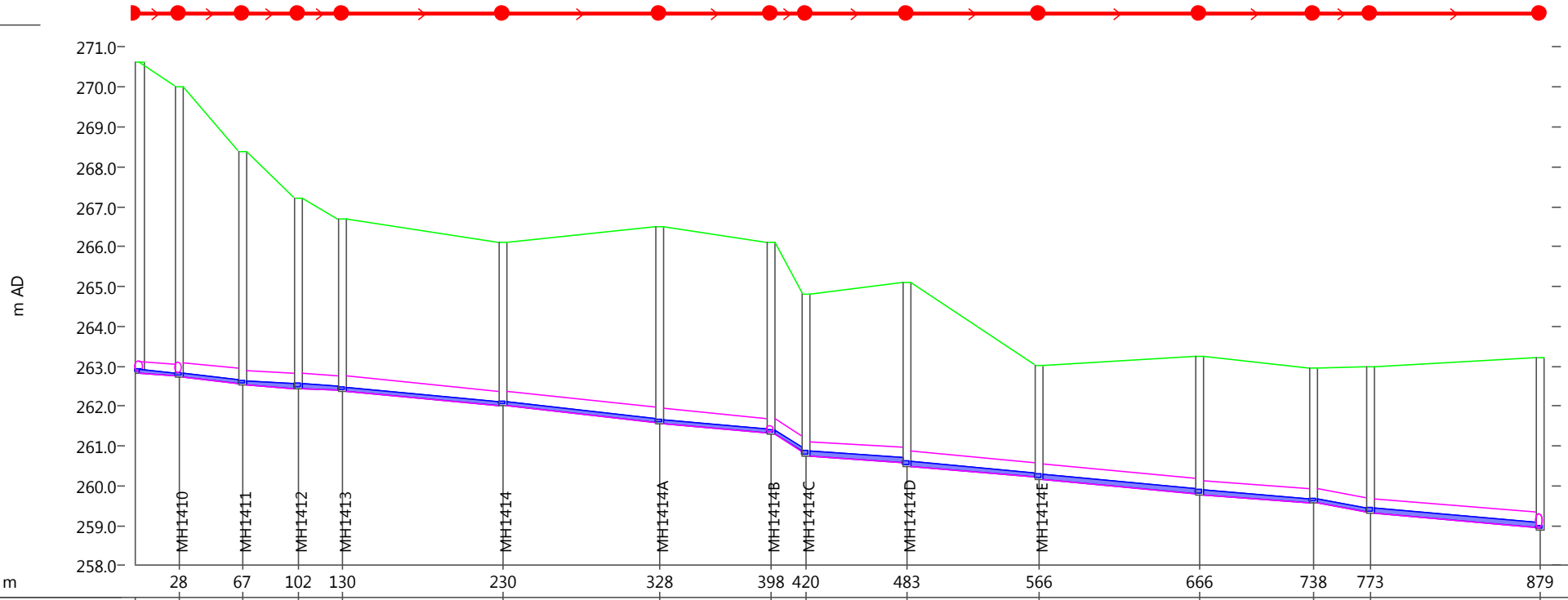
London Road Sub-Trunk



Link	MH1751.1	MH1752.1	MH1753.1	MH1754.1	MH1755.1	MH1756.1	MH1756A.1
US Node ID	MH1751	MH1752	MH1753	MH1754	MH1755	MH1756	MH1756A
ds node	MH1752	MH1753	MH1754	MH1755	MH1756	MH1756A	YR-N15-0053
length (m)	82.4	45.1	60.2	47.8	69.0	87.7	59.2
width (mm)	350	400	400	400	600	600	600
grad (m/m)	0.01153	0.01064	0.01380	0.01361	0.00101	0.01117	0.01520
DS Depth (m)	0.151	0.220	0.202	0.206	0.233	0.193	0.390
DS Flow (m3/s)	0.05734	0.11979	0.12017	0.12364	0.13173	0.13173	0.13206

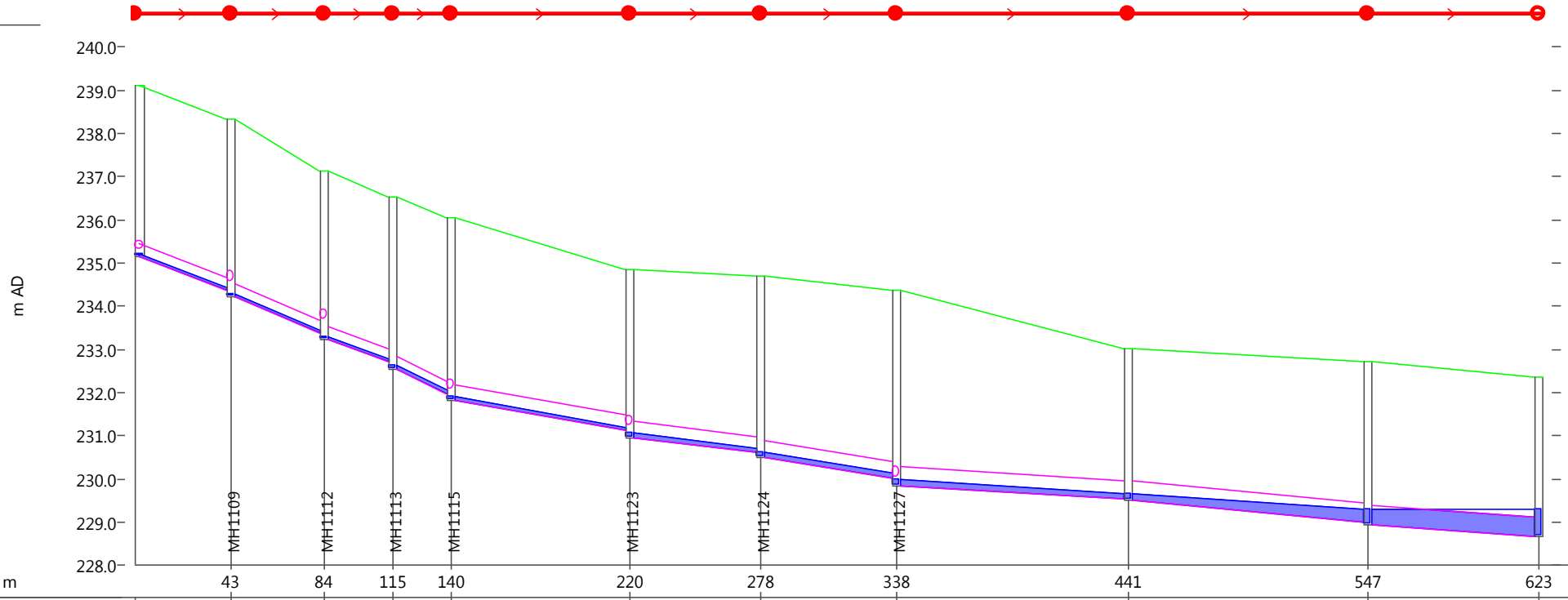
Node	MH1751	MH1752	MH1753	MH1754	MH1755	MH1756	MH1756A	-
Node ID	MH1751	MH1752	MH1753	MH1754	MH1755	MH1756	MH1756A	-
ground (m AD)	245.550	241.140	242.090	236.990	234.760	234.710	232.560	232.670

McCaffery Road Sub-Trunk



Link	-	-	-	-	MH1413.1		MH1414.1		MH1414A.1	-	MH1414C.1	MH1414D.1		MH1414E.1		MH1414F.1	-	MH1414H.1
US Node ID	-	MH1410	-	-	MH1413		MH1414		MH1414A	-	MH1414C	MH1414D		MH1414E		MH1414F	-	MH1414H
ds node	-	MH1411	-	-	MH1414		MH1414A		MH1414B	-	MH1414D	MH1414E		MH1414F		MH1414G	-	MH1479
length (m)	27.9	39.6	34.8	27.6	100.6		98.0		69.9	21.6	63.0	83.1		100.3		71.3	35.7	106.1
width (mm)	300	375	375	375	375		375		375	375	375	375		375		375	375	375
grad (m/m)	-	0.00384	-	-	0.00371		0.00408		0.00329	-	0.00222	0.00337		0.00359		0.00280	-	0.00321
DS Depth (m)	0.086	0.094	0.118	0.094	0.098		0.098		0.098	-	0.115	0.116		0.116		0.115	0.111	0.116
DS Flow (m3/s)	-	0.01714	-	-	0.01719		0.01857		0.01857	-	0.02566	0.02566		0.02566		0.02566	-	0.02566
Node		-	-	-	MH1413		MH1414		MH1414A	-	-	MH1414D		MH1414E		MH1414F	MH1414G	MH1414H	MH1479
Node ID		-	-	-	MH1413		MH1414		MH1414A	-	-	MH1414D		MH1414E		MH1414F	MH1414G	MH1414H	MH1479
ground (m AD)		-	-	-	266.700		266.100		266.500	266.100	264.800	265.110		263.010		263.250	262.950	262.974	263.210

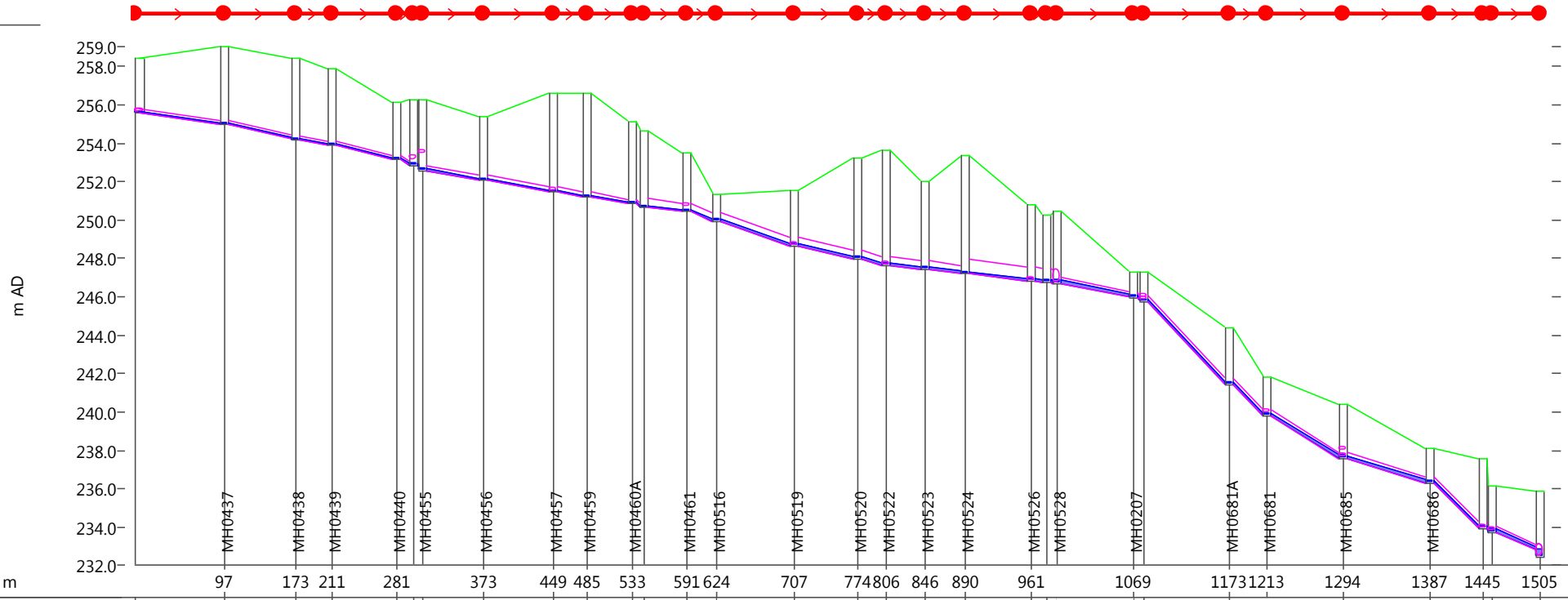
Patterson Road Sub-Trunk



Link	MH1108.1	MH1109.1	-	-	MH1115.1	MH1123.1	MH1124.1	MH1127.1	MH1126.1	MH1125.1
US Node ID	MH1108	MH1109	MH1112	-	MH1115	MH1123	MH1124	MH1127	MH1126	MH1125
ds node	MH1109	MH1112	MH1113	-	MH1123	MH1124	MH1127	MH1126	MH1125	YR-N15-0023
length (m)	43.0	41.3	30.5	25.4	79.4	58.3	60.0	103.2	106.0	75.8
width (mm)	300	300	300	300	375	375	375	450	450	450
grad (m/m)	0.01815	0.02008	0.01705	0.02241	0.00881	0.00600	0.00800	0.00300	0.00472	0.00330
DS Depth (m)	0.060	0.070	0.076	0.072	0.084	0.115	0.108	0.141	0.306	0.610
DS Flow (m3/s)	0.00834	0.01373	0.01511	0.01532	0.01731	0.02723	0.02781	0.04185	0.04185	0.04185

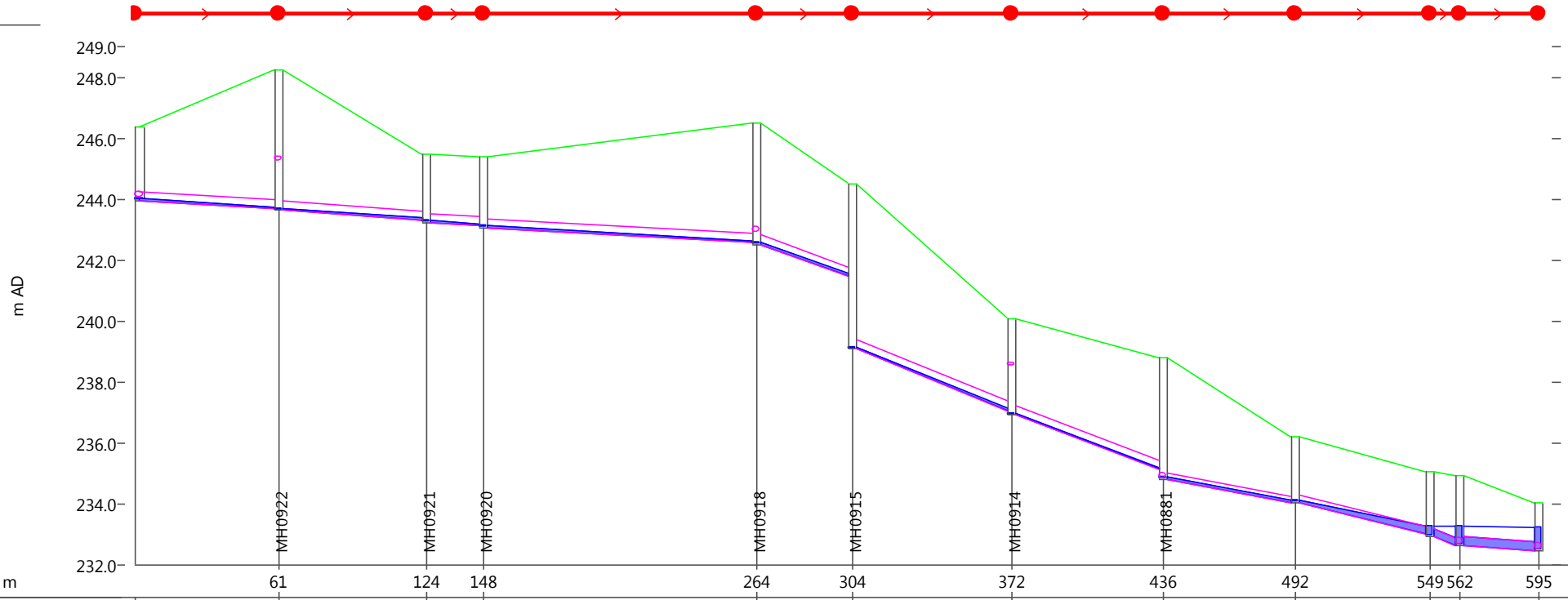
Node	-	MH1109	MH1112	-	MH1115	MH1123	MH1124	MH1127	MH1126	MH1125	-
Node ID	-	MH1109	MH1112	-	MH1115	MH1123	MH1124	MH1127	MH1126	MH1125	-
ground (m AD)	-	238.350	237.130	-	236.070	234.850	234.700	234.390	233.020	232.710	232.380

Penn Amelia Sub-Trunk



m	97	173	211	281	373	449	485	533	591	624	707	774	806	846	890	961	1069	1173	1213	1294	1387	1445	1505
Link	MH0432.1	-	-	-	-	-	-	-	-	-	MH0516.1	-	-	-	-	-	MH0528.1	MH0678.1	-	MH0681.1	MH0685.1	-	-
US Node ID	MH0432	MH0437	-	MH0439	-	-	MH0456	-	-	-	MH0516	MH0519	-	-	-	MH0524	MH0528	MH0678	-	MH0681	MH0685	-	-
ds node	MH0437	MH0438	-	MH0440	-	-	MH0457	-	-	-	MH0519	MH0520	-	-	-	MH0526	MH0207	MH0681A	-	MH0685	MH0686	-	-
length (m)	96.6	76.4	38.1	69.7	-	65.5	75.2	36.2	48.3	45.5	-	83.5	66.9	-	40.8	43.5	70.9	81.6	91.9	40.1	81.2	93.2	57.5	51.4
width (mm)	200	200	200	200	-	250	250	250	250	450	450	450	450	450	450	450	750	300	300	300	300	300	300	300
grad (m/m)	0.00628	0.00955	-	0.01062	-	0.00748	0.00797	-	-	-	-	0.01513	0.01037	-	-	-	0.00531	0.00870	0.04679	-	0.02735	0.01373	-	-
DS Depth (m)	0.075	0.072	-	0.073	-	0.099	0.105	-	0.105	0.102	-	0.115	0.116	-	-	0.130	0.120	0.161	0.112	-	0.138	0.157	0.147	0.149
DS Flow (m3/s)	0.00750	0.00816	-	0.00901	-	0.01583	0.01683	-	-	-	-	0.03341	0.03525	-	-	-	0.03786	0.04983	0.05331	-	0.05608	0.05928	-	-
Node	-	MH0437	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	MH0685	-	-	-
Node ID	-	MH0437	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	MH0685	-	-	-
ground (m AD)	-	259.000	-	-	-	-	-	-	-	-	251.523	-	-	-	-	-	-	-	-	-	240.400	238.080	-	-

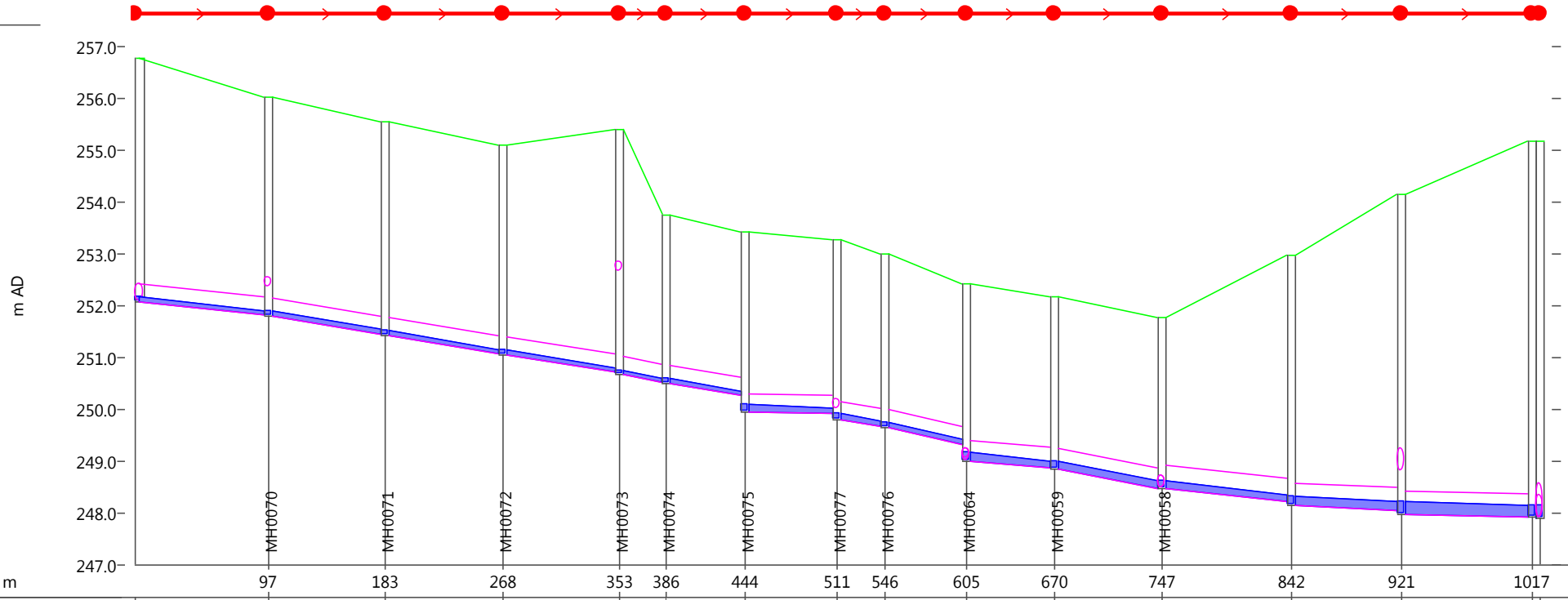
Queen Street Sub-Trunk



Link	MH0923.1	MH0922.1	-	MH0920.1	MH0918.1	MH0915.1	MH0914.1	MH0881.1	MH0875A.1	-	-
US Node ID	MH0923	MH0922	-	MH0920	MH0918	MH0915	MH0914	MH0881	MH0875A	-	MH0828A
ds node	MH0922	MH0921	-	MH0918	MH0915	MH0914	MH0881	MH0875A	MH0875	-	MH0873
length (m)	61.2	62.4	24.3	115.8	40.8	67.6	64.1	55.9	56.9	-	33.3
width (mm)	300	300	300	300	300	300	300	200	250	250	300
grad (m/m)	0.00441	0.00497	-	0.00415	0.02511	0.02975	0.02810	0.01377	0.01791	-	0.00441
DS Depth (m)	0.056	0.059	0.059	0.063	0.054	0.054	0.056	0.075	0.238	-	0.772
DS Flow (m3/s)	0.00509	0.00569	-	0.00653	0.00753	0.00831	0.00879	0.01072	0.01135	-	0.01555

Node	-	MH0922	MH0921	MH0920	MH0918	MH0915	MH0914	MH0881	MH0875A	MH0875	-	-
Node ID	-	MH0922	MH0921	MH0920	MH0918	MH0915	MH0914	MH0881	MH0875A	MH0875	-	-
ground (m AD)	246.400	248.250	245.500	245.400	246.500	244.500	240.100	238.800	236.220	235.100	-	-

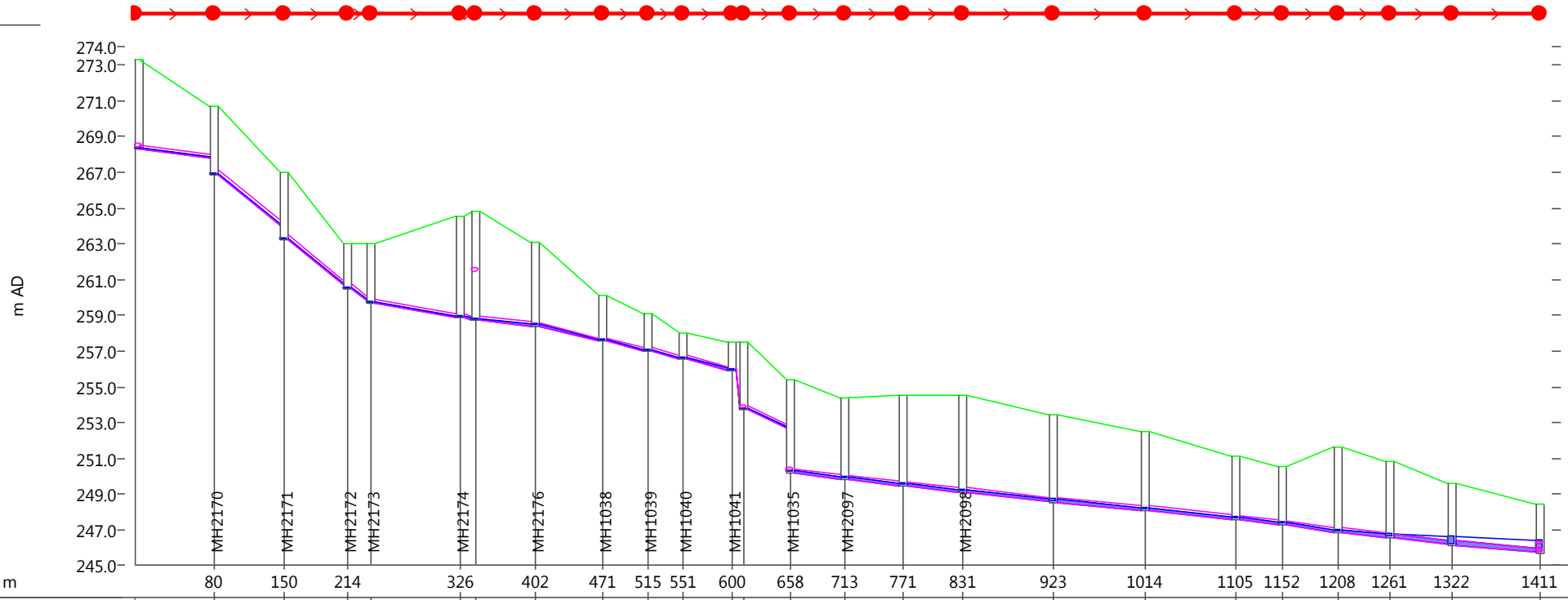
Sanford Street Sub-Trunk



Link	MH0032.1	MH0070.1	MH0071.1	MH0072.1	-	MH0074.1	MH0075.1	-	MH0076.1	MH0064.1	MH0059.1	MH0058.1	MH0303.1	MH0300.1
US Node ID	MH0032	MH0070	MH0071	MH0072	-	MH0074	MH0075	-	MH0076	MH0064	MH0059	MH0058	MH0303	MH0300
ds node	MH0070	MH0071	MH0072	MH0073	-	MH0075	MH0077	-	MH0064	MH0059	MH0058	MH0303	MH0300	MH0294
length (m)	97.4	85.2	85.6	84.6	33.7	57.3	67.6	34.9	58.9	64.4	77.7	94.6	79.4	95.9
width (mm)	350	350	350	350	350	350	350	350	350	400	400	450	450	450
grad (m/m)	0.00254	0.00399	0.00409	0.00390	-	0.00405	0.00036	-	0.00545	0.00186	0.00495	0.00271	0.00126	0.00042
DS Depth (m)	0.074	0.083	0.085	0.086	0.087	0.088	0.088	0.104	0.103	0.128	0.160	0.137	0.178	0.219
DS Flow (m3/s)	0.01028	0.01267	0.01317	0.01354	-	0.01440	0.01476	-	0.02005	0.03262	0.03262	0.03967	0.04015	0.04015

Node	-	MH0070	MH0071	MH0072	MH0073	-	MH0075	-	-	MH0064	MH0059	MH0058	MH0303	MH0300	-
Node ID	-	MH0070	MH0071	MH0072	MH0073	-	MH0075	-	-	MH0064	MH0059	MH0058	MH0303	MH0300	-
ground (m AD)	-	256.030	255.570	255.120	255.420	-	253.440	253.290	-	252.432	252.200	251.786	252.980	254.150	255.180

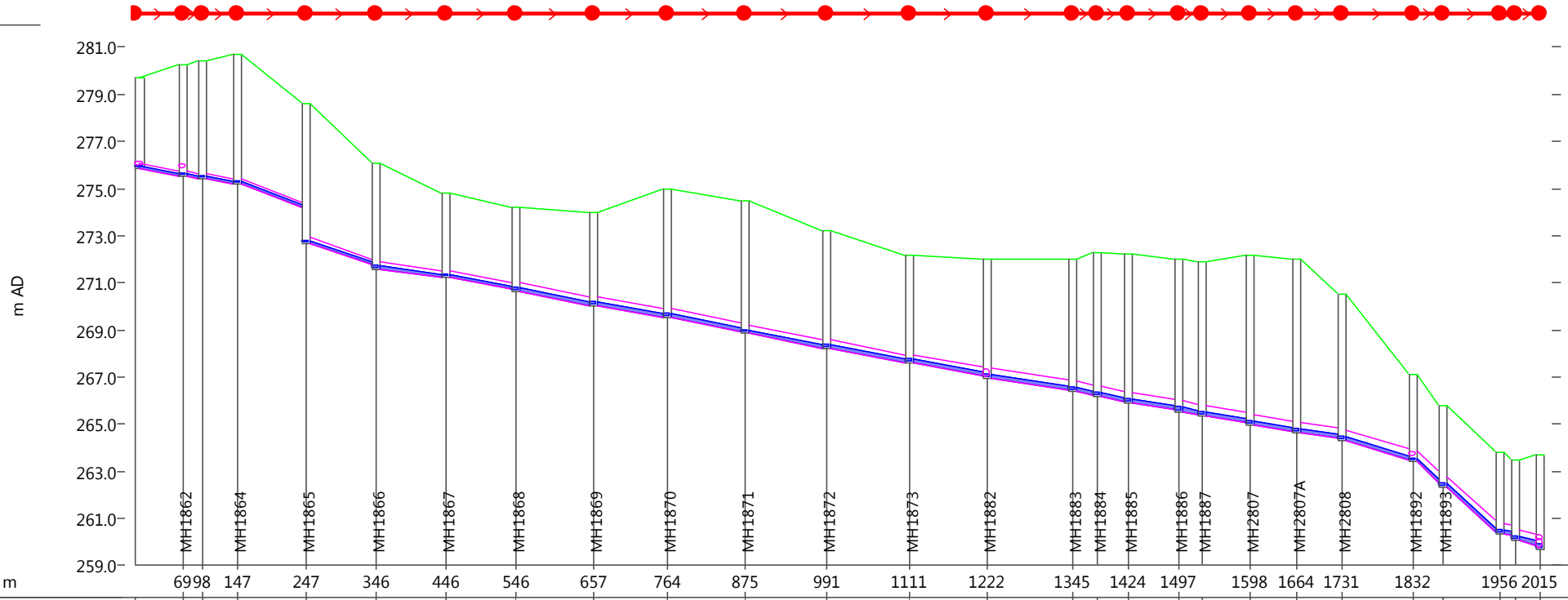
Sparrow Road Sub-Trunk



Link	MH2169.1	-	-	-	MH2173.1	-	-	-	-	-	-	-	-	-	-	MH2098.1	MH2099.1	MH2100.1	-	-	-	-	MH2105.1
US Node ID	MH2169	MH2170	MH2171	-	MH2173	-	MH2176	-	-	-	-	-	-	-	-	MH2098	MH2099	MH2100	-	-	-	-	MH2105
ds node	MH2170	MH2171	MH2172	-	MH2174	-	MH1038	-	-	-	-	-	-	-	-	MH2099	MH2100	MH2101	-	-	-	-	MH1019
length (m)	79.8	70.5	64.1	-	89.2	58.7	68.7	44.9	35.1	49.4	46.1	55.4	58.1	60.0	91.2	91.7	91.0	47.2	55.5	53.0	61.6	88.8	
width (mm)	250	250	250	-	250	250	200	200	200	200	250	250	250	250	250	250	250	250	250	250	250	250	
grad (m/m)	0.00664	0.04041	0.03975	-	0.00875	0.00511	0.01247	-	-	-	-	-	0.00530	0.00579	0.00568	0.00492	0.00529	-	-	-	0.00584	0.00436	
DS Depth (m)	0.102	0.069	0.070	-	0.101	0.113	0.112	0.112	-	0.111	0.097	0.136	0.137	0.148	0.139	0.151	0.141	0.141	0.144	0.237	0.438	0.641	
DS Flow (m3/s)	0.01598	0.01745	0.01745	-	0.01798	0.01923	0.02079	-	-	-	-	-	0.02808	0.02841	0.02886	0.02928	0.02972	-	-	-	0.03084	0.03109	

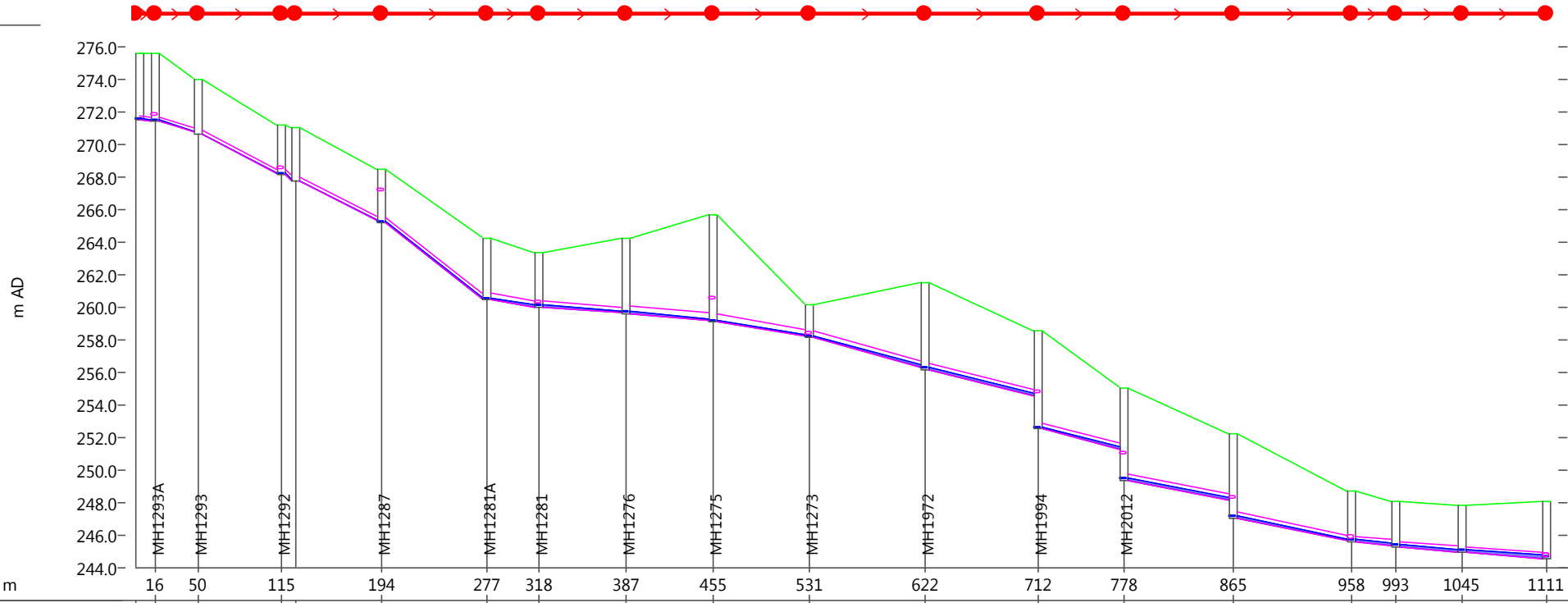
Node	-	MH2170	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	MH2098	MH2099	MH2100	-	-	-	-	MH2105	-
Node ID	-	MH2170	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	MH2098	MH2099	MH2100	-	-	-	-	MH2105	-
ground (m AD)	-	270.700	267.000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	254.510	253.440	252.530	251.160	-	-	-	249.630	-

Stellar Drive Sub-Trunk



m	6	9	8	147	247	346	446	546	657	764	875	991	1111	1222	1345	1424	1497	1598	1664	1731	1832	1956	2015
Link	-	-	-	-	-	-	-	MH1868.1	-	MH1870.1	MH1871.1	MH1872.1	MH1873.1	MH1882.1	-	-	-	-	-	-	-	-	-	-	-
US Node ID	-	-	-	MH1864	MH1865	MH1866	MH1867	MH1868	MH1869	MH1870	MH1871	MH1872	MH1873	MH1882	-	-	-	-	-	-	-	MH2808	-	-	-
ds node	-	-	-	MH1865	MH1866	MH1867	MH1868	MH1869	MH1870	MH1871	MH1872	MH1873	MH1882	MH1883	-	-	-	-	-	-	-	MH1892	-	-	-
length (m)	69.4	-	49.0	99.3	99.3	99.8	100.5	110.9	106.6	111.8	115.5	119.9	111.6	122.3	-	44.2	72.4	-	68.1	66.1	66.7	100.6	-	81.7	-
width (mm)	250	-	250	250	250	300	300	375	375	375	375	375	375	450	-	450	450	-	450	450	450	450	450	450	-
grad (m/m)	-	-	-	0.01007	0.00906	0.00361	0.00497	0.00532	0.00488	0.00519	0.00546	0.00526	0.00493	0.00392	-	-	-	-	-	-	-	0.00785	-	-	-
DS Depth (m)	0.117	-	-	0.105	0.117	0.146	0.137	0.135	0.153	0.151	0.158	0.161	0.157	0.175	-	-	0.177	-	0.178	0.177	0.178	0.159	-	0.128	-
DS Flow (m3/s)	-	-	-	0.02057	0.02432	0.02732	0.03141	0.03231	0.03325	0.04295	0.04414	0.04566	0.04640	0.06362	-	-	-	-	-	-	-	0.06617	-	-	-
Node	-	-	-	-	-	-	-	MH1868	MH1869	MH1870	MH1871	MH1872	MH1873	MH1882	-	-	-	-	-	-	-	-	-	-	-
Node ID	-	-	-	-	-	-	-	MH1868	MH1869	MH1870	MH1871	MH1872	MH1873	MH1882	-	-	-	-	-	-	-	-	-	-	-
ground (m AD)	-	-	-	-	278.600	276.090	274.800	274.200	274.000	275.000	274.500	273.200	272.200	272.000	-	-	-	-	-	-	-	-	-	-	-

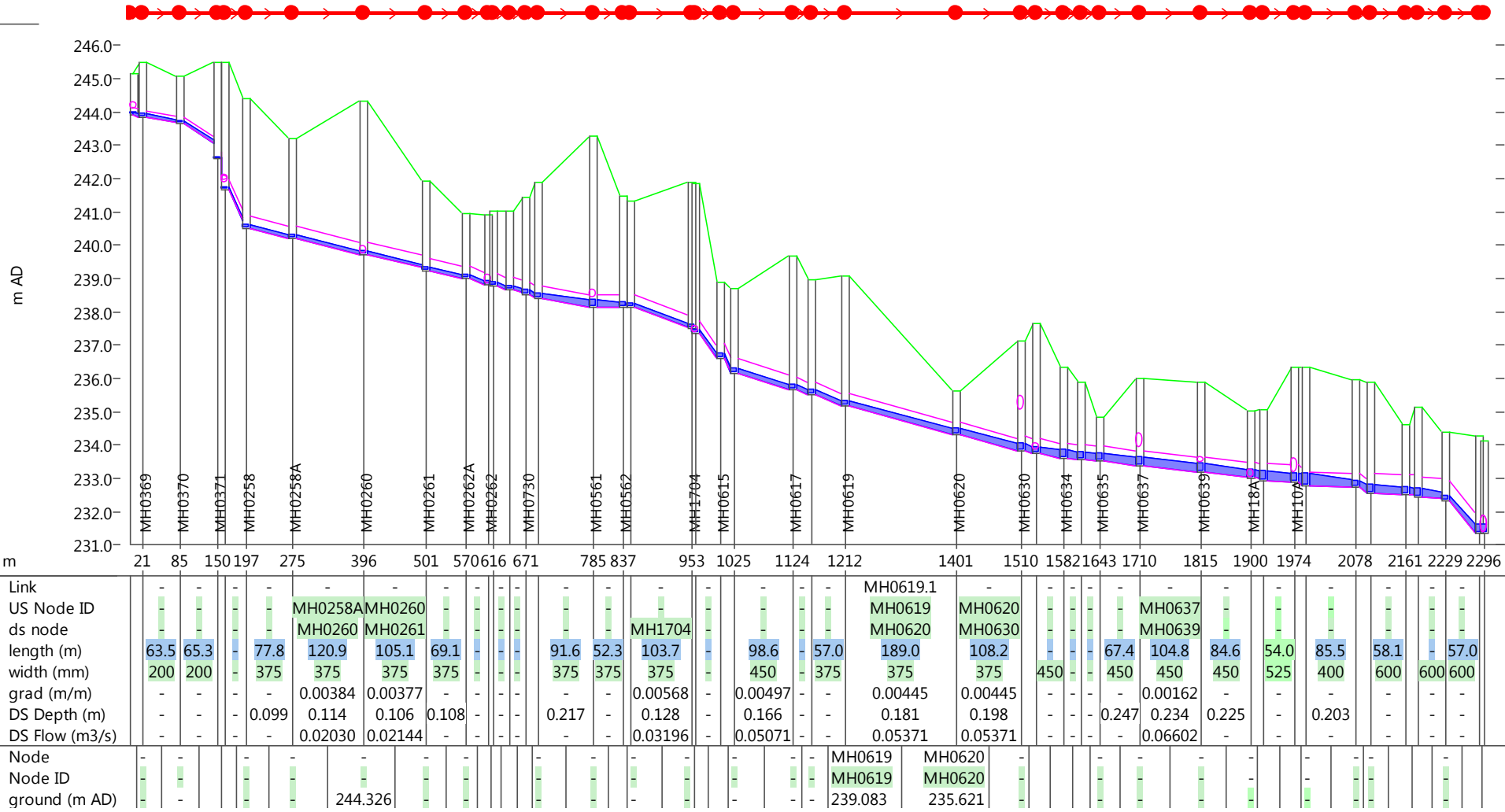
Wayne Drive Sub-Trunk



Link	-	-	MH1293.1	MH1288.1	MH1287.1	-	MH1281.1	MH1276.1	MH1275.1	MH1273.1	MH1972.1	MH1994.1	MH2012.1	MH2023.1	-	-	MH1191.1	
US Node ID	-	-	MH1293	MH1288	MH1287	-	MH1281	MH1276	MH1275	MH1273	MH1972	MH1994	MH2012	MH2023	-	MH2025	MH1191	
ds node	-	-	MH1292	MH1287	MH1281A	-	MH1276	MH1275	MH1273	MH1972	MH1994	MH2012	MH2023	MH2024	-	MH1191	MH1192	
length (m)	-	34.3	65.6	67.2	83.0	40.9	68.7	68.8	75.6	91.3	89.2	66.8	86.3	93.6	34.6	52.3	66.2	
width (mm)	-	250	300	300	300	375	375	450	450	375	375	375	375	375	375	375	350	
grad (m/m)	-	-	0.03663	0.03576	0.05673	-	0.00519	0.00620	0.01234	0.01995	0.01783	0.01847	0.01385	0.01492	-	0.00582	0.00534	
DS Depth (m)	-	0.067	0.059	0.062	0.086	0.108	0.108	0.099	0.102	0.100	0.103	0.116	0.137	0.139	0.176	0.179	0.184	
DS Flow (m3/s)	-	-	0.01131	0.01339	0.01723	-	0.02216	0.02291	0.02957	0.03295	0.03307	0.04474	0.05529	0.05876	-	0.06012	0.06052	

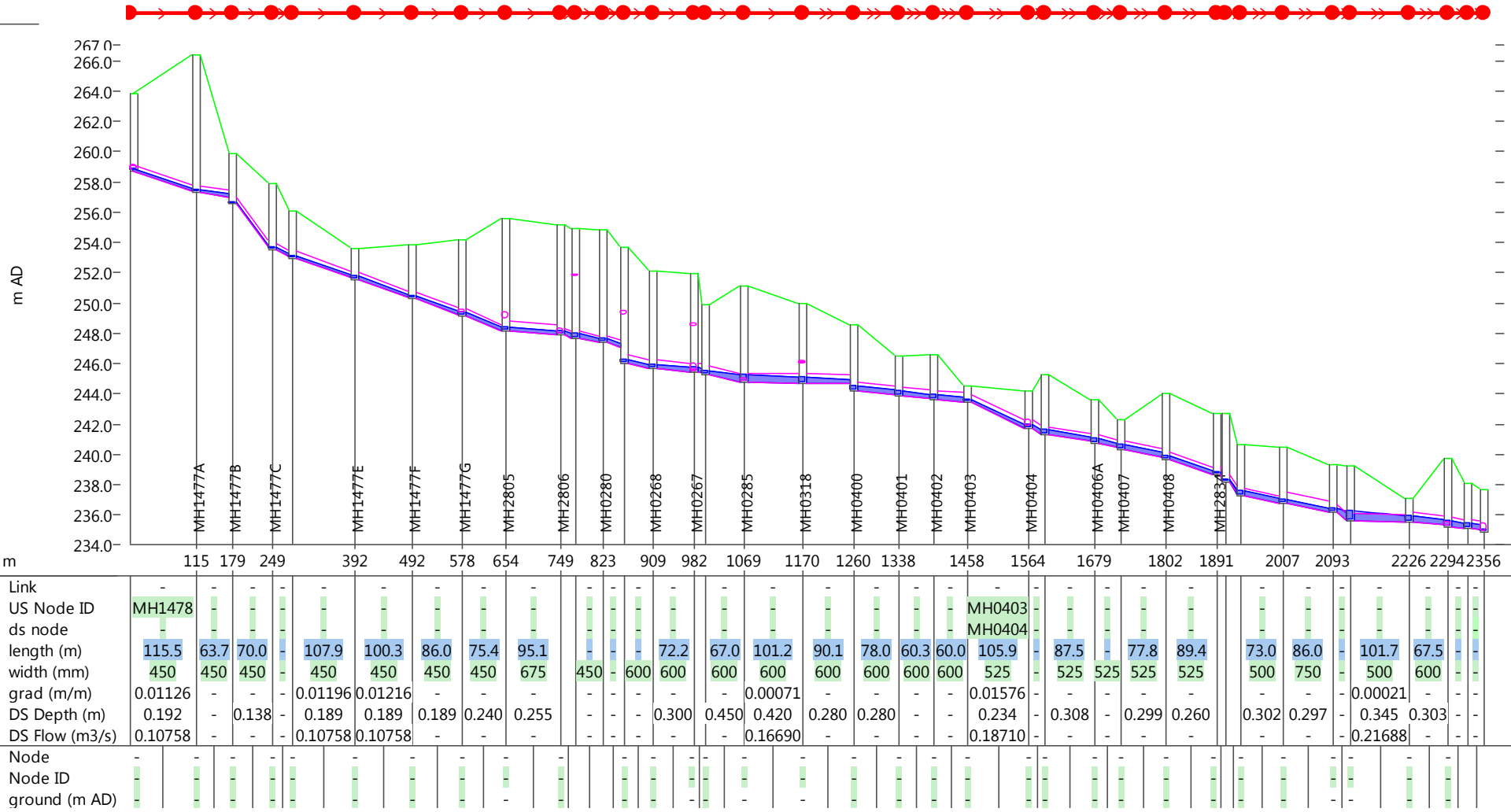
Node	-	-	-	-	MH1287	-	-	MH1276	MH1275	MH1273	MH1972	MH1994	MH2012	MH2023	MH2024	-	MH1191	-
Node ID	-	-	-	-	MH1287	-	-	MH1276	MH1275	MH1273	MH1972	MH1994	MH2012	MH2023	MH2024	-	MH1191	-
ground (m AD)	-	-	-	-	268.530	264.300	263.390	264.290	265.720	260.220	261.590	258.560	255.110	252.240	248.790	-	247.900	-

West Central Sub-Trunk



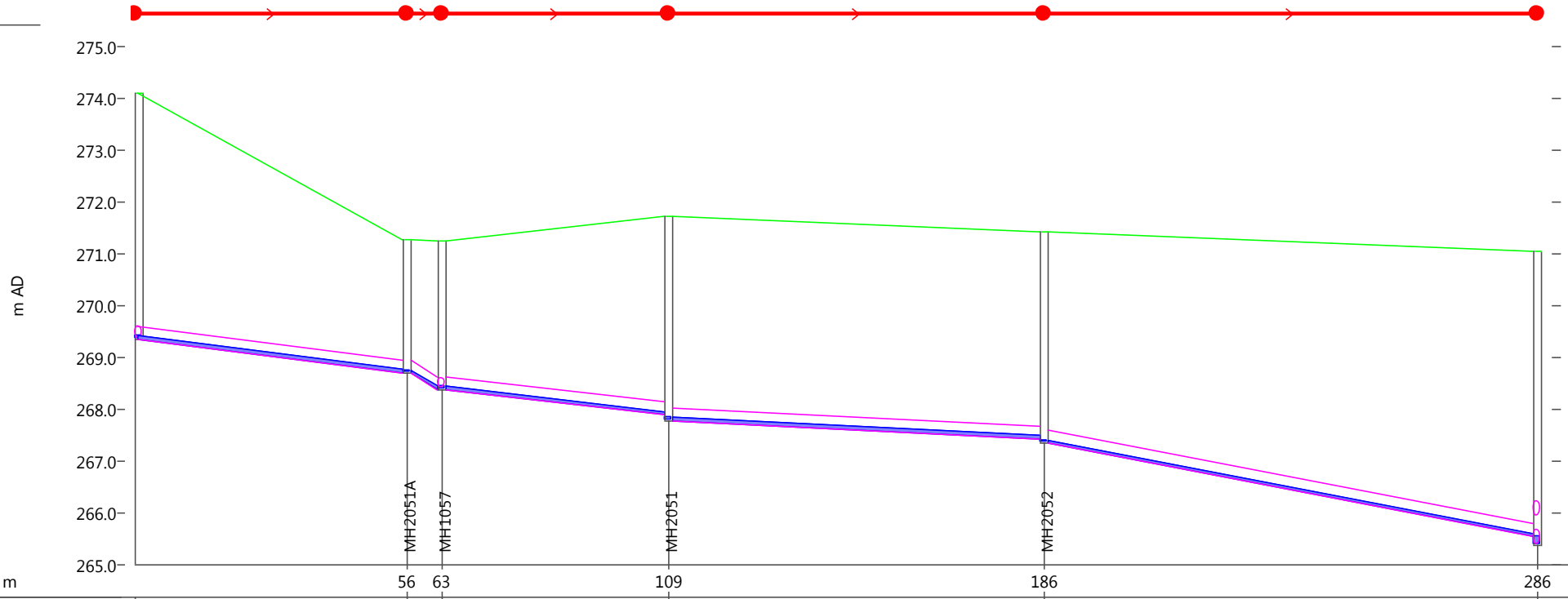
Link	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	MH0619.1	-	-	-	-	-	-	-	-	-	-	-	-
US Node ID					MH0258A	MH0260													MH0619	MH0620				MH0637							
ds node					MH0260	MH0261							MH1704						MH0620	MH0630				MH0639							
length (m)	63.5	65.3	-	77.8	120.9	105.1	69.1	-	-	-	91.6	52.3	103.7	-	98.6	-	57.0	189.0	108.2	-	-	-	67.4	104.8	84.6	54.0	85.5	58.1	-	57.0
width (mm)	200	200	-	375	375	375	375	-	-	-	375	375	375	-	450	-	375	375	375	450	-	-	450	450	450	525	400	600	600	600
grad (m/m)	-	-	-	-	0.00384	0.00377	-	-	-	-	-	-	0.00568	-	0.00497	-	-	0.00445	0.00445	-	-	-	-	0.00162	-	-	-	-	-	-
DS Depth (m)	-	-	-	0.099	0.114	0.106	0.108	-	-	-	0.217	-	0.128	-	0.166	-	-	0.181	0.198	-	-	-	0.247	0.234	0.225	-	0.203	-	-	-
DS Flow (m3/s)	-	-	-	-	0.02030	0.02144	-	-	-	-	-	-	0.03196	-	0.05071	-	-	0.05371	0.05371	-	-	-	-	0.06602	-	-	-	-	-	-
Node	-	-		-	-	-	-	-	-		-	-	-	-	-	-	-	MH0619	MH0620	-		-	-	-	-		-	-	-		-
Node ID	-	-		-	-		-	-	-		-	-	-	-	-	-	-	MH0619	MH0620	-		-	-	-	-		-	-	-		-
ground (m AD)	-	-		-	-	244.326	-	-			-	-	-	-	-	-	-	239.083	235.621	-		-	-	-	-		-	-	-		-

Western Sub-Trunk



Link	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
US Node ID	MH1478	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	MH0403	-	-	-	-	-	-	-	-	-	-	-	-	-
ds node	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	MH0404	-	-	-	-	-	-	-	-	-	-	-	-	-
length (m)	115.5	63.7	70.0	-	107.9	100.3	86.0	75.4	95.1	-	-	-	72.2	67.0	101.2	90.1	78.0	60.3	60.0	105.9	-	87.5	-	77.8	89.4	-	73.0	86.0	-	101.7	67.5	-	-	-	-
width (mm)	450	450	450	-	450	450	450	450	675	450	-	600	600	600	600	600	600	600	600	525	-	525	525	525	525	-	500	750	-	500	600	-	-	-	-	-
grad (m/m)	0.01126	-	-	-	0.01196	0.01216	-	-	-	-	-	-	-	-	0.00071	-	-	-	-	0.01576	-	-	-	-	-	-	-	-	-	0.00021	-	-	-	-	-	-
DS Depth (m)	0.192	-	0.138	-	0.189	0.189	0.189	0.240	0.255	-	-	-	0.300	0.450	0.420	0.280	0.280	-	-	0.234	-	0.308	-	0.299	0.260	-	0.302	0.297	-	0.345	0.303	-	-	-	-	-
DS Flow (m3/s)	0.10758	-	-	-	0.10758	0.10758	-	-	-	-	-	-	-	-	0.16690	-	-	-	-	0.18710	-	-	-	-	-	-	-	-	-	0.21688	-	-	-	-	-	-
Node	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Node ID	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ground (m AD)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Wildwood Drive Sub-Trunk



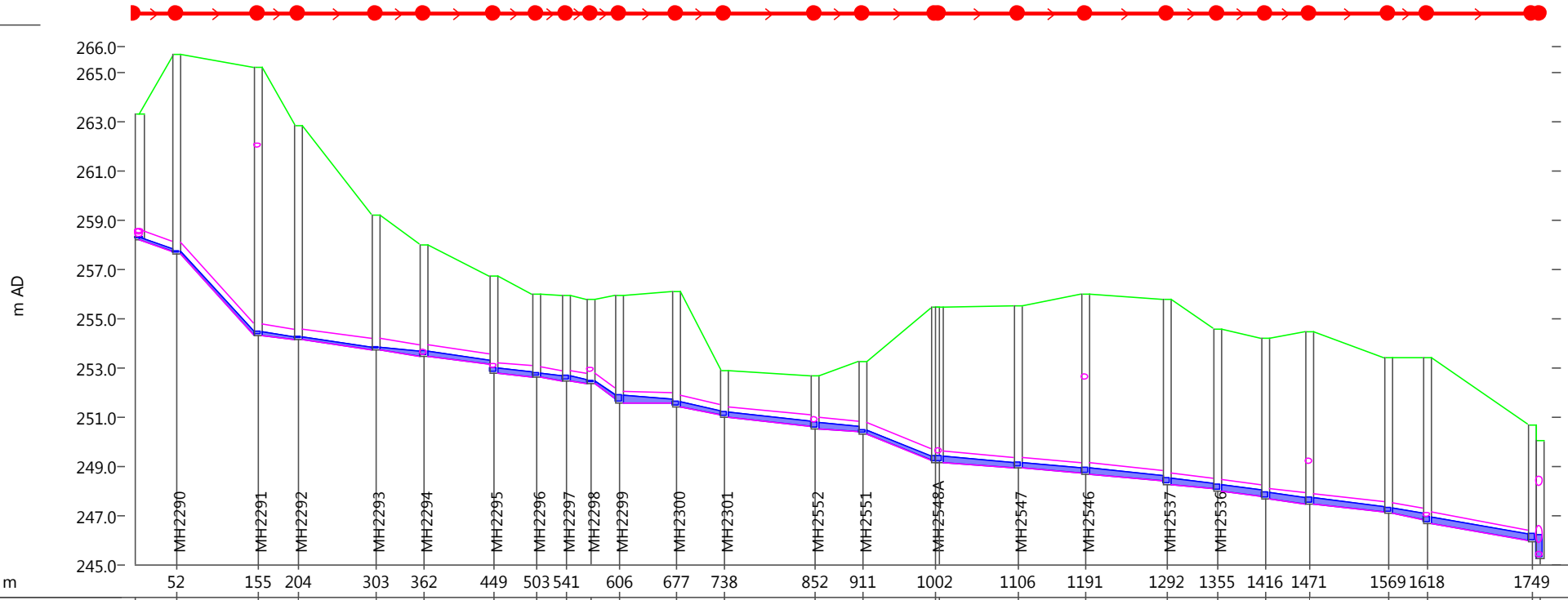
Link	MH2051B.1	-	MH1057.2	MH2051.1	MH2052.1	
US Node ID	MH2051B	-	MH1057	MH2051	MH2052	
ds node	MH2051A	-	MH2051	MH2052	MH2080	
length (m)	55.7	7.0	46.2	76.8	100.7	
width (mm)	250	250	250	250	250	
grad (m/m)	0.01174	-	0.01042	0.00444	0.01790	
DS Depth (m)	0.070	-	0.060	0.068	0.057	
DS Flow (m3/s)	0.00977	-	0.00646	0.00685	0.00742	

Node	MH2051B	MH2051A	MH1057	MH2051	MH2052	MH2080
Node ID	MH2051B	MH2051A	MH1057	MH2051	MH2052	MH2080
ground (m AD)	274.103	271.299	271.270	271.740	271.440	271.070

APPENDIX B

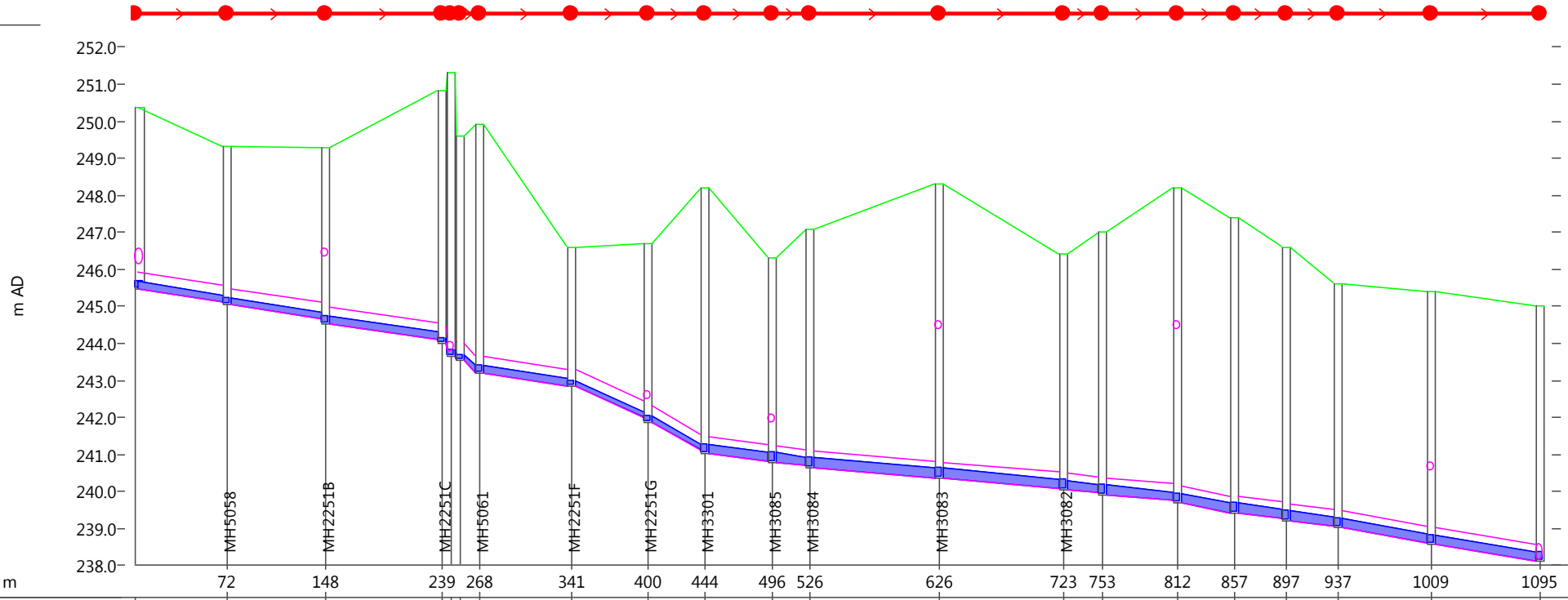
Future Conditions Hydraulic Grade Profiles

Bayview Avenue Sub-Trunk



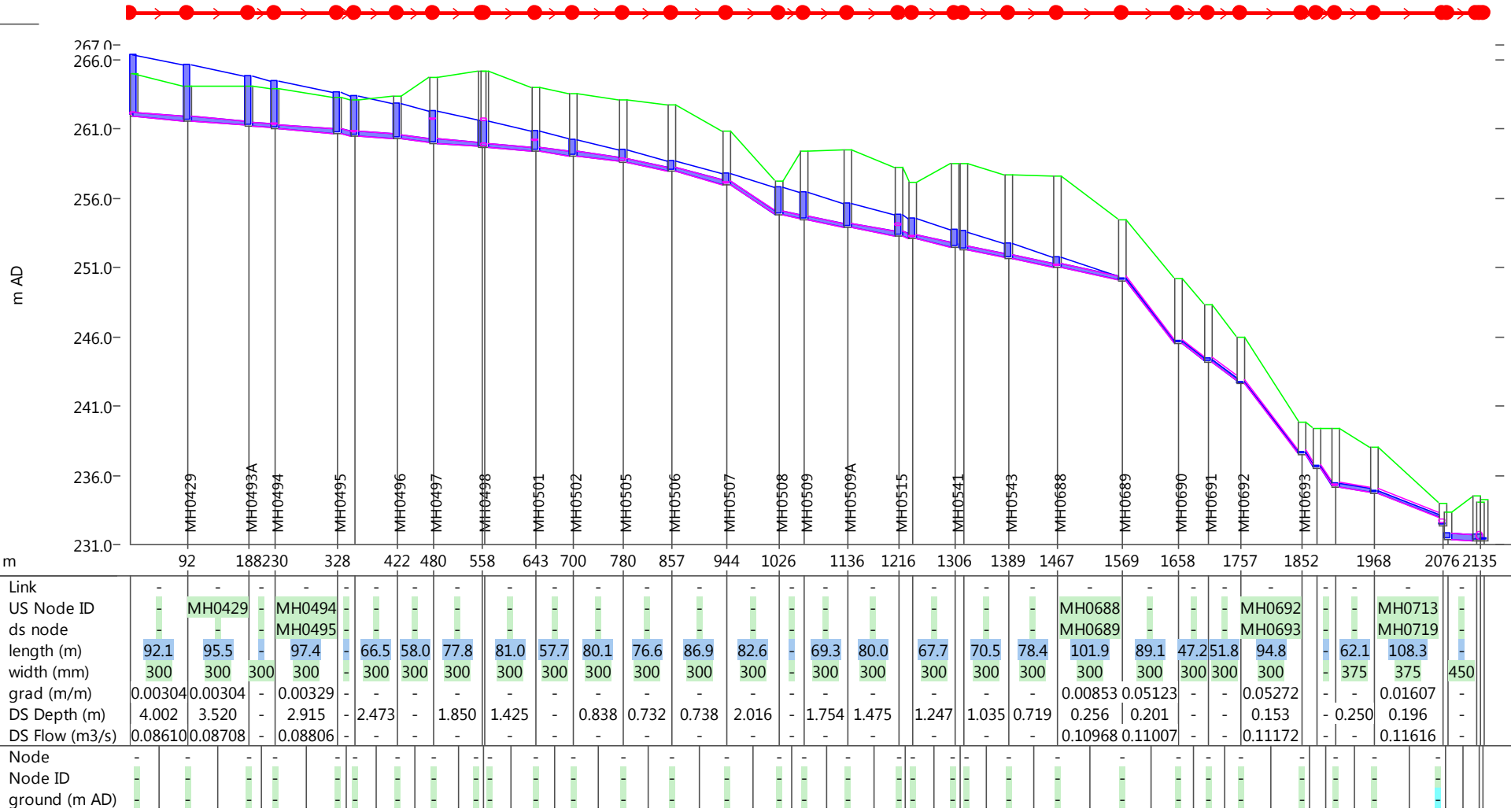
Link	-	MH2290.1	-	MH2292.1	-	-	-	-	-	-	-	-	MH2301.1	-	-	MH2548.1	-	MH2546.1	-	-	-	MH2534.1	-	MH2578.1				
US Node ID	-	MH2290	-	MH2292	-	MH2294	-	-	-	-	-	-	MH2301	-	MH2551	MH2548	MH2547	MH2546	-	-	-	MH2534	-	MH2578				
ds node	-	MH2291	-	MH2293	-	MH2295	-	-	-	-	-	-	MH2552	-	-	MH2547	MH2546	MH2537	-	-	-	MH2533	-	MH2579				
length (m)	52.5	102.1	49.6	98.5	59.5	86.7	54.5	-	-	-	71.1	60.6	113.9	59.5	90.2	98.7	84.7	101.4	62.9	61.0	54.7	98.7	48.6	131.0				
width (mm)	450	450	450	450	450	450	450	450	-	450	450	450	450	450	450	450	450	450	450	450	450	450	450	450				
grad (m/m)	-	0.03241	-	0.00406	-	0.00415	-	-	-	-	-	-	0.00281	-	0.01165	0.00245	0.00245	0.00286	-	-	-	0.00324	-	0.00527				
DS Depth (m)	0.102	0.130	0.130	0.130	0.187	0.176	0.179	-	-	-	0.182	0.181	0.183	0.198	0.173	0.261	0.239	0.215	0.216	0.216	0.232	0.225	-	0.264				
DS Flow (m3/s)	-	0.03037	-	0.03221	-	0.06483	-	-	-	-	-	-	0.07017	-	0.08116	0.08957	0.09006	0.09517	-	-	-	0.10368	-	0.12428				
Node	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	MH2547	MH2546	-	-	-	-	-	-	-			
Node ID	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	MH2547	MH2546	-	-	-	-	-	-	-			
ground (m AD)	-	-	-	-	-	-	-	-	-	-	-	-	252.880	252.700	-	-	255.500	256.000	-	-	-	-	-	253.400	-			

Bogart Avenue Sub-Trunk



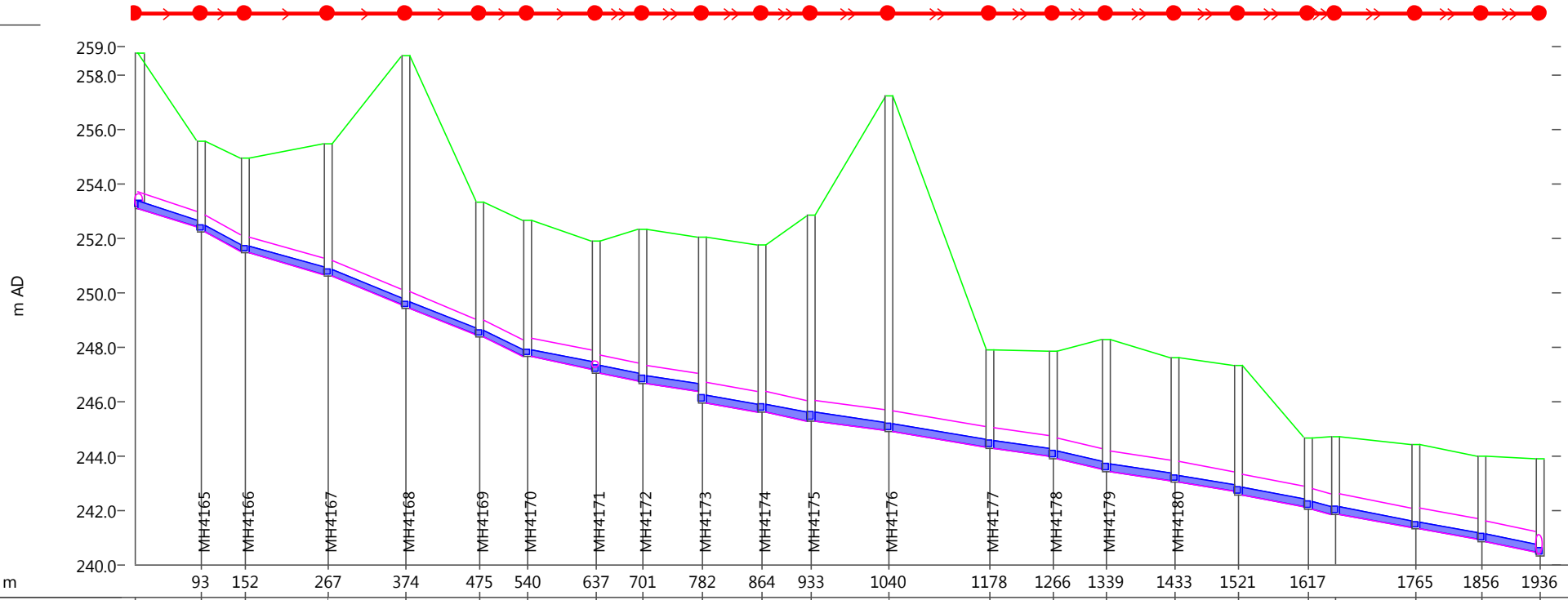
m	72	148	239	268	341	400	444	496	526	626	723	753	812	857	897	937	1009	1095
Link	MH5057.1	MH5058.1	MH2251B.1	-	MH5061.1	-	-	-	-	MH3084.1	MH3083.1	-	-	-	-	-	MH3076.1	MH3070.1
US Node ID	MH5057	MH5058	MH2251B	-	MH5061	MH2251F	-	MH3301	-	MH3084	MH3083	-	MH3081	-	-	-	MH3076	MH3070
ds node	MH5058	MH2251B	MH2251C	-	MH2251F	MH2251G	-	MH3085	-	MH3083	MH3082	-	MH3080	-	-	-	MH3070	MH3062A
length (m)	71.9	76.5	91.0	-	72.3	59.4	43.9	52.1	29.9	100.2	97.0	30.2	58.5	45.2	39.6	40.5	72.2	85.4
width (mm)	450	450	450	-	450	450	450	450	450	450	450	450	450	450	450	450	450	450
grad (m/m)	0.00487	0.00484	0.00461	-	0.00484	0.01413	-	0.00422	-	0.00289	0.00258	-	0.00273	-	-	-	0.00586	0.00509
DS Depth (m)	0.184	0.184	0.193	-	0.210	0.165	0.168	0.239	-	0.279	0.228	-	0.228	0.268	0.247	0.248	0.250	0.253
DS Flow (m3/s)	0.07034	0.07034	0.07697	-	0.09075	0.09075	-	0.10372	-	0.10480	0.10635	-	0.10665	-	-	-	0.12690	0.12937
Node	-	MH5058	MH2251B	-	-	MH2251F	-	-	-	MH3084	MH3083	MH3082	-	-	-	-	MH3076	MH3070	-
Node ID	-	MH5058	MH2251B	-	-	MH2251F	-	-	-	MH3084	MH3083	MH3082	-	-	-	-	MH3076	MH3070	-
ground (m AD)	-	249.330	249.300	-	-	246.580	-	-	-	247.100	248.300	246.400	-	-	-	-	245.600	245.400	-

Cherrywood Penn Sub-Trunk



m	92	188	230	328	422	480	558	643	700	780	857	944	1026	1136	1216	1306	1389	1467	1569	1658	1757	1852	1968	2076	2135
Link	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
US Node ID	-	MH0429	-	MH0494	-	-	-	-	-	-	-	-	-	-	-	-	-	MH0688	-	-	MH0692	-	-	MH0713	-
ds node	-	-	-	MH0495	-	-	-	-	-	-	-	-	-	-	-	-	-	MH0689	-	-	MH0693	-	-	MH0719	-
length (m)	92.1	95.5	-	97.4	-	66.5	58.0	77.8	81.0	57.7	80.1	76.6	86.9	82.6	-	69.3	80.0	67.7	70.5	78.4	101.9	89.1	47.2	51.8	94.8	-	62.1	108.3	-
width (mm)	300	300	300	300	-	300	300	300	300	300	300	300	300	300	-	300	300	300	300	300	300	300	300	300	300	-	375	375	450
grad (m/m)	0.00304	0.00304	-	0.00329	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.00853	0.05123	-	-	0.05272	-	-	0.01607	-
DS Depth (m)	4.002	3.520	-	2.915	-	2.473	-	1.850	1.425	-	0.838	0.732	0.738	2.016	-	1.754	1.475	1.247	1.035	0.719	0.256	0.201	-	-	0.153	-	0.250	0.196	-
DS Flow (m3/s)	0.08610	0.08708	-	0.08806	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.10968	0.11007	-	-	0.11172	-	-	0.11616	-
Node	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Node ID	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ground (m AD)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

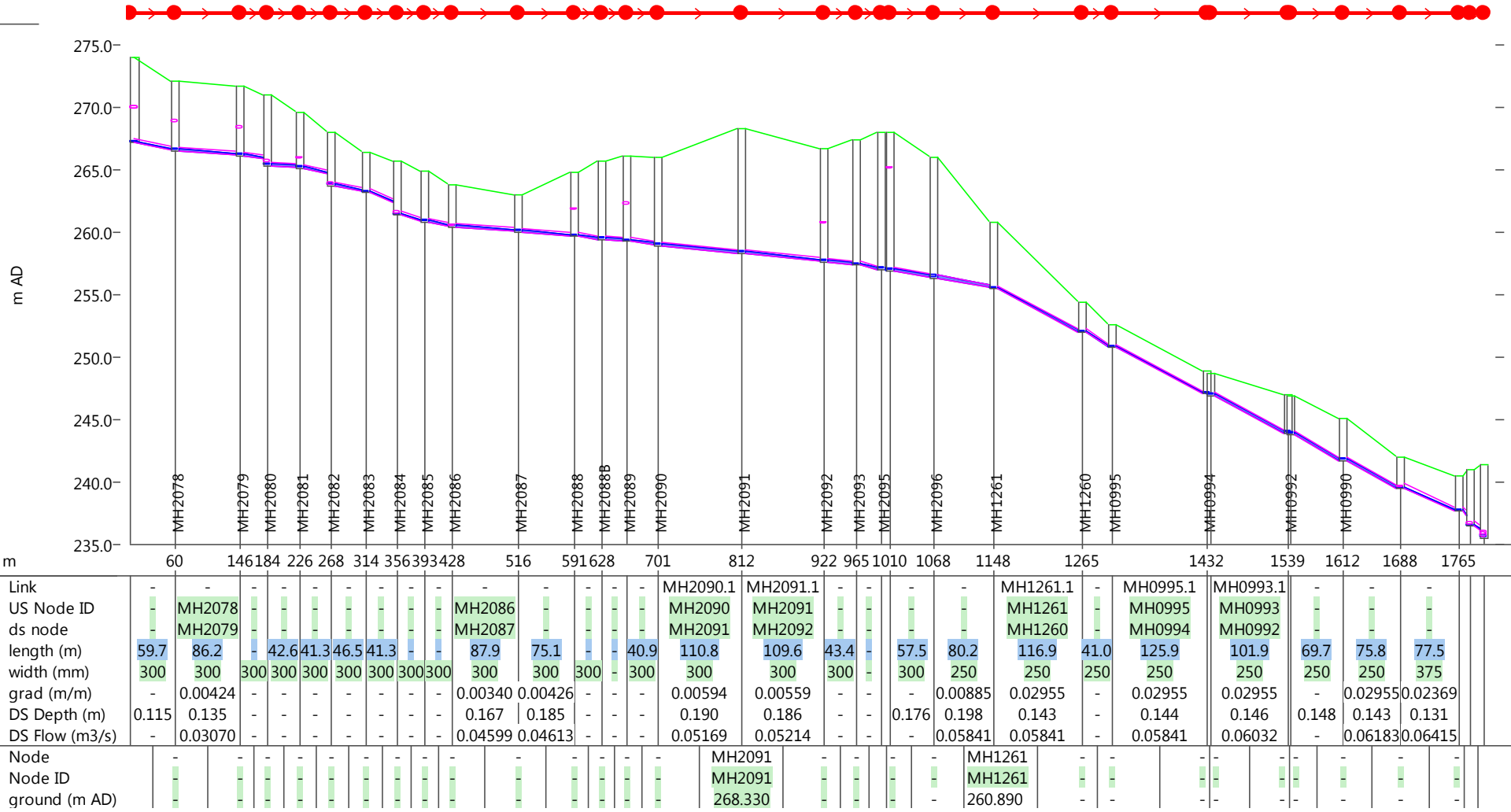
Colter Sub-Trunk



Link	-	-	MH4166.1	MH4167.1	-	-	-	-	-	-	-	MH4175.1	MH4176.1	-	-	-	-	-	-	MH4183.1	-	-
US Node ID	MH4164	-	MH4166	MH4167	MH4168	-	MH4170	-	-	-	-	MH4175	MH4176	MH4177	-	MH4179	MH4180	MH4181	-	MH4183	MH4184	-
ds node	MH4165	-	MH4167	MH4168	MH4169	-	MH4171	-	-	-	-	MH4176	MH4177	MH4178	-	MH4180	MH4181	MH4182	-	MH4184	MH4185	-
length (m)	92.7	59.0	115.3	107.0	101.5	65.0	96.1	64.3	80.7	82.1	69.0	106.7	138.6	87.6	73.5	93.3	88.5	95.6	-	110.4	90.9	79.7
width (mm)	600	600	600	600	600	600	675	675	675	750	750	750	750	750	750	750	750	750	750	750	750	750
grad (m/m)	0.00755	-	0.00668	0.00972	0.00946	-	0.00458	-	0.00359	0.00390	-	0.00328	0.00418	0.00343	-	0.00343	0.00384	0.00439	-	0.00462	0.00418	0.00464
DS Depth (m)	0.249	0.222	0.256	0.230	0.232	0.232	0.270	0.277	0.277	0.269	0.286	0.269	0.269	0.269	0.259	0.269	0.269	0.266	-	0.264	0.269	0.263
DS Flow (m3/s)	0.18690	-	0.18690	0.18690	0.18690	-	0.18690	-	0.19558	0.19558	-	0.19558	0.19558	0.19558	-	0.19558	0.19558	0.19558	-	0.19558	0.19558	0.19558

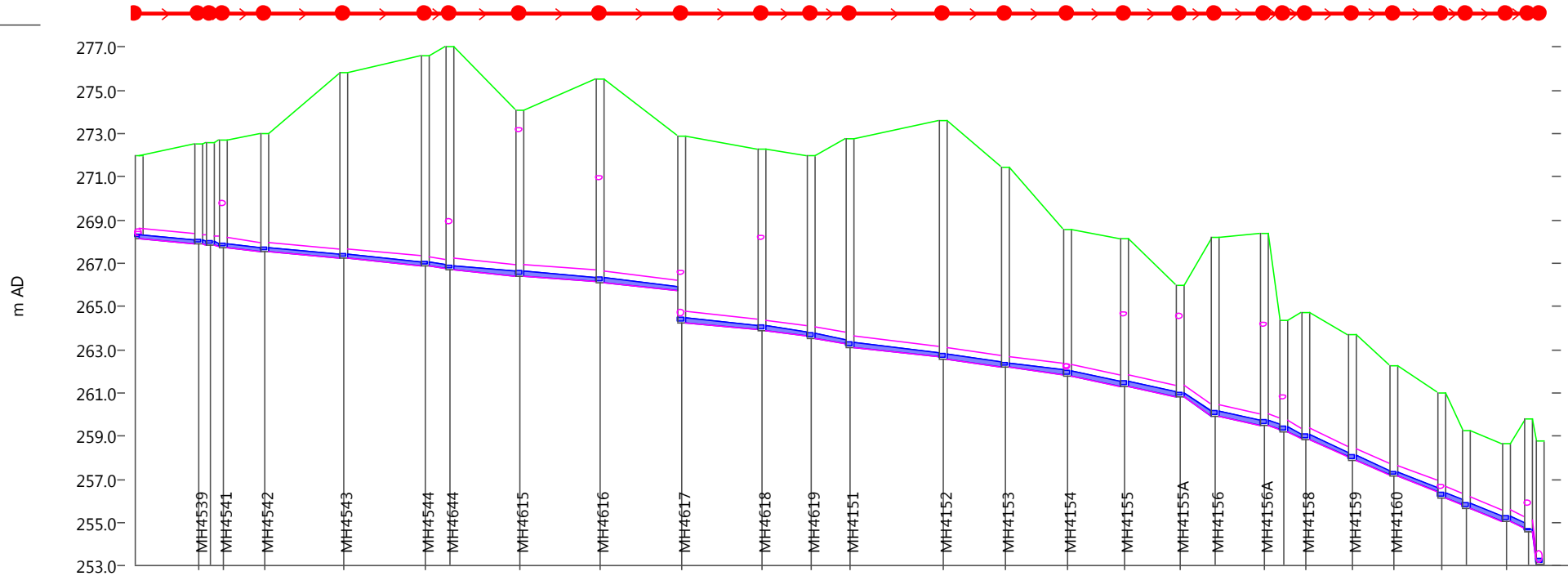
Node	-	-	-	MH4167	MH4168	-	-	-	-	-	-	-	-	MH4176	MH4177	-	-	-	-	-	-	MH4184	-	-
Node ID	-	-	-	MH4167	MH4168	-	-	-	-	-	-	-	-	MH4176	MH4177	-	-	-	-	-	-	MH4184	-	-
ground (m AD)	-	-	-	255.440	258.700	-	-	-	-	-	-	-	-	257.210	247.910	-	-	-	247.320	-	-	244.420	-	-

Davis Drive Sub-Trunk



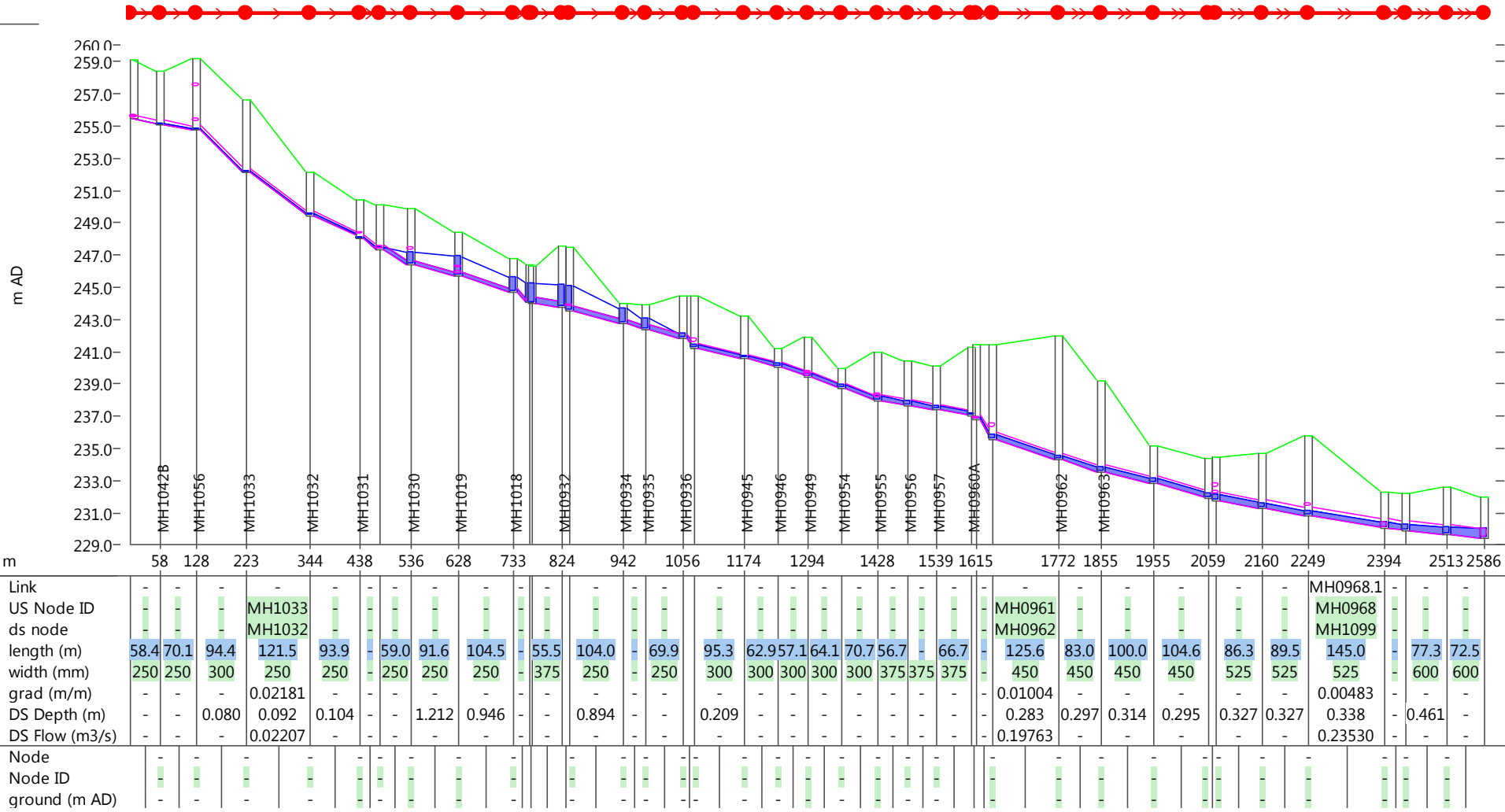
m	60	146	184	226	268	314	356	393	428	516	591	628	701	812	922	965	1010	1068	1148	1265	1432	1539	1612	1688	1765
Link	-	-	-	-	-	-	-	-	-	-	-	-	-	MH2090.1	MH2091.1	-	-	-	-	MH1261.1	-	MH0995.1	MH0993.1	-	-	-
US Node ID	-	MH2078	-	-	-	-	-	-	-	MH2086	-	-	-	MH2090	MH2091	-	-	-	-	MH1261	-	MH0995	MH0993	-	-	-
ds node	-	MH2079	-	-	-	-	-	-	-	MH2087	-	-	-	MH2091	MH2092	-	-	-	-	MH1260	-	MH0994	MH0992	-	-	-
length (m)	59.7	86.2	-	42.6	41.3	46.5	41.3	-	-	87.9	75.1	-	-	110.8	109.6	43.4	-	57.5	80.2	116.9	41.0	125.9	101.9	69.7	75.8	77.5
width (mm)	300	300	300	300	300	300	300	300	300	300	300	300	-	300	300	300	-	300	250	250	250	250	250	250	250	375
grad (m/m)	-	0.00424	-	-	-	-	-	-	-	0.00340	0.00426	-	-	-	0.00594	0.00559	-	-	-	0.00885	0.02955	-	0.02955	0.02955	-	0.02955	0.02369
DS Depth (m)	0.115	0.135	-	-	-	-	-	-	-	0.167	0.185	-	-	-	0.190	0.186	-	-	0.176	0.198	0.143	-	0.144	0.146	0.148	0.143	0.131
DS Flow (m3/s)	-	0.03070	-	-	-	-	-	-	-	0.04599	0.04613	-	-	-	0.05169	0.05214	-	-	-	0.05841	0.05841	-	0.05841	0.06032	-	0.06183	0.06415
Node	-	-	-	-	-	-	-	-	-	-	-	-	-	-	MH2091	-	-	-	-	MH1261	-	-	-	-	-	-	-
Node ID	-	-	-	-	-	-	-	-	-	-	-	-	-	-	MH2091	-	-	-	-	MH1261	-	-	-	-	-	-	-
ground (m AD)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	268.330	-	-	-	-	260.890	-	-	-	-	-	-	-

Doubletree Lane Sub-Trunk



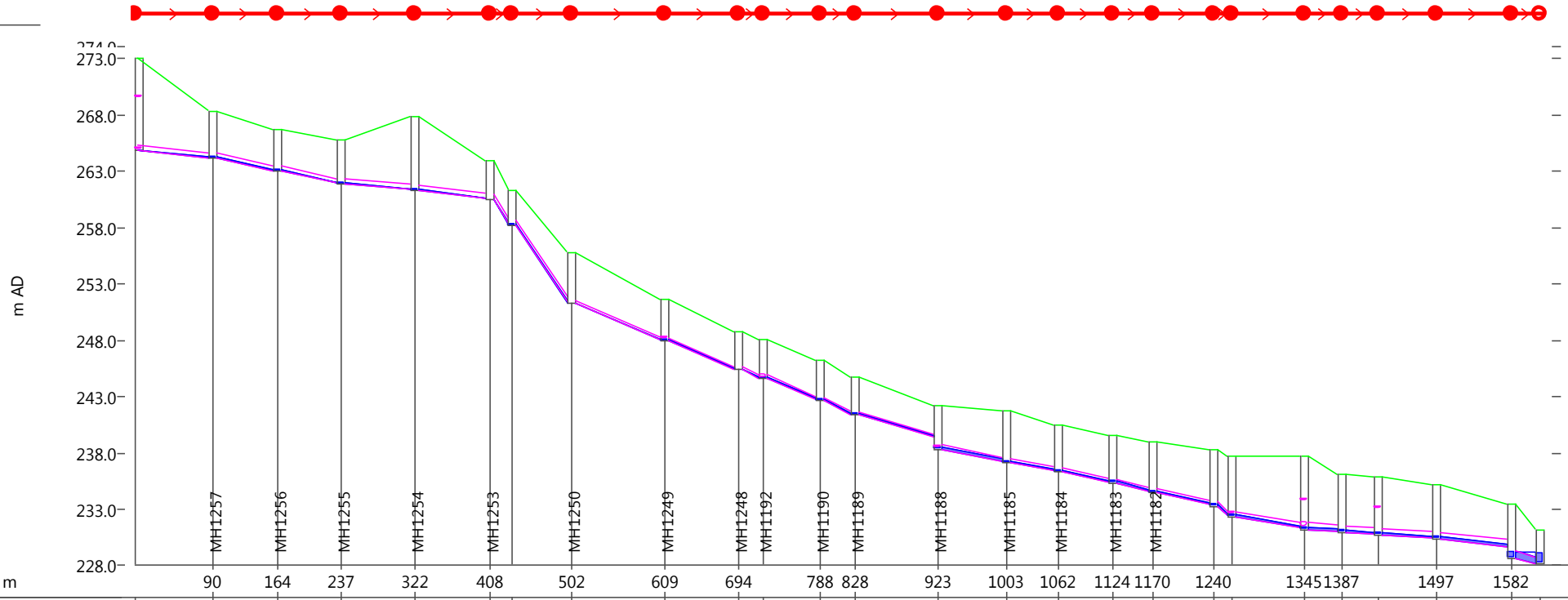
m	79	111	163	261	362	479	580	682	783	843	892	1007	1086	1163	1235	1304	1408	1459	1518	1570	1629	1710
Link	-	-	MH4542.1	MH4543.1	-	-	MH4615.1	MH4616.1	MH4617.1	-	-	MH4151.1	-	-	-	-	-	-	-	-	-	-
US Node ID	MH4538	-	MH4542	MH4543	-	MH4644	MH4615	MH4616	MH4617	-	-	MH4151	-	-	-	-	-	-	-	-	-	-
ds node	MH4539	-	MH4543	MH4544	-	MH4615	MH4616	MH4617	MH4618	-	-	MH4152	-	-	-	-	-	-	-	-	-	-
length (m)	79.3	51.8	98.4	100.6	-	86.7	100.3	102.0	100.8	60.1	49.8	114.9	78.8	77.3	71.2	69.4	42.6	61.7	-	-	59.0	51.9	58.9	-	50.1	-
width (mm)	450	450	450	450	-	525	525	525	525	525	525	525	525	525	525	525	525	525	-	-	525	525	525	-	525	-
grad (m/m)	0.00328	-	0.00295	0.00318	-	0.00334	0.00229	0.00412	0.00327	-	-	0.00383	0.00444	0.00427	-	-	-	-	-	-	-	-	-	-	-	-
DS Depth (m)	0.151	0.185	0.162	0.161	-	0.201	0.182	0.184	0.222	0.222	-	0.222	0.222	0.222	0.224	0.217	-	0.232	-	-	0.202	0.208	0.212	-	0.229	-
DS Flow (m3/s)	0.04704	-	0.05355	0.05410	-	0.07322	0.07508	0.07632	0.11044	-	-	0.11079	0.11079	0.11079	-	-	-	-	-	-	-	-	-	-	-	-
Node	-	-	-	-	MH4543	-	-	MH4615	MH4616	MH4617	-	-	-	MH4152	-	-	-	-	-	-	-	-	-	-	-	-
Node ID	-	-	-	-	MH4543	-	-	MH4615	MH4616	MH4617	-	-	-	MH4152	-	-	-	-	-	-	-	-	-	-	-	-
ground (m AD)	-	-	-	-	275.800	-	-	274.100	275.500	272.900	-	-	-	273.600	-	-	-	-	-	-	-	-	-	-	-	-

East Central Sub-Trunk



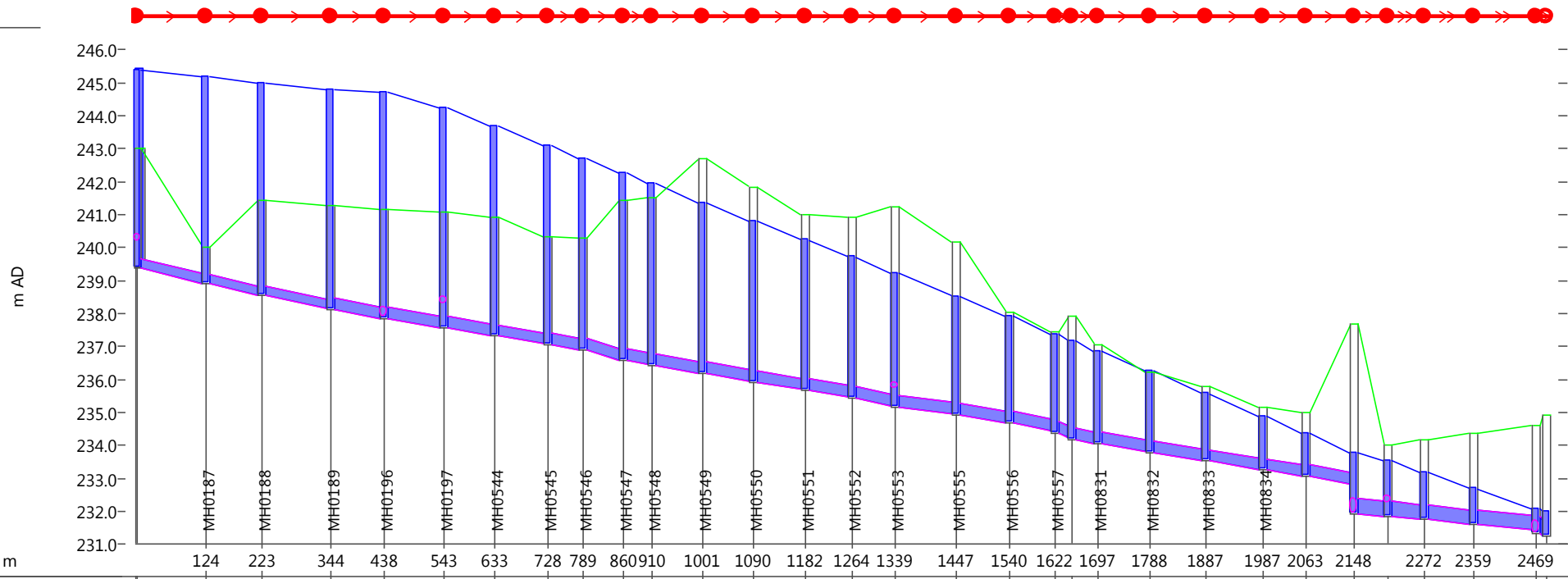
m	58	128	223	344	438	536	628	733	824	942	1056	1174	1294	1428	1539	1615	1772	1855	1955	2059	2160	2249	2394	2513	2586
Link	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	MH0968.1	-	-	-
US Node ID	-	-	-	MH1033	-	-	-	-	-	-	-	-	-	-	-	-	MH0961	-	-	-	-	MH0968	-	-	-
ds node	-	-	-	MH1032	-	-	-	-	-	-	-	-	-	-	-	-	MH0962	-	-	-	-	MH1099	-	-	-
length (m)	58.4	70.1	94.4	121.5	93.9	-	59.0	91.6	104.5	-	55.5	104.0	-	69.9	95.3	62.9	57.1	64.1	70.7	56.7	-	66.7	-	125.6	83.0	100.0	104.6	86.3	89.5	145.0	-	77.3	72.5
width (mm)	250	250	300	250	250	-	250	250	250	-	375	250	-	250	300	300	300	300	300	375	375	375	-	450	450	450	450	525	525	525	-	600	600
grad (m/m)	-	-	-	0.02181	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.01004	-	-	-	-	-	0.00483	-	-	-
DS Depth (m)	-	-	0.080	0.092	0.104	-	-	1.212	0.946	-	-	0.894	-	-	0.209	-	-	-	-	-	-	-	-	0.283	0.297	0.314	0.295	0.327	0.327	0.338	-	0.461	-
DS Flow (m3/s)	-	-	-	0.02207	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.19763	-	-	-	-	-	0.23530	-	-	-
Node	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Node ID	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ground (m AD)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Elgin Street Sub-Trunk



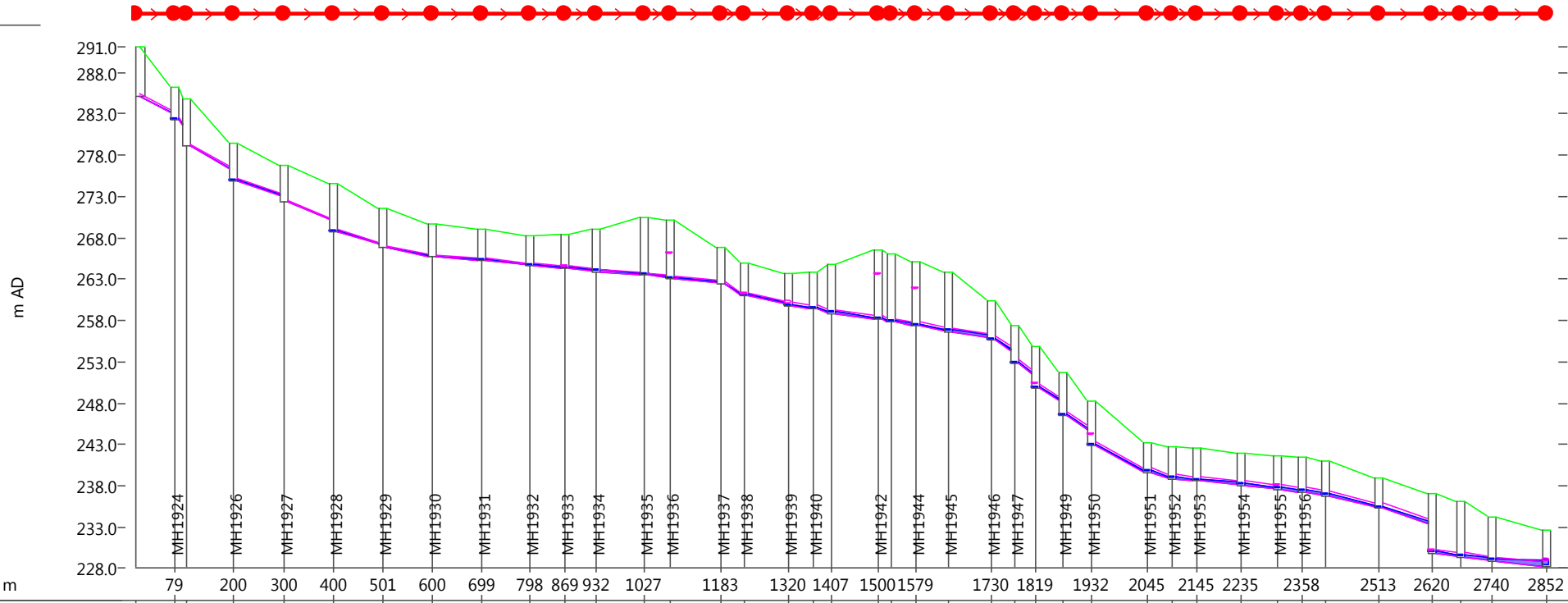
Link	-	-	-	-	-	-	-	MH1250.1	-	-	-	-	MH1189.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
US Node ID	MH1258A	MH1257	MH1256	MH1255	MH1254	-	-	MH1250	MH1249	-	-	-	MH1189	MH1188	-	-	-	-	-	MH1180	-	-	-	MH1171	-		
ds node	MH1257	MH1256	MH1255	MH1254	MH1253	-	-	MH1249	MH1248	-	-	-	MH1188	MH1185	-	-	-	-	-	MH1176	-	-	-	MH1170	-		
length (m)	90.0	74.4	72.3	85.7	85.4	-	67.6	107.2	85.1	-	65.5	40.1	95.0	79.7	59.3	61.9	46.5	69.9	-	83.3	43.0	42.2	67.3	84.9	-		
width (mm)	450	450	450	450	450	-	450	250	250	-	300	300	300	375	375	375	375	375	-	450	600	600	600	600	600		
grad (m/m)	0.00667	0.01512	0.01560	0.00601	0.00888	-	0.10250	0.03013	0.02921	-	-	-	0.02072	0.01342	-	-	-	0.01503	-	0.01189	-	-	0.00431	0.00754	-		
DS Depth (m)	0.075	0.075	0.076	0.083	0.077	-	0.061	0.073	0.075	-	0.151	-	0.169	0.172	0.180	0.167	0.165	0.168	-	0.189	-	-	0.216	0.190	-		
DS Flow (m3/s)	0.01322	0.01386	0.01465	0.01527	0.01610	-	0.01667	0.01730	0.01820	-	-	-	0.08077	0.08353	-	-	-	0.08523	-	0.10739	-	-	0.11298	0.11345	-		
Node	-	-	-	-	MH1254	-	-	MH1250	MH1249	-	-	-	-	MH1188	-	-	-	-	-	-	-	-	-	-	-	-	-
Node ID	-	-	-	-	MH1254	-	-	MH1250	MH1249	-	-	-	-	MH1188	-	-	-	-	-	-	-	-	-	-	-	-	-
ground (m AD)	-	268.320	-	265.790	267.800	-	-	255.730	251.690	-	-	-	-	242.170	-	-	-	-	-	-	-	-	-	-	-	-	-

Holland River Sub-Trunk



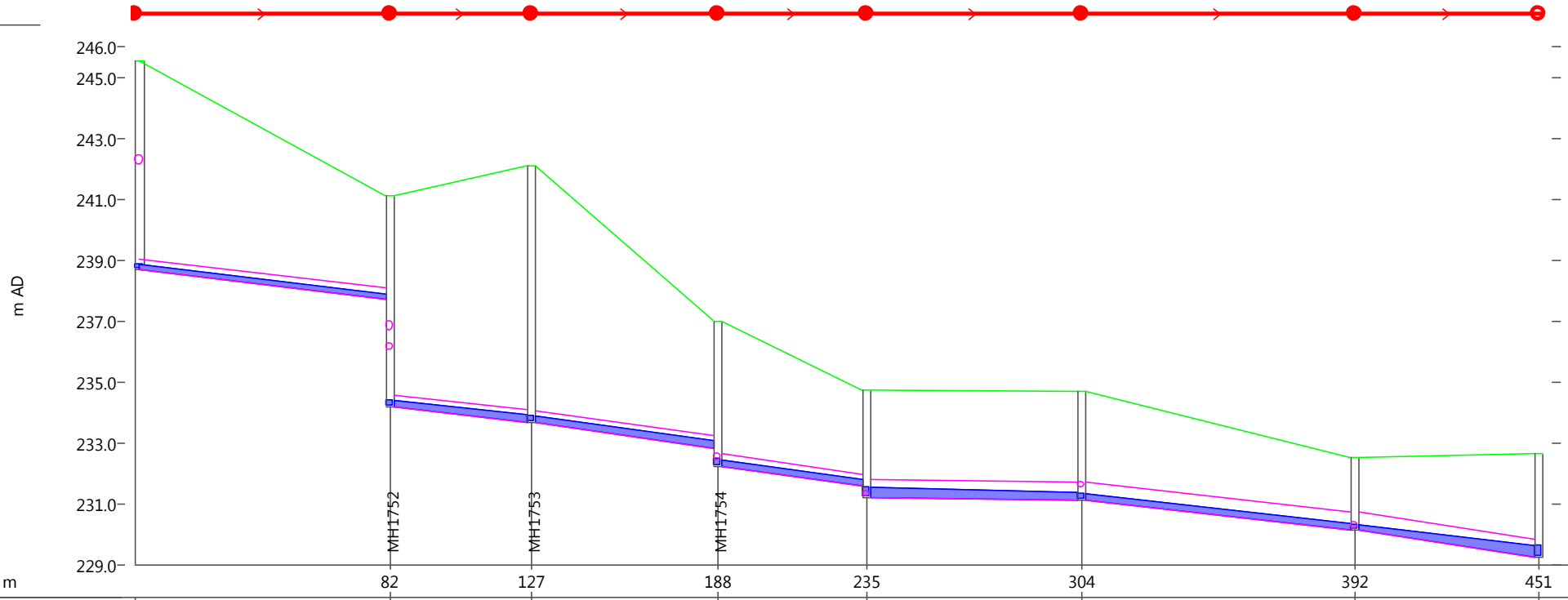
Link	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
US Node ID	MH0186	-	MH0188	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ds node	MH0187	-	MH0189	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
length (m)	119.9	98.8	121.2	93.6	105.8	90.0	94.5	60.5	71.1	-	91.4	88.5	92.1	82.1	75.6	107.4	93.1	81.9	-	-	90.6	99.1	100.1	76.2	85.3	59.2	64.5	86.8	109.7	
width (mm)	300	300	300	350	350	350	350	350	350	350	350	350	350	350	350	350	350	350	-	-	350	350	350	350	350	450	450	450	450	
grad (m/m)	0.00384	-	0.00322	-	0.00255	-	-	-	-	-	-	-	-	-	-	0.00195	-	-	-	-	-	-	-	-	-	-	-	-	0.00137	
DS Depth (m)	6.268	6.473	6.649	6.866	6.671	6.355	6.022	-	5.681	-	5.179	4.862	4.542	4.255	4.027	3.580	3.216	2.911	-	-	2.442	2.036	1.621	1.317	0.941	-	-	1.104	0.638	
DS Flow (m3/s)	0.04009	-	0.04009	-	0.09594	-	-	-	-	-	-	-	-	-	-	0.11715	-	-	-	-	-	-	-	-	-	-	-	-	0.21033	
Node	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Node ID	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ground (m AD)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Leslie Valley Sub-Trunk



m	79	200	300	400	501	600	699	798	869	932	1027	1183	1320	1407	1500	1579	1730	1819	1932	2045	2145	2235	2358	2513	2620	2740	2852
Link	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
US Node ID																											
ds node																											
length (m)	79.3	95.1	100.7	100.1	100.2	99.2	99.3	98.7	70.9	63.2	95.4	-	102.5	-	90.6	-	-	93.3	-	65.4	85.6	-	-	-	-	113.0	-	-	90.5	73.4	-	-	107.8	106.7	-	63.0	112.1
width (mm)	250	250	250	250	250	250	250	250	250	300	300	-	300	-	300	-	-	450	-	450	450	-	-	450	450	450	-	-	525	525	-	-	525	525	525	525	525
grad (m/m)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DS Depth (m)	-	0.039	0.050	0.059	0.069	0.083	0.101	0.101	-	-	0.147	-	0.151	-	0.137	-	-	0.218	-	-	0.222	-	-	-	-	0.162	-	-	0.234	-	-	-	0.191	0.179	-	-	0.681
DS Flow (m3/s)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Node		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Node ID																																					
ground (m AD)		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

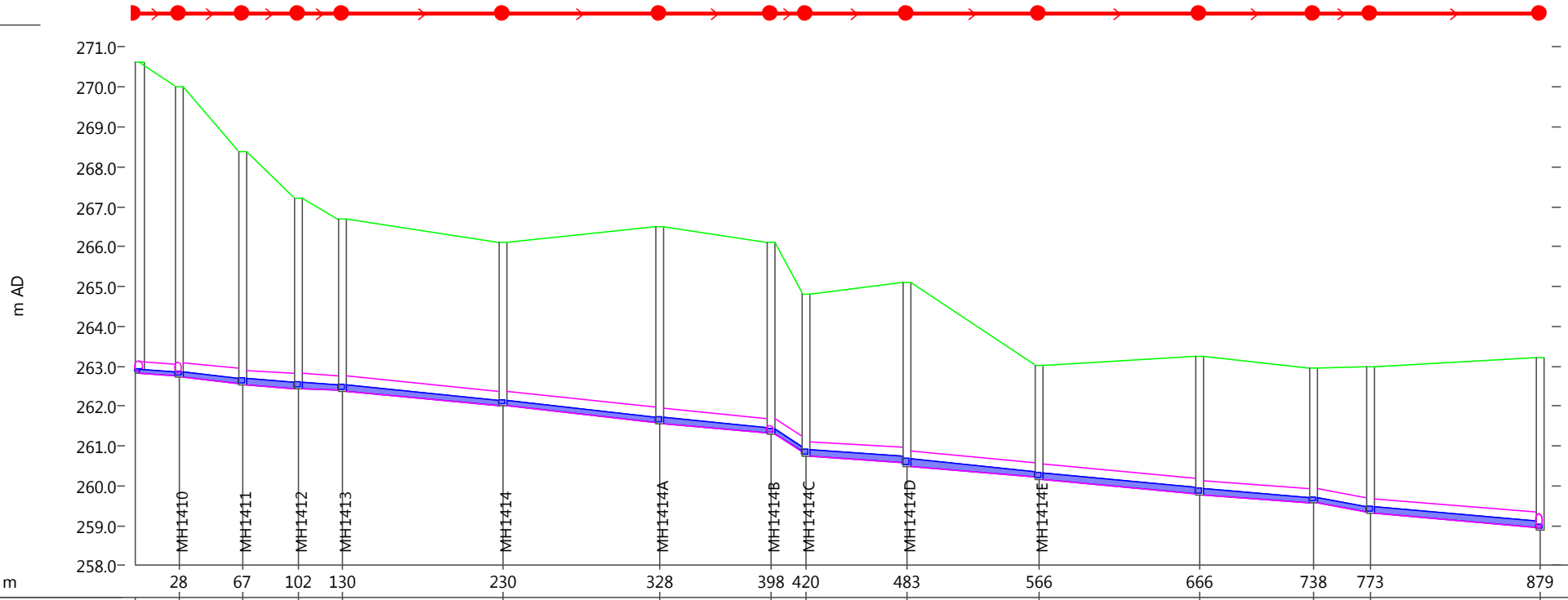
London Road Sub-Trunk



Link	MH1751.1	MH1752.1	MH1753.1	MH1754.1	MH1755.1	MH1756.1	MH1756A.1
US Node ID	MH1751	MH1752	MH1753	MH1754	MH1755	MH1756	MH1756A
ds node	MH1752	MH1753	MH1754	MH1755	MH1756	MH1756A	YR-N15-0053
length (m)	82.4	45.1	60.2	47.8	69.0	87.7	59.2
width (mm)	350	400	400	400	600	600	600
grad (m/m)	0.01153	0.01064	0.01380	0.01361	0.00101	0.01117	0.01520
DS Depth (m)	0.168	0.235	0.221	0.224	0.248	0.206	0.390
DS Flow (m3/s)	0.06908	0.13692	0.13723	0.14004	0.14845	0.14845	0.14896

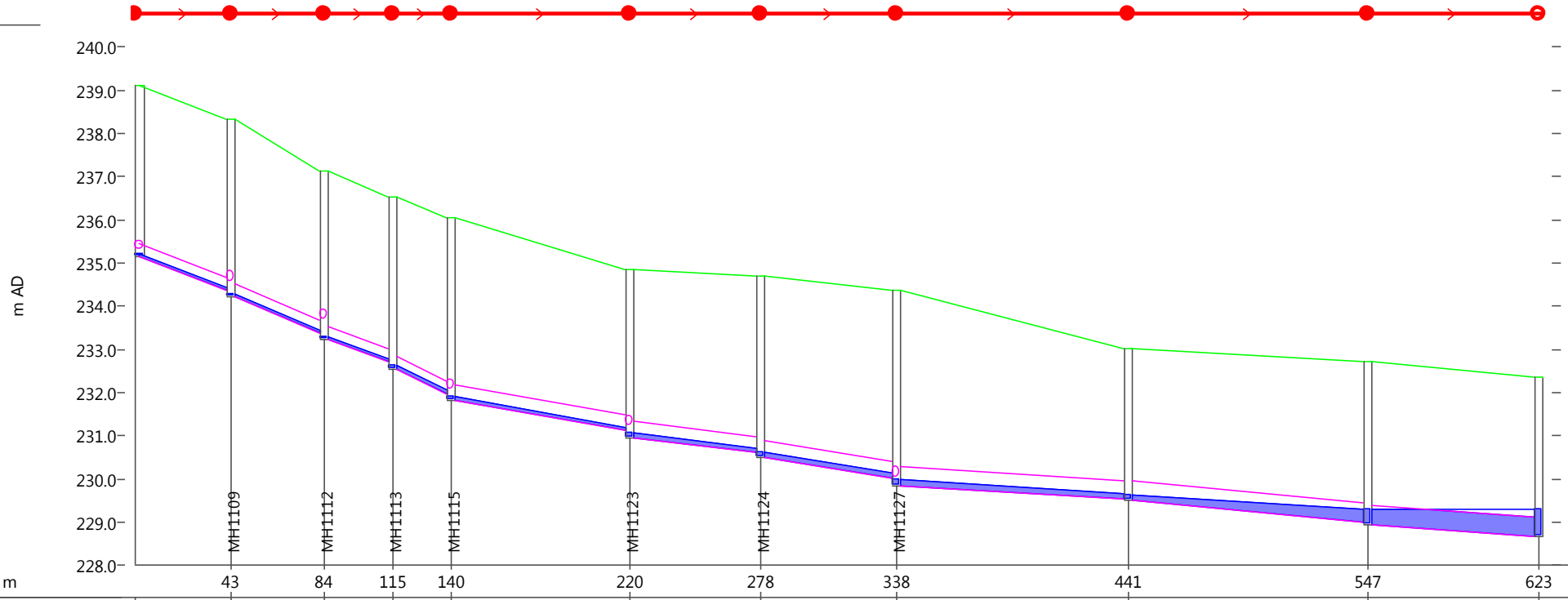
Node	MH1751	MH1752	MH1753	MH1754	MH1755	MH1756	MH1756A	-
Node ID	MH1751	MH1752	MH1753	MH1754	MH1755	MH1756	MH1756A	-
ground (m AD)	245.550	241.140	242.090	236.990	234.760	234.710	232.560	232.670

McCaffery Road Sub-Trunk



Link	-	-	-	-	MH1413.1		MH1414.1		MH1414A.1	-	MH1414C.1	MH1414D.1		MH1414E.1	MH1414F.1	-	MH1414H.1
US Node ID	-	MH1410	-	-	MH1413		MH1414		MH1414A	-	MH1414C	MH1414D		MH1414E	MH1414F	-	MH1414H
ds node	-	MH1411	-	-	MH1414		MH1414A		MH1414B	-	MH1414D	MH1414E		MH1414F	MH1414G	-	MH1479
length (m)	27.9	39.6	34.8	27.6	100.6		98.0		69.9	21.6	63.0	83.1		100.3	71.3	35.7	106.1
width (mm)	300	375	375	375	375		375		375	375	375	375		375	375	375	375
grad (m/m)	-	0.00384	-	-	0.00371		0.00408		0.00329	-	0.00222	0.00337		0.00359	0.00280	-	0.00321
DS Depth (m)	0.119	0.129	0.165	0.133	0.138		0.135		0.135	-	0.148	0.148		0.148	0.148	0.143	0.148
DS Flow (m3/s)	-	0.03188	-	-	0.03383		0.03482		0.03482	-	0.04191	0.04191		0.04191	0.04191	-	0.04191
Node	-	-	-	MH1413		MH1414		MH1414A		-	-	MH1414D		MH1414E	MH1414F	MH1414G	MH1414H	MH1479
Node ID	-	-	-	MH1413		MH1414		MH1414A		-	-	MH1414D		MH1414E	MH1414F	MH1414G	MH1414H	MH1479
ground (m AD)	-	-	-	266.700		266.100		266.500		266.100	264.800	265.110		263.010	263.250	262.950	262.974	263.210

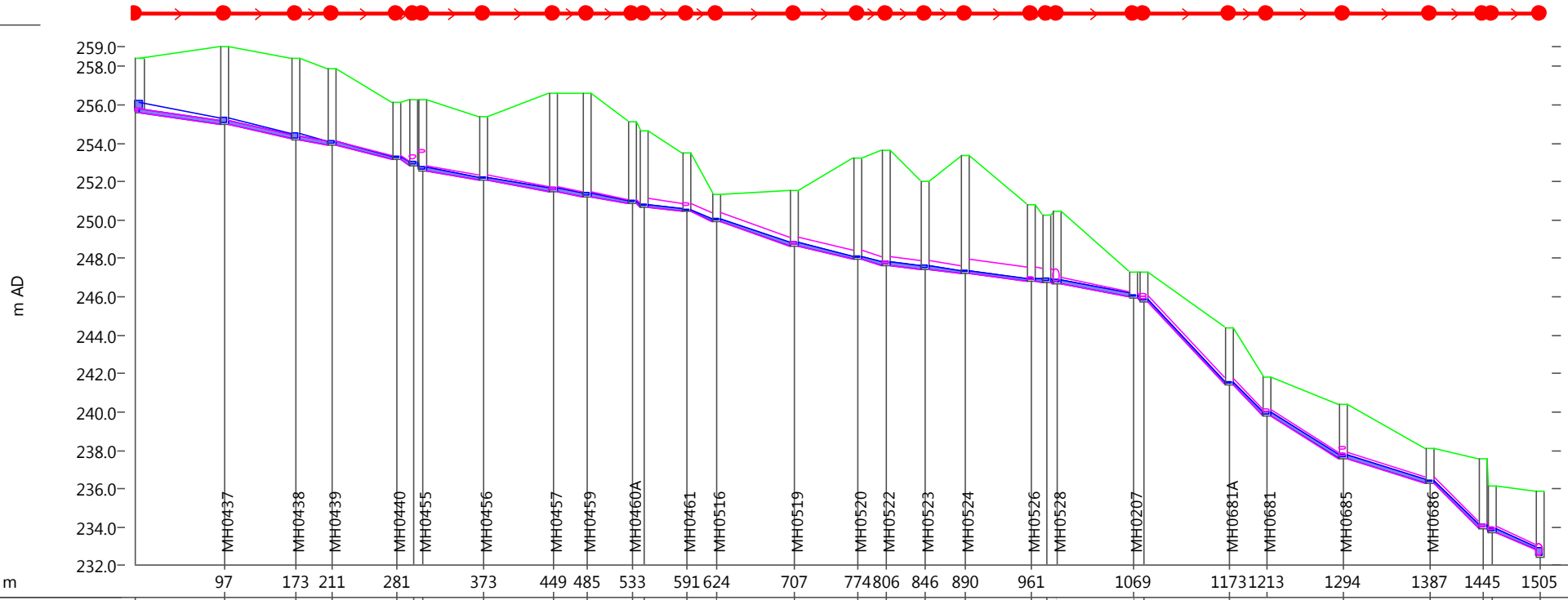
Patterson Road Sub-Trunk



Link	MH1108.1	MH1109.1	-	-	MH1115.1	MH1123.1	MH1124.1	MH1127.1	MH1126.1	MH1125.1
US Node ID	MH1108	MH1109	MH1112	-	MH1115	MH1123	MH1124	MH1127	MH1126	MH1125
ds node	MH1109	MH1112	MH1113	-	MH1123	MH1124	MH1127	MH1126	MH1125	YR-N15-0023
length (m)	43.0	41.3	30.5	25.4	79.4	58.3	60.0	103.2	106.0	75.8
width (mm)	300	300	300	300	375	375	375	450	450	450
grad (m/m)	0.01815	0.02008	0.01705	0.02241	0.00881	0.00600	0.00800	0.00300	0.00472	0.00330
DS Depth (m)	0.063	0.074	0.079	0.074	0.085	0.113	0.107	0.132	0.303	0.610
DS Flow (m3/s)	0.00991	0.01524	0.01625	0.01639	0.01794	0.02663	0.02708	0.03686	0.03686	0.03686

Node	-	MH1109	MH1112	-	MH1115	MH1123	MH1124	MH1127	MH1126	MH1125	-
Node ID	-	MH1109	MH1112	-	MH1115	MH1123	MH1124	MH1127	MH1126	MH1125	-
ground (m AD)	-	238.350	237.130	-	236.070	234.850	234.700	234.390	233.020	232.710	232.380

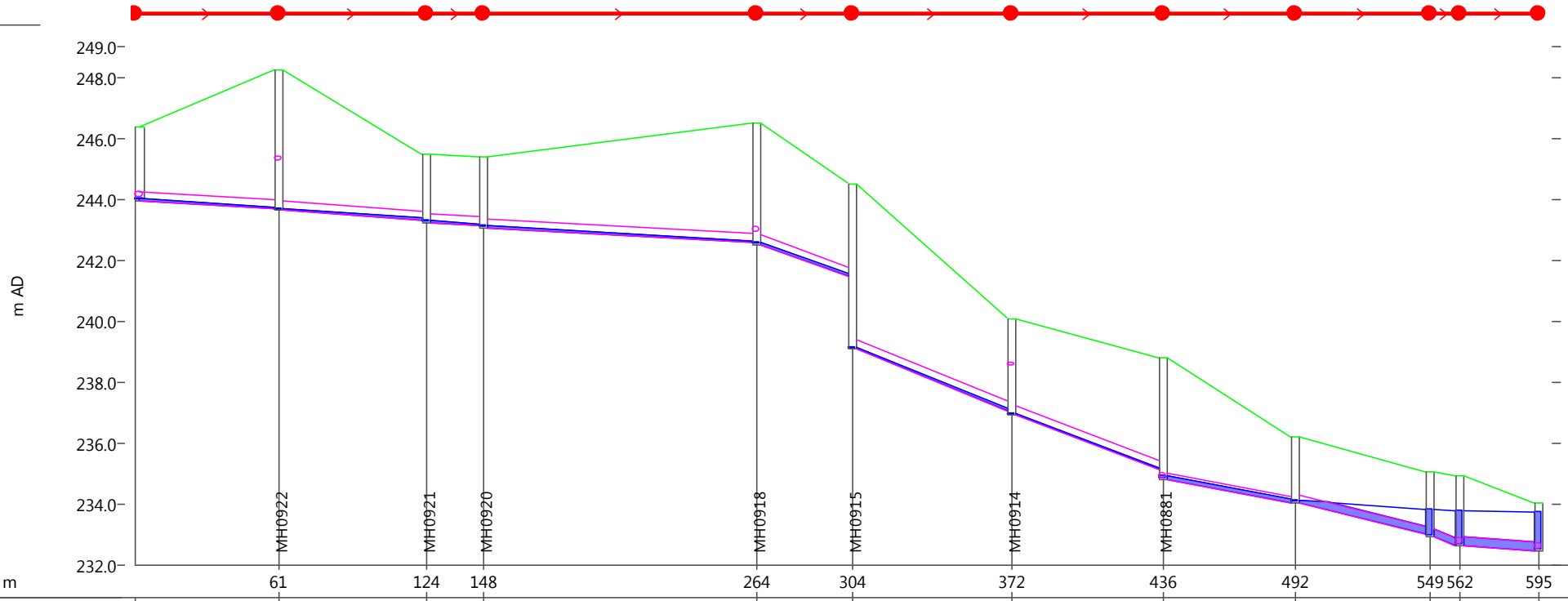
Penn Amelia Sub-Trunk



m: 97, 173, 211, 281, 373, 449, 485, 533, 591, 624, 707, 774, 806, 846, 890, 961, 1069, 1173, 1213, 1294, 1387, 1445, 1505

Link	MH0432.1	-	-	-	-	-	-	-	-	-	-	-	MH0516.1	-	-	-	-	-	MH0528.1	MH0678.1	-	MH0681.1	MH0685.1	-	-
US Node ID	MH0432	MH0437	-	MH0439	-	-	-	MH0456	-	-	-	-	MH0516	MH0519	-	-	-	MH0524	MH0528	MH0678	-	MH0681	MH0685	-	-
ds node	MH0437	MH0438	-	MH0440	-	-	-	MH0457	-	-	-	-	MH0519	MH0520	-	-	-	MH0526	MH0207	MH0681A	-	MH0685	MH0686	-	-
length (m)	96.6	76.4	38.1	69.7	-	65.5	75.2	36.2	48.3	45.5	-	83.5	66.9	-	40.8	43.5	70.9	81.6	91.9	40.1	81.2	93.2	57.5	51.4
width (mm)	200	200	200	200	-	250	250	250	250	450	450	450	450	450	450	450	750	300	300	300	300	300	300	300
grad (m/m)	0.00628	0.00955	-	0.01062	-	0.00748	0.00797	-	-	-	-	0.01513	0.01037	-	-	-	0.00531	0.00870	0.04679	-	0.02735	0.01373	-	-
DS Depth (m)	0.323	0.279	-	0.161	-	0.174	0.184	-	0.174	0.148	-	0.149	0.150	-	-	0.172	0.156	0.203	0.131	-	0.171	0.187	0.172	0.172
DS Flow (m3/s)	0.03016	0.03208	-	0.03440	-	0.04124	0.04201	-	-	-	-	0.05858	0.06172	-	-	-	0.06427	0.07130	0.07328	-	0.07536	0.07707	-	-
Node	-	MH0437	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	MH0685	-	-	-
Node ID	-	MH0437	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	MH0685	-	-	-
ground (m AD)	-	259.000	-	-	-	-	-	-	-	-	-	-	251.523	-	-	-	-	-	-	-	-	240.400	238.080	-	-

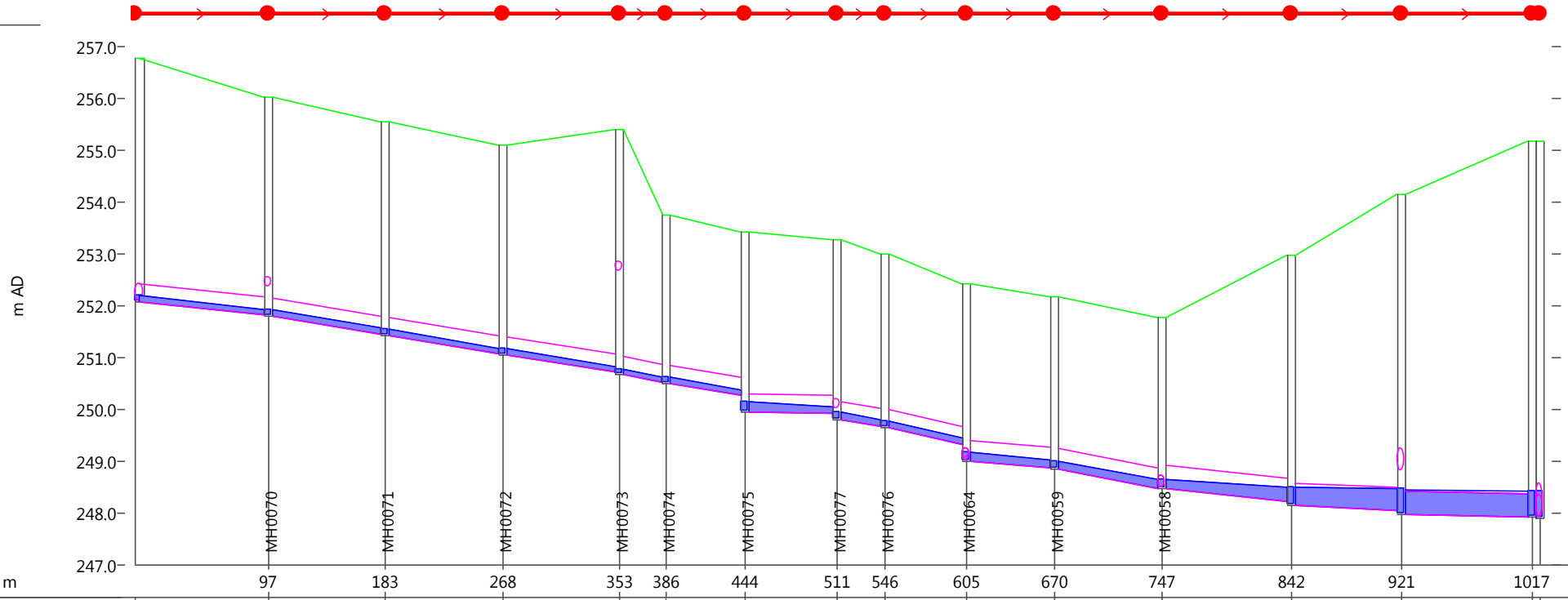
Queen Street Sub-Trunk



Link	MH0923.1	MH0922.1	-	MH0920.1	MH0918.1	MH0915.1	MH0914.1	MH0881.1	MH0875A.1	-	-
US Node ID	MH0923	MH0922	-	MH0920	MH0918	MH0915	MH0914	MH0881	MH0875A	-	MH0828A
ds node	MH0922	MH0921	-	MH0918	MH0915	MH0914	MH0881	MH0875A	MH0875	-	MH0873
length (m)	61.2	62.4	24.3	115.8	40.8	67.6	64.1	55.9	56.9	-	33.3
width (mm)	300	300	300	300	300	300	300	200	250	250	300
grad (m/m)	0.00441	0.00497	-	0.00415	0.02511	0.02975	0.02810	0.01377	0.01791	-	0.00441
DS Depth (m)	0.061	0.063	0.063	0.066	0.055	0.055	0.058	0.101	0.787	-	1.269
DS Flow (m3/s)	0.00608	0.00653	-	0.00716	0.00790	0.00851	0.00943	0.01899	0.02050	-	0.03573

Node	-	MH0922	MH0921	MH0920	MH0918	MH0915	MH0914	MH0881	MH0875A	MH0875	-	-
Node ID	-	MH0922	MH0921	MH0920	MH0918	MH0915	MH0914	MH0881	MH0875A	MH0875	-	-
ground (m AD)	246.400	248.250	245.500	245.400	246.500	244.500	240.100	238.800	236.220	235.100	-	-

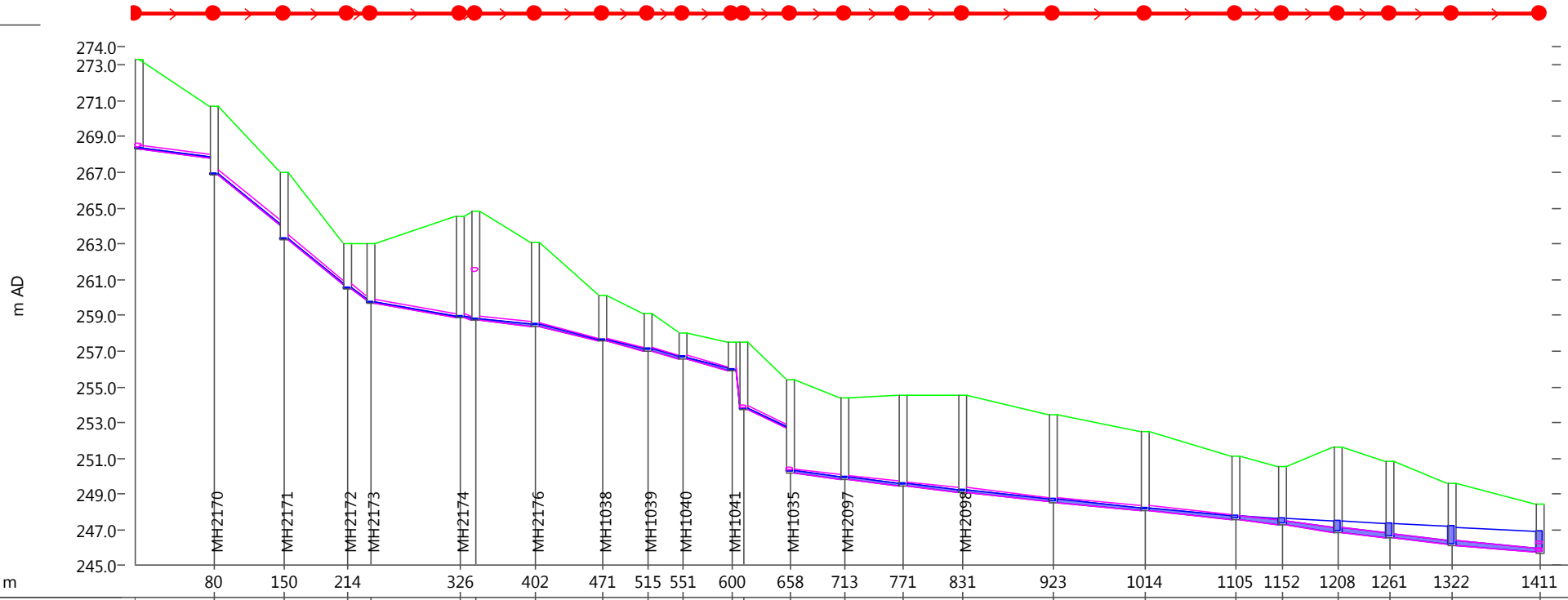
Sanford Street Sub-Trunk



Link	MH0032.1	MH0070.1	MH0071.1	MH0072.1	-	MH0074.1	MH0075.1	-	MH0076.1	MH0064.1	MH0059.1	MH0058.1	MH0303.1	MH0300.1
US Node ID	MH0032	MH0070	MH0071	MH0072	-	MH0074	MH0075	-	MH0076	MH0064	MH0059	MH0058	MH0303	MH0300
ds node	MH0070	MH0071	MH0072	MH0073	-	MH0075	MH0077	-	MH0064	MH0059	MH0058	MH0303	MH0300	MH0294
length (m)	97.4	85.2	85.6	84.6	33.7	57.3	67.6	34.9	58.9	64.4	77.7	94.6	79.4	95.9
width (mm)	350	350	350	350	350	350	350	350	350	400	400	450	450	450
grad (m/m)	0.00254	0.00399	0.00409	0.00390	-	0.00405	0.00036	-	0.00545	0.00186	0.00495	0.00271	0.00126	0.00042
DS Depth (m)	0.102	0.107	0.108	0.109	0.110	0.111	0.111	0.128	0.128	0.142	0.185	0.271	0.425	0.504
DS Flow (m3/s)	0.01932	0.02130	0.02168	0.02198	-	0.02270	0.02300	-	0.03022	0.04027	0.04027	0.05064	0.05092	0.05092

Node	-	MH0070	MH0071	MH0072	MH0073	-	MH0075	-	-	MH0064	MH0059	MH0058	MH0303	MH0300	-
Node ID	-	MH0070	MH0071	MH0072	MH0073	-	MH0075	-	-	MH0064	MH0059	MH0058	MH0303	MH0300	-
ground (m AD)	-	256.030	255.570	255.120	255.420	-	253.440	253.290	-	252.432	252.200	251.786	252.980	254.150	255.180

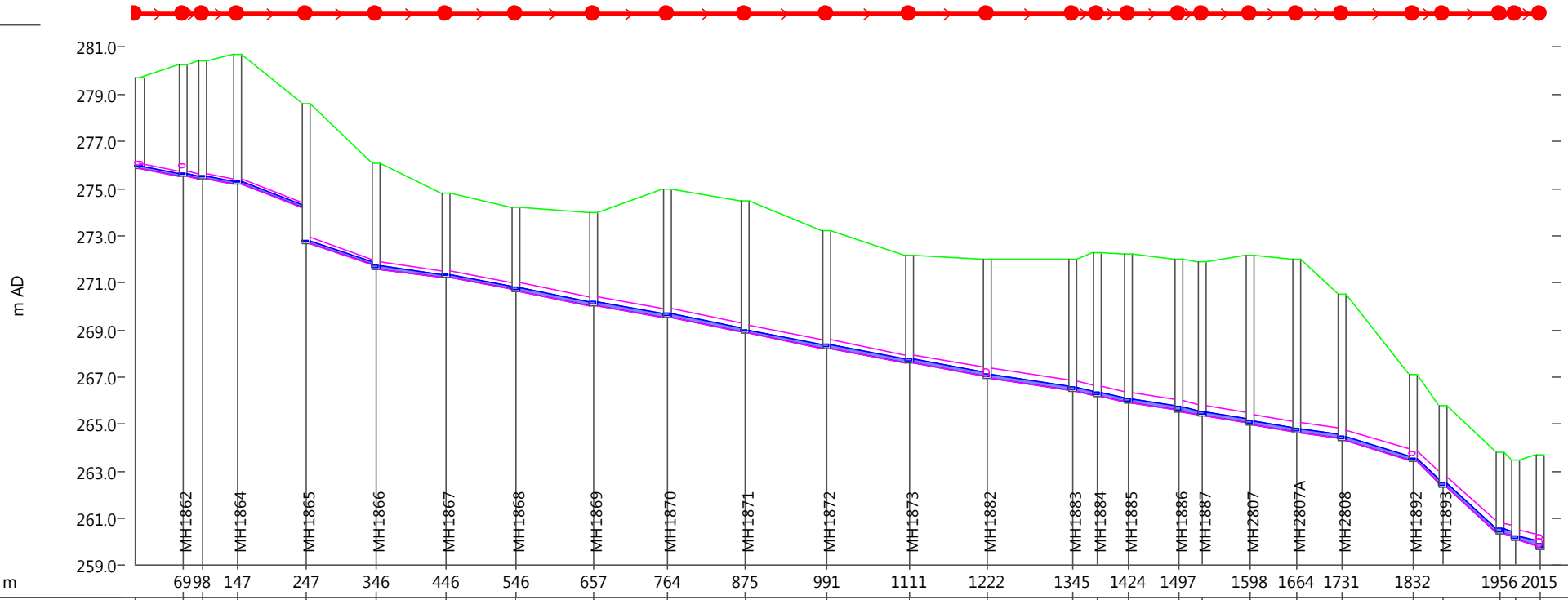
Sparrow Road Sub-Trunk



Link	MH2169.1	-	-	-	MH2173.1	-	-	-	-	-	-	-	-	-	-	MH2098.1	MH2099.1	MH2100.1	-	-	-	-	MH2105.1
US Node ID	MH2169	MH2170	MH2171	-	MH2173	-	MH2176	-	-	-	-	-	-	-	-	MH2098	MH2099	MH2100	-	-	-	-	MH2105
ds node	MH2170	MH2171	MH2172	-	MH2174	-	MH1038	-	-	-	-	-	-	-	-	MH2099	MH2100	MH2101	-	-	-	-	MH1019
length (m)	79.8	70.5	64.1	-	89.2	58.7	68.7	44.9	35.1	49.4	46.1	55.4	58.1	60.0	91.2	91.7	91.0	47.2	55.5	53.0	61.6	88.8	
width (mm)	250	250	250	-	250	250	200	200	200	200	250	250	250	250	250	250	250	250	250	250	250	250	
grad (m/m)	0.00664	0.04041	0.03975	-	0.00875	0.00511	0.01247	-	-	-	-	-	0.00530	0.00579	0.00568	0.00492	0.00529	-	-	-	0.00584	0.00436	
DS Depth (m)	0.102	0.071	0.072	-	0.104	0.119	0.117	0.117	-	0.116	0.100	0.139	0.140	0.153	0.142	0.154	0.200	0.357	0.638	0.786	0.977	1.169	
DS Flow (m3/s)	0.01596	0.01879	0.01879	-	0.01925	0.02119	0.02275	-	-	-	-	-	0.02926	0.02953	0.02992	0.03027	0.03065	-	-	-	0.03162	0.03184	

Node	-	MH2170	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	MH2098	MH2099	MH2100	-	-	-	-	MH2105	-
Node ID	-	MH2170	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	MH2098	MH2099	MH2100	-	-	-	-	MH2105	-
ground (m AD)	-	270.700	267.000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	254.510	253.440	252.530	251.160	-	-	-	249.630	-

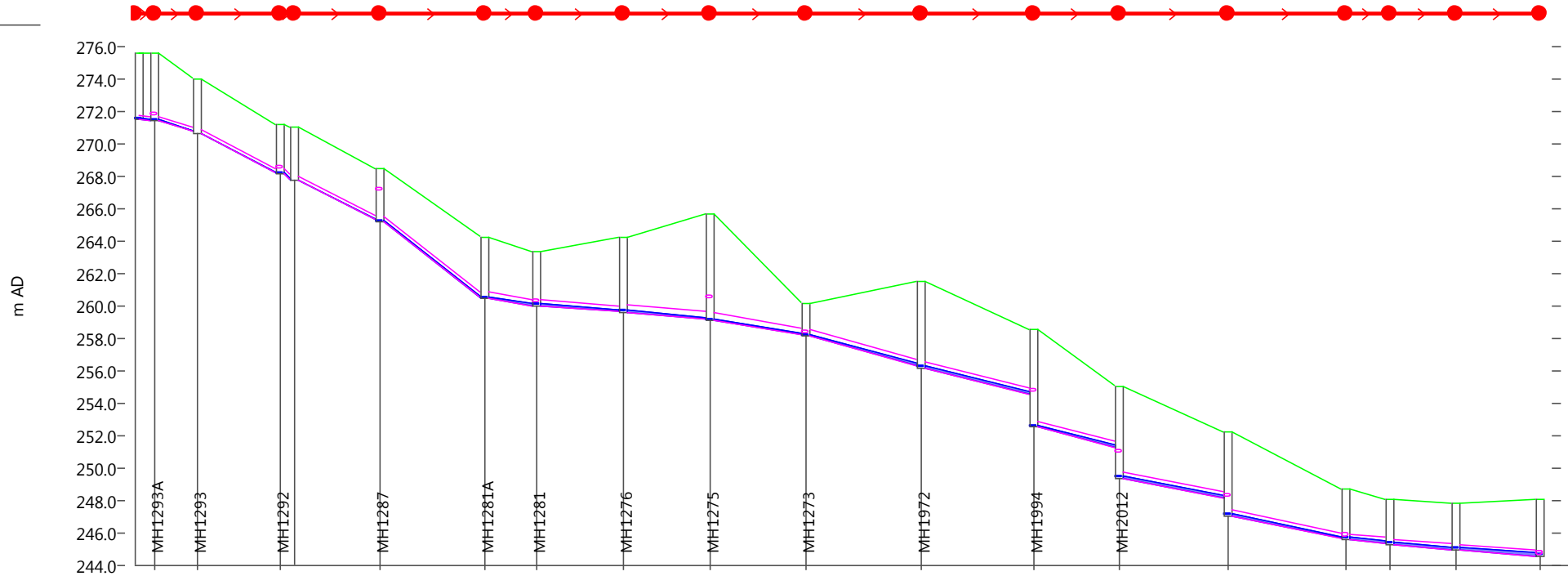
Stellar Drive Sub-Trunk



Link	-	-	-	-	-	-	-	-	MH1868.1	-	MH1870.1	MH1871.1	MH1872.1	MH1873.1	MH1882.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
US Node ID	-	-	-	MH1864	MH1865	MH1866	MH1867	MH1868	MH1869	MH1870	MH1871	MH1872	MH1873	MH1882		-	-	-	-	-	-	-	MH2808	-	-	-	-	-	-	-
ds node	-	-	-	MH1865	MH1866	MH1867	MH1868	MH1869	MH1870	MH1871	MH1872	MH1873	MH1882	MH1883		-	-	-	-	-	-	-	MH1892	-	-	-	-	-	-	-
length (m)	69.4	-	49.0	99.3	99.3	99.8	100.5	110.9	106.6	111.8	115.5	119.9	111.6	122.3	-	44.2	72.4	-	68.1	66.1	66.7	100.6	-	81.7	-				
width (mm)	250	-	250	250	250	300	300	375	375	375	375	375	375	450	-	450	450	-	450	450	450	450	450	450	-				
grad (m/m)	-	-	-	0.01007	0.00906	0.00361	0.00497	0.00532	0.00488	0.00519	0.00546	0.00526	0.00493	0.00392		-	-	-	-	-	-	-	0.00785	-	-	-	-	-	-	-
DS Depth (m)	0.122	-	-	0.108	0.121	0.149	0.140	0.137	0.156	0.153	0.160	0.163	0.159	0.178		-	-	0.181	-	0.181	0.181	0.181	0.161	-	0.129	-				
DS Flow (m3/s)	-	-	-	0.02182	0.02557	0.02857	0.03292	0.03383	0.03477	0.04447	0.04565	0.04717	0.04803	0.06628		-	-	-	-	-	-	-	0.06876	-	-	-	-	-	-	-

Node	-	-	-	-	-	-	MH1868	MH1869	MH1870	MH1871	MH1872	MH1873	MH1882		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Node ID	-	-	-	-	-	-	MH1868	MH1869	MH1870	MH1871	MH1872	MH1873	MH1882		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ground (m AD)	-	-	-	278.600	276.090	274.800	274.200	274.000	275.000	274.500	273.200	272.200	272.000		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

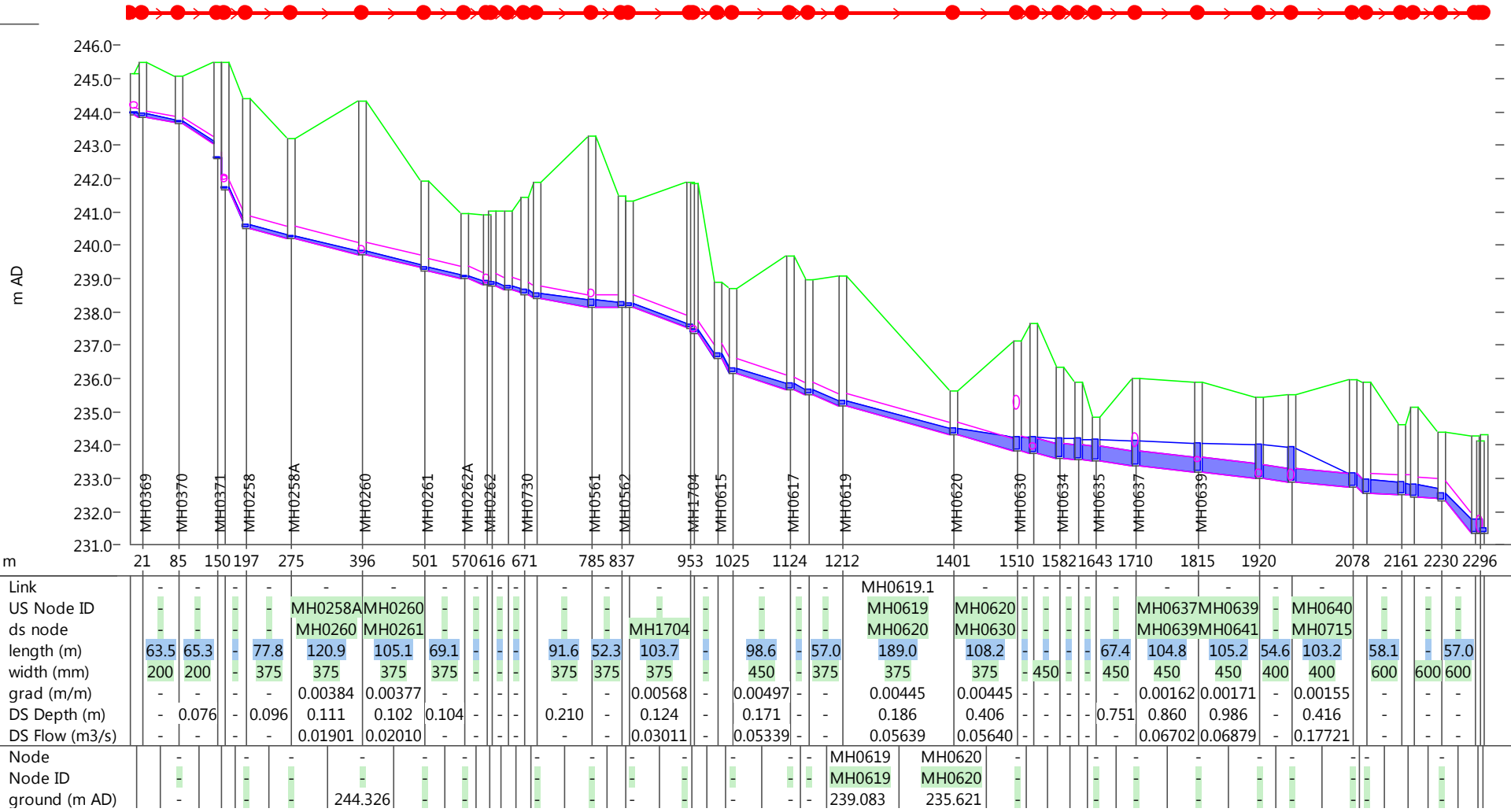
Wayne Drive Sub-Trunk



Link	-	-	MH1293.1	MH1288.1	MH1287.1	-	MH1281.1	MH1276.1	MH1275.1	MH1273.1	MH1972.1	MH1994.1	MH2012.1	MH2023.1	-	-	MH1191.1	
US Node ID	-	-	MH1293	MH1288	MH1287	-	MH1281	MH1276	MH1275	MH1273	MH1972	MH1994	MH2012	MH2023	-	MH2025	MH1191	
ds node	-	-	MH1292	MH1287	MH1281A	-	MH1276	MH1275	MH1273	MH1972	MH1994	MH2012	MH2023	MH2024	-	MH1191	MH1192	
length (m)	-	34.3	65.6	67.2	83.0	40.9	68.7	68.8	75.6	91.3	89.2	66.8	86.3	93.6	34.6	52.3	66.2	
width (mm)	-	250	300	300	300	375	375	450	450	375	375	375	375	375	375	375	350	
grad (m/m)	-	-	0.03663	0.03576	0.05673	-	0.00519	0.00620	0.01234	0.01995	0.01783	0.01847	0.01385	0.01492	-	0.00582	0.00534	
DS Depth (m)	-	0.068	0.059	0.063	0.085	0.107	0.106	0.097	0.103	0.101	0.104	0.119	0.139	0.140	0.177	0.180	0.184	
DS Flow (m3/s)	-	-	0.01150	0.01361	0.01711	-	0.02152	0.02226	0.03023	0.03358	0.03368	0.04691	0.05675	0.05956	-	0.06065	0.06101	

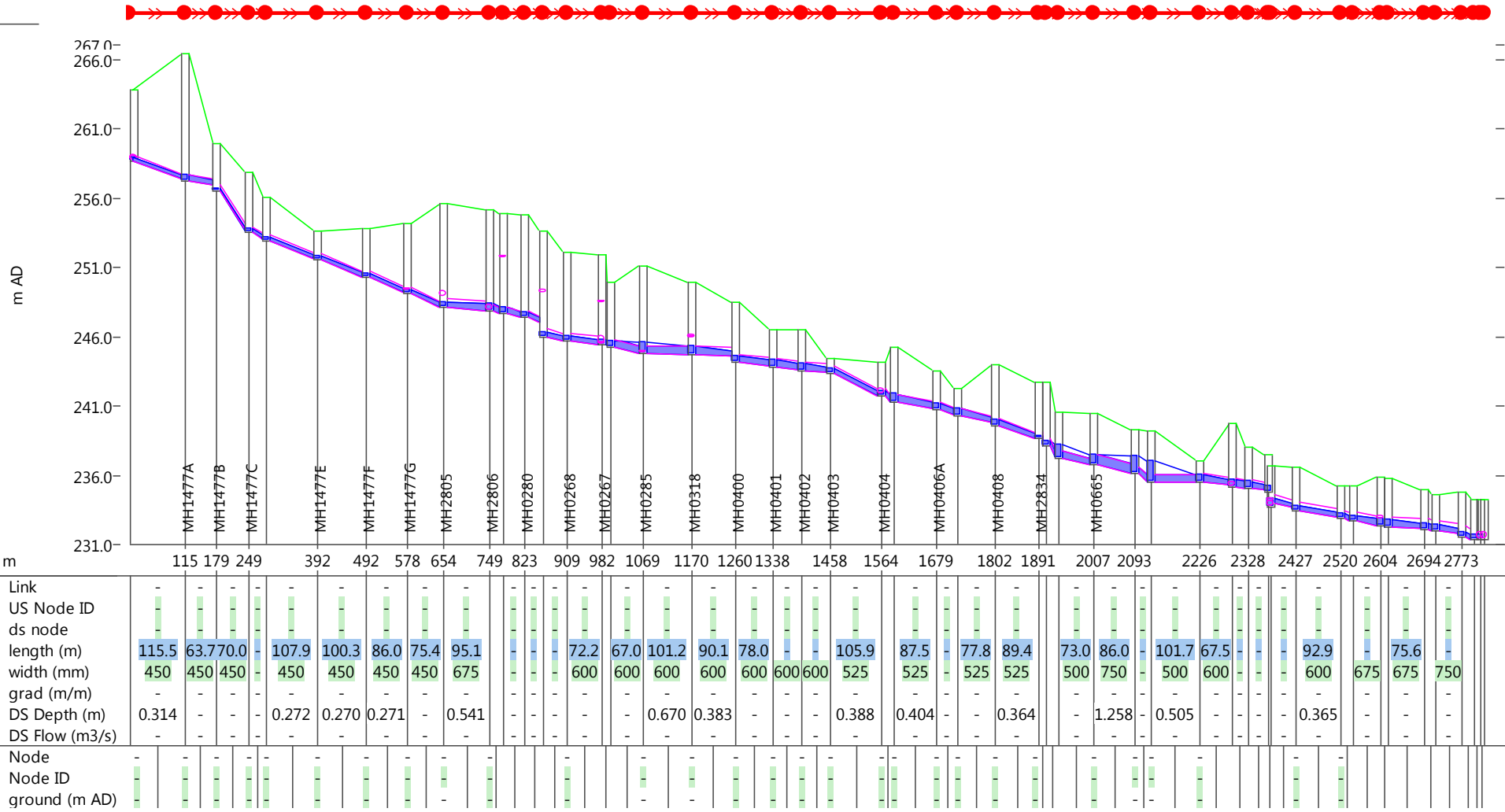
Node	-	-	-	-	MH1287	-	-	MH1276	MH1275	MH1273	MH1972	MH1994	MH2012	MH2023	MH2024	-	MH1191	-
Node ID	-	-	-	-	MH1287	-	-	MH1276	MH1275	MH1273	MH1972	MH1994	MH2012	MH2023	MH2024	-	MH1191	-
ground (m AD)	-	-	-	-	268.530	264.300	263.390	264.290	265.720	260.220	261.590	258.560	255.110	252.240	248.790	-	247.900	-

West Central Sub-Trunk



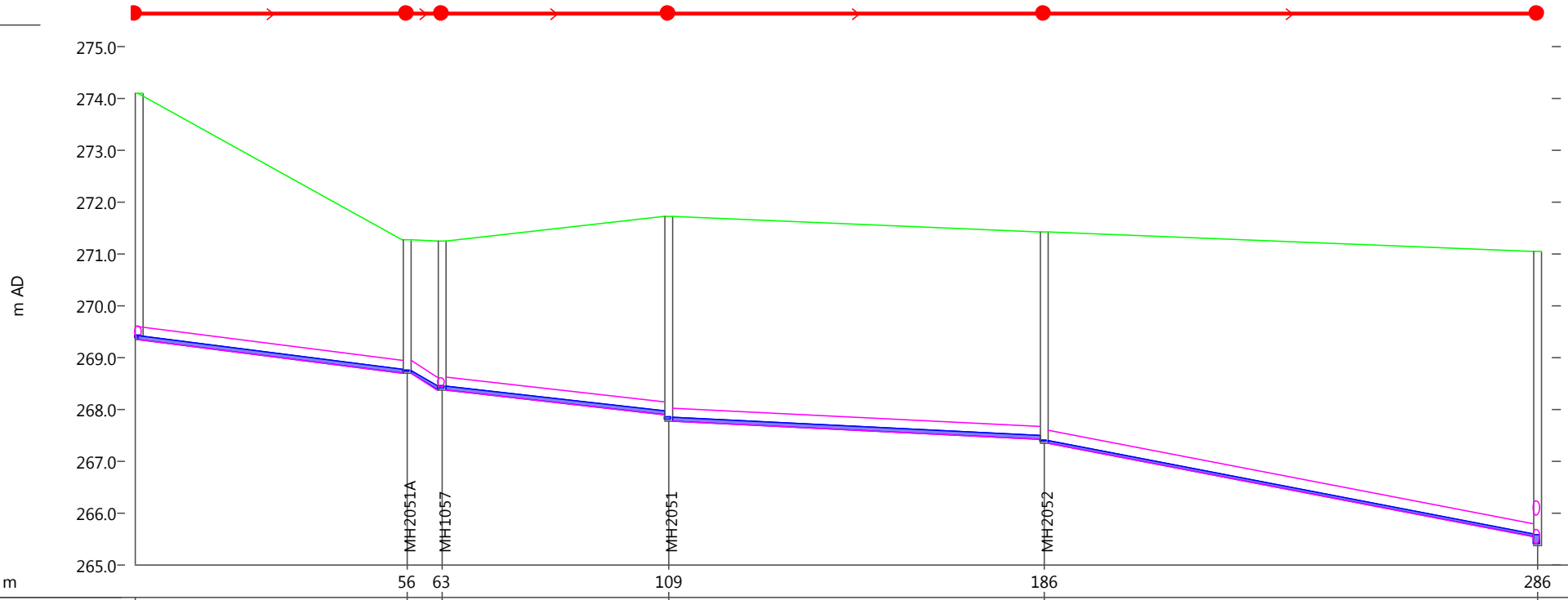
Link	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	MH0619.1	-	-	-	-	-	-	-	-	-	-	-	-	-
US Node ID					MH0258A	MH0260													MH0619	MH0620					MH0637	MH0639		MH0640				
ds node					MH0260	MH0261							MH1704						MH0620	MH0630					MH0639	MH0641		MH0715				
length (m)	63.5	65.3	-	77.8	120.9	105.1	69.1	-	-	-	91.6	52.3	103.7	-	98.6	-	57.0	189.0	108.2	-	-	-	-	67.4	104.8	105.2	54.6	103.2	58.1	-	57.0
width (mm)	200	200	-	375	375	375	375	-	-	-	375	375	375	-	450	-	375	375	375	-	450	-	-	450	450	450	400	400	600	600	600
grad (m/m)	-	-	-	-	0.00384	0.00377	-	-	-	-	-	-	0.00568	-	0.00497	-	-	0.00445	0.00445	-	-	-	-	-	0.00162	0.00171	-	0.00155	-	-	-
DS Depth (m)	-	0.076	-	0.096	0.111	0.102	0.104	-	-	-	0.210	-	0.124	-	0.171	-	-	0.186	0.406	-	-	-	-	0.751	0.860	0.986	-	0.416	-	-	-
DS Flow (m3/s)	-	-	-	-	0.01901	0.02010	-	-	-	-	-	-	0.03011	-	0.05339	-	-	0.05639	0.05640	-	-	-	-	-	0.06702	0.06879	-	0.17721	-	-	-
Node		-		-	-	-	-	-			-	-	-	-	-	-		MH0619	MH0620	-		-	-	-	-	-	-		-		-
Node ID		-		-	-	-	-	-			-	-	-	-	-	-		MH0619	MH0620	-		-	-	-	-	-	-		-		-
ground (m AD)		-		-	-	244.326	-	-			-	-	-	-	-	-		239.083	235.621	-		-	-	-	-	-	-		-		-

Western Sub-Trunk



m	115	179	249	392	492	578	654	749	823	909	982	1069	1170	1260	1338	1458	1564	1679	1802	1891	2007	2093	2226	2328	2427	2520	2604	2694	2773
Link	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
US Node ID	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ds node	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
length (m)	115.5	63.7	70.0	-	107.9	100.3	86.0	75.4	95.1	-	-	-	72.2	67.0	101.2	90.1	78.0	-	-	105.9	87.5	-	77.8	89.4	73.0	86.0	-	101.7	67.5	-	-	-	92.9	-	75.6	-
width (mm)	450	450	450	-	450	450	450	450	675	-	-	-	600	600	600	600	600	600	600	525	525	-	525	525	500	750	-	500	600	-	-	-	600	675	675	750
grad (m/m)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DS Depth (m)	0.314	-	-	-	0.272	0.270	0.271	-	0.541	-	-	-	-	-	0.670	0.383	-	-	-	0.388	0.404	-	-	0.364	-	1.258	-	0.505	-	-	-	0.365	-	-	-
DS Flow (m3/s)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Node	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Node ID	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ground (m AD)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Wildwood Drive Sub-Trunk



Link	MH2051B.1	-	MH1057.2	MH2051.1	MH2052.1	
US Node ID	MH2051B	-	MH1057	MH2051	MH2052	
ds node	MH2051A	-	MH2051	MH2052	MH2080	
length (m)	55.7	7.0	46.2	76.8	100.7	
width (mm)	250	250	250	250	250	
grad (m/m)	0.01174	-	0.01042	0.00444	0.01790	
DS Depth (m)	0.086	-	0.071	0.081	0.066	
DS Flow (m3/s)	0.01501	-	0.00953	0.00986	0.01036	

Node	MH2051B	MH2051A	MH1057	MH2051	MH2052	MH2080
Node ID	MH2051B	MH2051A	MH1057	MH2051	MH2052	MH2080
ground (m AD)	274.103	271.299	271.270	271.740	271.440	271.070

Appendix C

UNIT COST INFORMATION

Town of Newmarket Water and Wastemater Master Plan
Watermain Unit Costs

Land Use	Nom. Pipe Size (mm)	Outer Diameter (m)	Depth to Invert (m)	Minimum Trench Width (m)	Excavation		Bedding		Backfill		Restoration		Pipe Unit Cost ($/m)	Hydrants ($/m)	Service Connections ($/m)	Construction Factor Cost ($/m)	Dewatering ($/m)	Additional Restoration (See Note 7) ($/m)	Subtotal Unit Cost ($/m)	Engineering 10%	Contingency 25%	Total Unit Cost Open Cut ($2015/m)	Tunnelling (including Liner Pipe) ($/m)	Dewatering Unit Cost Tunnel ($/m)	Subtotal Unit Cost Tunnel ($/m)	Engineering 10%	Contingency 20%	Total Unit Cost Tunnel ($2015/m)	Rock Excavation in Trenches ($2015/m)	Hydraulic Rock Excavation ($2015/m)
					Vol. (m3)	Cost ($/m)	Vol. (m3)	Cost ($/m)	Vol. (m3)	Cost ($/m)	Area (m2)	Cost ($/m)																		
Dense Urban	100	0.15	1.95	1.00	2.3	$96	0.4	$18	1.8	$22	0.7	$5	$40		$200	$60	$16	$103	$501	$50.06	$125.16	$501	$4,030	$160	$4,230	$423	$846	$4,230	$85	$25
Dense Urban	150	0.2	2.00	1.00	2.3	$97	0.5	$20	1.8	$22	0.8	$6	$65	$65	$200	$98	$16	$112	$602	$60.18	$150.45	$602	$4,030	$160	$4,255	$426	$851	$4,255	$85	$25
Dense Urban	200	0.25	2.05	1.00	2.4	$97	0.5	$21	1.8	$22	0.9	$6	$105	$65	$200	$158	$16	$121	$653	$65.29	$163.23	$653	$4,030	$160	$4,295	$430	$859	$4,295	$85	$25
Dense Urban	250	0.3	2.10	1.00	2.4	$98	0.5	$22	1.8	$22	1.0	$7	$155	$65	$200	$233	$16	$129	$714	$71.40	$178.49	$714	$4,030	$160	$4,345	$435	$869	$4,345	$85	$25
Dense Urban	300	0.35	2.15	1.10	2.7	$108	0.6	$26	2.0	$24	1.2	$8	$210	$65	$200	$315	$16	$138	$795	$79.54	$198.86	$795	$4,030	$160	$4,400	$440	$880	$4,400	$85	$25
Dense Urban	350	0.42	2.22	1.10	2.8	$109	0.7	$28	2.0	$24	1.3	$9	$240	$65	$200	$360	$16	$150	$841	$84.12	$210.29	$841	$4,030	$160	$4,430	$443	$886	$4,430	$85	$25
Dense Urban	400	0.5	2.30	1.20	3.2	$121	0.8	$32	2.2	$26	1.6	$11	$265	$65		$398	$16	$164	$700	$70.03	$175.07	$700	$4,030	$160	$4,455	$446	$891	$4,455	$85	$25
Dense Urban	450	0.55	2.35	1.25	3.4	$127	0.8	$35	2.3	$28	1.8	$12	$330			$495	$16	$172	$720	$71.99	$179.99	$720	$4,030	$160	$4,520	$452	$904	$4,520	$85	$25
Dense Urban	500	0.6	2.40	1.40	3.9	$143	1.0	$42	2.6	$31	2.0	$14	$400			$600	$16	$181	$827	$82.66	$206.66	$827	$4,030	$160	$4,590	$459	$918	$4,590	$85	$25
Dense Urban	600	0.73	2.53	1.50	4.4	$157	1.1	$48	2.9	$35	2.4	$17	$640			$960	$16	$203	$1,115	$111.48	$278.70	$1,115	$4,030	$160	$4,830	$483	$966	$4,830	$85	$25
Dense Urban	750	0.9	2.70	1.80	5.8	$193	1.5	$65	3.6	$43	3.0	$21	$760			$1,140	$16	$258	$1,357	$135.65	$339.13	$1,357	$4,030	$160	$4,950	$495	$990	$4,950	$85	$25
Dense Urban	900	1.1	2.90	2.30	8.0	$255	2.3	$96	4.8	$57	3.9	$27	$920			$1,380	$16	$293	$1,665	$166.45	$416.13	$1,665	$4,030	$160	$5,110	$511	$1,022	$5,110	$85	$25

Watermain Costing Notes

1. Minimum Trench Width = Outer Diameter (OD) + 2X
   where X = 0.225 m for 300 to 600 mm pipe
   and X = 0.3 m for 750 mm and larger diameter pipe
2. Excavation: use a 1:1 slope above the trench box
   Excavation for 3 m depth to invert, use a 2.4 m trench box
3. Cost of excavation: $42.00/m^3 includes stockpile and disposal of excess material for excavation within trench box
   Cost of bulk excavation: $12.00/m^3 includes stockpile and disposal of excess material for excavation outside of trench box
4. Cost of bedding/pipe surround: $42.50/m^3 includes supply and place of materia
5. Backfill trench: $12.00/m^3 includes replacement of native material and compaction
6. Restoration: $7/m^3 includes topsoil and sod
7. Additional restoration in Dense Urban land use area includes restoration of the road within the trench width (incl. Granular A, Granular B and Asphalt)
8. Pipe cost: PVC for 300 mm watermain and concrete pressure pipe (CPP) for 400 to 1200 mm watermains
9. CPP pipe cost includes 15% above material cost for installation (no additional 15% installation cost applied for the 300 mm PVC pipe)
10. Dewatering costs based on recent construction cost information
11. Liner pipe unit costs based on previous experience for a bore and jack installation
12. Construction Factor: Rural 1.00
13. 1.8m Frost Cover Urban 1.25
    Dense Urb 1.50
14. Hydrant cost based on a $5000 hydrant every 80m = $65/m
15. Service connection cost based on 2 - 19mm copper service (each side of the road) ever 20 m of road at $200/m of service = $200/m

Town of Newmarket Water and Wastemater Master Plan
Gravity Sewer Pipe Installation Unit Costs

Nom. Pipe Size (mm)	Outer Dia. (m)	Depth to Invert (m)	Trench Box Depth (m)	Minimum Trench Width (m)	Excavation		Bedding		Backfill		Restoration (see note 6)		Additional Restoration (see note 7)	Sewer Pipe Type (Concrete or PVC)	Sewer Pipe Unit Cost ($/m)	Precast Manholes Unit Cost ($/m)	Dewatering Open Cut Unit Cost ($/m)	Open Cut Unit Cost (installed) ($/m)	Engineering & Contingency Open Cut 0.2	Open Cut Total Cost (2015$)	Dewatering Tunnel Unit Cost ($/m)	Tunnelling Unit Cost (installed) ($/m)	Engineering & Contingency Tunnel 20%	Tunnelling Total Cost (2015$)	2015 Cost of Pipe/m 10% tunneling 90% open cut	2015 Cost of Pipe/m 10% tunneling 90% open cut	Rock Excavation in Trenches ($/m)	Hydraulic Rock Excavation ($/m)
					Vol. (m^3)	Cost ($/m)	Vol. (m^3)	Cost ($/m)	Vol. (m^3)	Cost ($/m)	Area (m^2)	Cost ($/m)																
150	0.3	3.0	2.4	0.8	3.4	$93	0.4	$17	2.9	$34	2.6	$18	$112	PVC	$60	$32	$16	$365	$91	$456	N/A	N/A	N/A	N/A	$456	$464	$85	$25
200	0.3	3.0	2.4	0.8	3.4	$135	0.4	$17	2.9	$34	2.6	$18	$121	PVC	$100	$32	$16	$455	$114	$569	N/A	N/A	N/A	N/A	$569	$579	$85	$25
250	0.3	3.0	2.4	0.8	3.4	$135	0.4	$17	2.9	$34	2.6	$18	$129	PVC	$155	$32	$16	$519	$130	$648	N/A	N/A	N/A	N/A	$648	$660	$85	$25
250	0.3	5.0	2.4	0.8	12.8	$519	0.4	$17	12.3	$148	6.7	$47	$129	PVC	$220	$32	$16	$1,080	$270	$1,351	N/A	N/A	N/A	N/A	$1,351	$1,375	$85	$25
300	0.4	3.0	2.4	0.9	3.8	$152	0.5	$22	3.1	$37	2.7	$19	$138	PVC	$220	$32	$16	$616	$154	$770	N/A	N/A	N/A	N/A	$770	$784	$85	$25
375	0.5	2.0	2.4	1.0	2.3	$91	0.6	$25	1.5	$17	0.8	$5	$157	PVC	$220	$32	$16	$558	$140	$698	N/A	N/A	N/A	N/A	$698	$711	$85	$25
375	0.5	3.0	2.4	1.0	4.1	$163	0.6	$25	3.2	$39	2.8	$19	$157	PVC	$245	$32	$16	$677	$169	$847	N/A	N/A	N/A	N/A	$847	$862	$85	$25
375	0.5	4.0	2.4	1.0	7.8	$318	0.6	$25	7.0	$84	4.8	$33	$157	PVC	$245	$32	$16	$877	$219	$1,096	N/A	N/A	N/A	N/A	$1,096	$1,116	$85	$25
375	0.5	7.8	2.4	1.0	39.8	$1,621	0.6	$25	39.0	$468	12.3	$86	$157	PVC	$245	$32	$16	$2,564	$641	$3,205	N/A	N/A	N/A	N/A	$3,205	$3,263	$85	$25
450	0.6	4.0	4.8	1.0	4.7	$188	0.6	$27	3.8	$45	0.0	$14	$173	PVC	$265	$64	$16	$778	$194	$972	$160	$4,455	$891	$5,346	1,410	$1,435	$85	$25
450	0.6	5.0	4.8	1.0	5.7	$230	0.6	$27	4.8	$58	2.0	$14	$173	PVC	$265	$64	$16	$832	$208	$1,041	$160	$4,455	$891	$5,346	1,471	$1,498	$85	$25
525	0.7	5.0	4.8	1.1	6.2	$249	0.7	$31	5.1	$61	2.1	$15	$181	PVC	$450	$64	$16	$1,052	$263	$1,315	$150	$4,630	$926	$5,556	1,739	$1,771	$85	$25
600	0.8	5.0	4.8	1.2	6.7	$268	0.8	$35	5.4	$65	2.2	$15	$204	Concrete	$145	$64	$16	$796	$199	$995	$150	$4,325	$865	$5,190	1,414	$1,440	$85	$25
675	0.9	5.0	4.8	1.5	7.9	$318	1.1	$47	6.3	$75	2.5	$17	$231	Concrete	$220	$64	$16	$971	$243	$1,214	$150	$4,400	$880	$5,280	1,621	$1,650	$85	$25
750	0.9	5.0	4.8	1.5	8.4	$337	1.2	$52	6.5	$78	2.5	$18	$259	Concrete	$290	$72	$16	$1,104	$276	$1,380	$150	$4,470	$894	$5,364	1,778	$1,811	$85	$25
825	1.0	5.0	4.8	1.6	8.9	$356	1.3	$57	6.7	$81	2.6	$18	$276	Concrete	$340	$72	$16	$1,198	$299	$1,497	$150	$4,520	$904	$5,424	1,890	$1,924	$85	$25
900	1.1	5.0	4.8	1.7	9.4	$375	1.5	$62	6.9	$83	2.7	$19	$293	Concrete	$410	$72	$16	$1,311	$328	$1,639	$150	$4,590	$918	$5,508	2,026	$2,063	$85	$25
975	1.2	5.0	4.8	1.8	9.8	$395	1.6	$67	7.1	$85	2.8	$20	$306	Concrete	$445	$72	$16	$1,387	$347	$1,734	$150	$4,625	$925	$5,550	2,115	$2,154	$85	$25
1050	1.3	5.0	4.8	1.9	10.3	$414	1.7	$73	7.3	$87	2.9	$20	$320	Concrete	$510	$110	$16	$1,530	$382	$1,912	$150	$4,690	$938	$5,628	2,284	$2,325	$85	$25
2x3 box	3.0	6.0	6.0	3.6	22.8	$912	4.8	$204	10.9	$131	21.6	$151	$320	Concrete	$4,889	$220	$16	$6,691	$1,673	$8,364	$150	$9,069	$2,267	$11,336	8,661	$8,819	$85	$25

Gravity Sewer Costing Notes

1. Minimum Trench Width = Outer Diameter (OD) + 2X,
   where X = 0.225 m for 150 to 600 mm pipe
   X = 0.300 m for 675 to 1050 mm pipe
2. Excavation: use a 1:1 slope above the trench box(es)
   Excavation: for 2 - 4 m depth to invert, use a 2.4 m trench box, for 5 - 6 m depth to invert, use two (2) 2.4 m trench boxes
3. Cost of excavation: $40.00/$m^3$ includes stockpile and disposal of excess material for excavation within trench box.
   Cost of bulk excavation: $12.00/$m^3$ includes stockpile and disposal of excess material for excavation outside of trench box.
4. Cost of bedding/pipe surround - $42.50 /m3 includes supply and place
5. Backfill trench: $12 / m3 includes replacement of native material and compaction
6. Restoration: $7.00 /m2 includes topsoil and sod only
7. Additional Road Resoration within Trench width (includes Granular A, B and Asphalt)
8. Reinforced concrete pipe costs assume Class IV pipe for 2 - 4 m depth to invert and Class V pipe for 5 - 8 m depth to invert
9. Manholes: 1200 mm manhole for 450 to 675 mm pipe, 1500 mm manhole for 750 to 975 mm pipe, 1800 mm manhole for 1050 to
10. Dewatering costs based on recent construction cost information
11. Open Cut Unit Cost based on excavation, bedding, backfill, restoration, pipe cost, manholes and dewatering
12. Tunnelling/installation includes casing pipe and augering for 450 to 900 mm sewer pipe and hand mining for 975 to 1050 mm sewer pipe
    Tunnelling unit cost based on pipe cost, manholes, dewatering and tunnelling/installation
13. 2m x 3m box culvert calculated based on 30% contingency

Project ID	Street Name	Length (m)	Proposed Diameter (mm)	Unit Cost ($/m)	Estimated Project Cost
W1	Bristol Road	1680	300	$795	$1,340,000
W2	Main Street North	15	300	$795	$20,000
W3	George Street	657	200	$653	$430,000
W4	Willow Lane	120	250	$714	$90,000
W5	Huron Heights Drive	185	200	$653	$120,000
W6	Willstead Srive	481	200	$653	$310,000
W7	Queen Street	390	200	$653	$260,000
W8	Parkside Drive	130	200	$653	$90,000
W9	Calgain Rd	95	200	$653	$60,000
W10	Lorne Avenue	135	200	$653	$90,000
W11	Charles Street	330	200	$653	$220,000
W12	Glenway circle	540	200	$653	$350,000
W13	Millard Avenue	400	200	$653	$260,000
	Capital Cost to Provide Servicing				**$3,640,000**

Alternative Costing
Cherrywood/Penn and Amelia Sub Trunks

Option	Description	Length	Diameter	Average Depth of Cover (m)	Pumping Station Capacity (L/s)	Unit Cost Sewer	Unit Cost ($/m) ($/m³ for storage)	Pumping Station cost	Open CutCost ($)	Tunnel Cost	Total Cost
1	New sewer on Yonge Street from Upper Canada Mall to Northwest Sub Trunk at Stiver Drive	855	375	8	-	$3,205			$2,740,275		
	Option 1 Total Estimated Cost										**$2,740,275**
2	New pumping Station (117 L/s) and 855m forcemain along Yonge Street	855	375	2	$117	$700		$5,000,000	$598,500		
	Option 2 Total Estimated Cost										**$5,598,500**
3	Replace existing Cherrywood/Penn Sub Trunk with new 450mm diameter sewer	2,000	450	4	-		$1,041		$2,082,000		
	Option 3 Total Estimated Cost										**$2,083,041**
4	Replace existing sewer on the Penn/Amelia Sub trunk between Yonge Street and Penn Avenue with 375mm diameter sewer and between Hillview Drive and the connection to the York Region Trunk (split flows - 70% to Penn/Amelia and 30% to Cherrywood/Penn)	1,092	450	4	-	$1,051			$1,147,692		
		308	375	4		$1,096			$337,568		
	Option 4 Total Estimated Cost										**$1,485,260**
5	Replace existing sewer on Penn/ Amelia Sub trunk between Yonge Street and Penn Drive with 375mm diameter sewer	632	375	4		$1,096			$692,672		
	Construct new 375mm diameter sanitary sewer on Davis Drive and reconstruct Davis Drive	308	375	4		$1,096			$337,568		
	Option 5 Total Estimated Cost										**$1,030,240**
6	New sanitary sewer on future ring road and future updated minor collector	2,100	375	4		$1,096			$2,301,600		
	Option 6 Total Estimated Cost										**$2,301,600**
7	New 375mm diameter sanitary sewer replacement for upstream Penn Amelia	631	375	4		$1,096			$691,576		
	Modify existing maintenance hole at William Roe Blvd and Borden Ave to convey flow eastwards								$10,000		
	New 140m of 250mm diameter sanitary sewer on Hill Street	140	250	5		$1,351			$189,140		
	Allowance for connection to Davis Drive								$100,000		
	Option 7 Total Estimated Cost										**$990,716**

Alternative Costing
East Central Sub-Trunk

Option	Description	Length	Diameter	Average Depth of Cover (m)	Pumping Station Capacity (L/s)	Unit Cost Sewer	Unit Cost ($/m) ($/m³ for storage)	Pumping Station cost	Open CutCost ($)	Tunnel Cost	Total Cost
1	Replace existing sewer between Bogart Avenue and Roxborough Road with new 375mm diameter sewer	240	375	3	-	$847			$203,280		
	Option 1 Total Estimated Cost										**$203,280**
2	Construct new large diameter sewer on Bogart Avenue to provide storage and conveyance capacity	120	3m x 2m box culvert				$11,336		$1,360,320		
	Option 2 Total Estimated Cost										**$1,360,320**

Alternative Costing
Holland River Sub Trunk

Option	Description	Length	Diameter	Average Depth of Cover (m)	Storage Volume (m³)		Unit Cost		Cost ($)		
1	Replace existing Holland River Sub Trunk between Cane Parkway and the York Region trunk with 450-600mm diameter sewer	2,000	450-600	4	-		$5,190		$10,380,000		
	Option 1 Total Estimated Cost										**$10,380,000**
2	New 1,900 m³ offline storage facility on Cane Parkway – peak discharge to Holland River Sub Trunk limited to 55L/s	175	375	3			$847		$148,225		
		316	3m x 2m box culvert				$11,336		$3,582,176		
	Option 2 Total Estimated Cost										**$3,730,401**
3	new sewer on Cane Parkway, 2300m of 525mm	2,300					$1,315		$3,024,500		
	Option 3 Total Estimated Cost										**$3,024,500**

Preferred Alternative

Project ID	Description	Length	Diameter	Average Depth of Cover (m)	Unit Cost ($/m)	Allowance for Restoration and Connection on Davis Drive	Estimated Project Cost
WW1	New 375mm diameter sanitary sewer replacement for upstream Penn Amelia on Walter Avenue, Newberry Drive,	631	375	4	$1,096		$691,576
WW2	New 140m of 250mm diameter sanitary sewer on Hill Street including allowance for connection and restoration of Davis	140	250	5	$1,351	$100,000	$289,140
WW3	Modify existing maintenance hole at William Roe Boulevard and Borden Avenue				$5,000		$10,000
WW4	Construct new large diameter sewer on Bogart Avenue to provide storage and conveyance capacity	120	3m x 2m box culvert		$11,336		$1,360,320
WW5	Replace existing 300mm diameter sanitary sewer on Cane Parkway with 375mm diameter sanitary sewer	175	375	3	$847		$148,225
WW6	New 1,900 m³ offline storage facility on Cane Parkway – peak discharge to Holland River Sub Trunk limited to 55L/s	316	3m x 2m box culvert	3	$11,336		$3,582,176
	Capital cost to Provide Servicing						**$6,081,437**

Appendix D

PUBLIC CONSULTATION RECORD & MATERIALS

Town of Newmarket
Water & Wastewater Master Plan
Stakeholder Contact List

Comm.	PIC	Compl.	Add	Remove	Mr.Ms.	First Name	Last Name	Name	Job Title	Company	Address 1	Address 2	City	Prov	Post Code	Phone	Fax	Email	Notes
FEDERAL AGENCIES																			
✓	✓				Mr.	David	Burden	Mr. David Burden	Regional Director General	Department of Fisheries and Oceans	Regional Director Generals Office	520 Exmouth Street	Sarnia	ON	N7T 8B1	519-383-1810	519-464-5128		
✓	✓				Ms.	Ester	Bobet	Ms. Ester Bobet	Regional Director	Environment Canada	Environmental Protection Operations	4905 Dufferin Street	Toronto	ON	M3H 5T4	416-739-5880	416-739-4251	ester.bobet@ec.gc.ca	
✓	✓				Mr.	Rob	Dobos	Mr. Rob Dobos	Manager	Environment Canada	Environmental Assessment Section	867 Lakeshore Road, Box 5050	Burlington	ON	L7R 4A6	905-336-4953	905-336-8901	rob.dobos@ec.gc.ca	
PROVINCIAL AGENCIES																			
✓	✓				Mr.	Eric	Huey	Mr. Eric Huey	Contract Review Officer & Tender Coordinator	Ministry of Transportation	Southwestern Region - Planning and Design Section	659 Exeter Road, 3rd Floor	London	ON	N6E 1L3	519-873-4593	519-873-4600	eric.huey@ontario.ca	
✓	✓				Mr.	Lukasz	Grobel	Mr. Lukasz Grobel	Project Engineer	Ministry of Transportation		1201 Wilson Ave	Downsview	ON	M3M 1J8	416-235-5616		lukasz.grobel@ontario.ca	
✓	✓				Ms.	Shelley	Tapp	Ms. Shelley Tapp	Regional Director	Ministry of Transportation	Southwestern Region	659 Exeter Road	London	ON	N6E 1L3	519-873-4333	519-873-4236	shelley.tapp@ontario.ca	
✓	✓				Ms.	Halyna	Perun	Ms. Halyna Perun	Director	Ministry of Environment and Climate Change	Legal Services Branch	135 St. Clair Ave. W., 10th Floor	Toronto	ON	M4V 1P5			halyna.perun@ontario.ca	
✓	✓				Ms.	Eva	Salter	Ms. Eva Salter	Regional Advisor	Ministry of Tourism and Culture	301 St. Paul Street, 9th Floor		St. Catherines	ON	L2R 7R4			eva.salter@ontario.ca	
✓	✓				Ms.	Alison	MacKenzie	Ms. Alison MacKenzie	Director	Ministry of Natural Resources	Legal Services Branch	99 Wellesley St. West	Toronto	ON	M7A 1W3			alison.mackenzie@ontario.ca	
✓	✓				Mr.	Scott	Oliver	Mr. Scott Oliver	Team Lead, Planning	Ministry of Municipal Affairs and Housing	Western Municipal Services Office	659 Exeter Road, 2nd Floor	London	ON	N6E 1L3	519-873-4033	519-873-4018	scott.oliver@ontario.ca	
✓	✓				Ms.	Tija	Dirks	Ms. Tija Dirks	Manager, Growth Policy	Ontario Secretariat, Ministry of Public Infrastructure Renewal	14th floor, 777 Bay Street		Toronto	ON	M5G 2E5				
✓	✓								Director	Ministry of the Environment and Climate Change	Environmental Approvals Branch	1st Floor, 135 St. Clair Avenue West	Toronto	ON	M4V 1P5				
FIRST NATIONS AGENCIES / ABORIGINAL COMMUNITIES																			
✓	✓				Ms.	Donna	Big Canoe	Ms. Donna Big Canoe	Chief	Chippewas of Georgina Island	Administration Office	R.R.#2 Box N-13	Sutton West	ON	L0E 1R0	705-437-1337	705-437-4597		
			✓		Ms.	Kerry-Anne	Charles	Ms. Kerry-Anne Charles	Environment Co-ordinator	Chippewas of Georgina Island	Administration Office	R.R.#2 Box N-13	Sutton West	ON	L0E 1R0	705-437-1337	705-437-4597	kerry.charles@georginaisland.com	
			✓		Ms.	Natasha	Charles	Ms. Natasha Charles		Chippewas of Georgina Island	Administration Office	R.R.#2 Box N-13	Sutton West	ON	L0E 1R0	705-437-1337	705-437-4597	natasha.charles@georginaisland.com	
LOCAL AGENCIES																			
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✓	✓				Mr.	Peter	Lycklama	Mr. Peter Lycklama	Vice President	Lycklama Holdings		31 Main Street North	Newmarket	ON		905-895-5459		simonandsons@rogers.com	
✓	✓				Mr.	David	McKay	Mr. David McKay	Vice President and Partner	MHBC Planning, Urban Design and Landscape Architecture	Suite 230	7050 Weston Road	Woodbridge	ON	L4L 8G7	905-761-5588 ext 214	905-761-5589	dmckay@mhbcplan.com	
✓	✓				Ms.	Lynn	Barkey	Ms. Lynn Barkey		Criterion Development Corporation	Suite 404	3625 Dufferin Street	North York	ON	M3K 1N4	416-638-9000	416-636-7218	lbarkey@baifden.com	
✓	✓				Mr.	Christopher	Scott	Mr. Christopher Scott	Project Manager	York Region Rapid Transit Corporation		3601 Highway 7 East	Markham	ON	L3R 0M3	905-886-6767	905-886-6969	christopher.scott@york.ca	
✓	✓				Mr.	Ian	Maxwell	Mr. Ian Maxwell	General Manager	The Roxborough Retirement Residence		1 Roxborough Road	Newmarket	ON	L3Y 2P8	905-853-4573	905-853-4928	gm.rox@diversicare.ca	
✓	✓				Mr.	Ed	Urbonauicius	Mr. Ed Urbonauicius	Manager	The Roxborough Retirement Residence	Environmental Services	1 Roxborough Road	Newmarket	ON	L3Y 2P8	905-853-4573	905-853-4928	esm.rox@diversicare.ca	
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✓	✓				Mr.	Sebastian	Russo	Mr. Sebastian Russo	Vice President	Sterling Karamar		53 The Links Road	Toronto	ON	M2P 1T7	416-256-4434	416-256-0090	sebastian@sterlingkaramar.com	
✓	✓				Ms.	Maggie	Bassani	Ms. Maggie Bassani	Associate	Stikeman Elliot LLP		5300 Commerce Court West	Toronto	ON		416-869-9882	416-947-0866	mcbassani@stikeman.com	
✓	✓				Mr.	James	Harbell	Mr. James Harbell	Partner	Stikeman Elliot LLP		199 Bay St	Toronto	ON		416-869-5690	416-947-0867	jharbell@stikeman.com	
✓	✓				Mr.	Arthur	Grabowski	Mr. Arthur Grabowski	Planner	Weston Consulting		201 Millway Ave. Suite 19	Vaughan	ON		905-738-8080 ext 251	905-738-6637	agrabowski@westonconsulting.com	
✓	✓				Mr.	Brian	Baker	Mr. Brian Baker	President	Bridon Baker Developments Inc		65 The East Mall	Toronto	ON		416-537-2604 ext 241		bribak@hotmail.com	
✓	✓				Mr.	Paul	Bailey	Mr. Paul Bailey	President	Bazil Developments Inc	Suite 903	2235 Sheppard Avenue East	Toronto	ON		416-495-0375	416-495-1914	paulbailey@bazil.ca	

Comm.	PIC	Compl.	Add	Remove	Mr.Ms.	First Name	Last Name	Name	Job Title	Company	Address 1	Address 2	City	Prov	Post Code	Phone	Fax	Email	Notes
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✓	✓				Mr.	Michael	Walker	Mr. Michael Walker	Senior Project Coordinator	Delta Urban Inc	Suite 104	8800 Dufferin St	Vaughan	ON	L4K 0C5	905-660-7667	905-660-7076	michaelw@deltaurban.com	
✓	✓				Mr.	Charles	Walker	Mr. Charles Walker	Planning Coordinator	Lake Simcoe Region Conservation Authority		120 Bayview Parkway	Newmarket	ON		905-895-1281		c.burgess@lsrca.on.ca	
✓	✓				Mr.	Rob	Baldwin	Mr. Rob Baldwin	General Manager of Planning and Development	Lake Simcoe Region Conservation Authority		120 Bayview Parkway	Newmarket	ON		905-895-1281			
✓	✓				Mr.	Joe	Lasitz	Mr. Joe Lasitz	Project Manager, Associate	Counterpoint Engineering Inc	Suite 100	8395 Jane Street	Vaughan	ON	L4K 5Y2	905-326-3063		jlasitz@counterpointeng.com	
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	✓					Maggie	Chien	Maggie Chien										mchien@stikeman.com	
	✓					Marco	Mancini	Marco Mancini										mmancini@urbacon.net	
	✓					Marisa	Talarico	Marisa Talarico										marisaleight@gmail.com	
	✓					Mark	Sadgrove	Mark Sadgrove										mark@canadianmoose.org	
	✓					Mark	Sokolowski	Mark Sokolowski										msokolowski@oskargroup.com	
	✓					Marshall	Bleiweis	Marshall Bleiweis										marshall@sterlingkaramar.com	
	✓					Marvin	Sadowski	Marvin Sadowski										marvin@sterlingkaramar.com	
	✓					Mary	Ayers	Mary Ayers										Mary.Ayers@bnc.ca	
	✓					Mary-Frances	Turner	Mary-Frances Turner										mary-frances.turner@york.ca	
	✓					Matthew	DiVona	Matthew DiVona										matthewd@davieshowe.com	
	✓					Matthew	Fishman	Matthew Fishman										matthew@rosecorp.com	

Comm.	PIC	Compl.	Add	Remove	Mr.Ms.	First Name	Last Name	Name	Job Title	Company	Address 1	Address 2	City	Prov	Post Code	Phone	Fax	Email	Notes
	✓					Michael	Cole	Michael Cole										Michael.cole@infrastructureontario.ca	
	✓					Michael	Croxon	Michael Croxon										michael.croxon@newroads.ca	
	✓					Michael	Frustaglio	Michael Frustaglio										michael@forestgreenhomes.com	
	✓					Michael	Lipkus	Michael Lipkus										michael.lipkus@ibigroup.com	
	✓					Michael	Melling	Michael Melling										michaelm@davieshowe.com	
	✓					Michael	Mendes	Michael Mendes										mmendes@ricegroup.ca	
	✓					Michael	Patullo	Michael Patullo										mpatullo@eaglebayestates.com	
	✓					Michael	Skelly	Michael Skelly										michael.skelly@york.ca	
	✓					Michael	Walker	Michael Walker										michaelw@deltaurban.com	
	✓					Mike	Everard	Mike Everard										everard@rogers.com	
	✓					Mike	Mallette	Mike Mallette										Michael.Mallette@york.ca	
	✓					Mike	O'rourke	Mike O'rourke										mikejuneorourke@netzero.com	
	✓					Mike	Walters	Mike Walters										m.walters@lsrca.on.ca	
	✓					Mirhassan	Daryabeigy	Mirhassan Daryabeigy										mir@tpclinic.com	
	✓					Nancy	Ellis	Nancy Ellis										nellis777@hotmail.com	
	✓					Nathan	Pickard	Nathan Pickard										pickardnathan@hotmail.com	
	✓					Navid	Kichi	Navid Kichi										nkichi@saharhospitality.com	
	✓					NEDAC		NEDAC											
	✓					Nick	Michael	Nick Michael										nickmichael@rgrichards.com	
	✓					Nick	Wood	Nick Wood										nick@rgrichards.com	
	✓					Oscar	Kichi	Oscar Kichi										okichi@saharhospitality.com	
	✓					P & J	Meine	P & J Meine										janmeine@hotmail.com	
	✓					Patricia	Montgomery	Patricia Montgomery										mbutterfly47@gmail.com	
	✓					Paul	Bailey	Paul Bailey										paulbailey@bazil.ca	
	✓					Paul	Clarry	Paul Clarry										PClarry@southlakeregional.org	
	✓					Paul	Ferguson	Paul Ferguson										pferguson@nmhydro.ca	
	✓					Paul	May	Paul May										Paul.May@york.ca	
	✓					Paul	Minz	Paul Minz										pminz@acorncorp.ca	
	✓					Paul	Richardson	Paul Richardson										dcongdon@diversicare.ca	
	✓					Peter	Czapka	Peter Czapka										pczapka@multimatic.com	
	✓					Peter	Green	Peter Green										pgreen@southlakeregional.org	
	✓					Peter	Hillar	Peter Hillar										peter.hillar@greyfield.ca	
	✓					Peter	Lychlan	Peter Lychlan										simonandsons@rogers.com	
	✓					R.	Pearson	R. Pearson										pearsonr@rogers.com	
	✓					Remo	Agostino	Remo Agostino										ragostino@danielscorp.com	
	✓					Rene	Masad	Rene Masad										rene.masad@york.ca	
	✓									Rice Commercial Group Inc.								information@ricegroup.ca	
	✓					Richard	Cornblum	Richard Cornblum										rcornblum@trivest.com	
	✓					Richard	Zelinka	Richard Zelinka										richard.z@zpplan.com	
	✓					Rick & Shirley	Charles	Rick & Shirley Charles										shirchar@rogers.com	
	✓					Rita	Hooper	Rita Hooper										grannyhoop@rogers.com	
	✓					Robert	Buchan	Robert Buchan										buchan@rogers.com	
	✓					Robert	Piper	Robert Piper										robert.piper@york.ca	
	✓					Romas	Juknevicius	Romas Juknevicius										romas@rgrichards.com	
	✓					Ronald	D. Whitton	Ronald D. Whitton										Ron.Witton@trumbleyhampton.on.ca	
	✓					Rosemarie	Humphries	Rosemarie Humphries										rhumphries@humphriesplanning.com	
	✓			✓		Roslyn	Houser	Roslyn Houser										rhouser@goodmans.ca	
	✓					Rudolph	Bratty	Rudolph Bratty										rbratty@bratty.com	
	✓					Ryan	Guetter	Ryan Guetter										rguetter@westonconsulting.com	
	✓					Ryan	Moore	Ryan Moore										rmoore@mhbcplan.com	
	✓					Sabrina	Sgotto	Sabrina Sgotto										ssgotto@humphriesplanning.com	
	✓					Salim	Alibhai	Salim Alibhai										salim.alibhai@gmail.com	
	✓					Sam	Frustaglio	Sam Frustaglio										sam@forestgreenhomes.com	
	✓					Sam	Reisman	Sam Reisman										sam@rosecorp.com	
	✓					Sandro	Sementilli	Sandro Sementilli										sandro@sanmichael.ca	
	✓					Sara	Brockman	Sara Brockman										S.Brockman@lsrca.on.ca	
	✓					Scott	Browne	Scott Browne										scott.browne@nbc.ca	
	✓					Scott	MacGregor	Scott MacGregor										sa.mac@sympatico.ca	
	✓					Seanna	Kerr	Seanna Kerr										seanna@rgrichards.com	
	✓					Sebastian	Russo	Sebastian Russo										sebastian@sterlingkaramar.com	
	✓					Shane	MacDonald	Shane MacDonald										Shane.MacDonald@york.ca	
	✓					Sheldon	Gould	Sheldon Gould										sgould@delmanor.com	
	✓					Stephen	Champion	Stephen Champion										stephen.champion@sears.ca	
	✓					Stephen	Foster	Stephen Foster										sfoster@ellisdon.com	
	✓					Steven	K. Bishop	Steven K. Bishop										sbishop@nadg.com	
	✓					Steven	Menke	Steven Menke										smenkes@menkes.com	
	✓					Sue & Terry	Gaudet	Sue & Terry Gaudet										sgaudet@rogers.com	
	✓					Suzanne	Theroux	Suzanne Theroux										supaal@sympatico.ca	
	✓					Syd	Hopkinson	Syd Hopkinson										syd@rmscomanagement.ca	
	✓					Taymoore	R. Balbaa	Taymoore R. Balbaa										taymoore@ryerson.ca	
	✓					Terry	Alderson	Terry Alderson										terry.alderson@bell.net	
	✓					Tim	Jessop	Tim Jessop										tjessop@westonconsulting.com	
	✓					Vi	Bui	Vi Bui										vi.bui@york.ca	
	✓					Victor	Labreche	Victor Labreche										victor@lpplan.com	

Comm.	PIC	Compl.	Add	Remove	Mr.Ms.	First Name	Last Name	Name	Job Title	Company	Address 1	Address 2	City	Prov	Post Code	Phone	Fax	Email	Notes
	✓					Victor	Woodhouse	Victor Woodhouse										victor@woodhouseinsurance.ca	
	✓					Vince	Naccarato	Vince Naccarato										vince@rodeofinehomes.com	
	✓					Vince	Santino	Vince Santino										vsantino@minto.com	
	✓					Walt	Klywak	Walt Klywak										jnwklywak@gmail.com	
	✓					Wayne	Olson	Wayne Olson										wolson@waremalcomb.com	
	✓					Wendy	Kwan	Wendy Kwan										gormleymanor1@gmail.com	
	✓					William	Mulock	William Mulock										wmulock@hotmail.com	
	✓					William	Russell	William Russell										wtrussell@rogers.com	
	✓					William	Whelan	William Whelan										william.whelan@rogers.com	

ENGINEERING SERVICES
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F: 905 953 5138

July 20, 2015

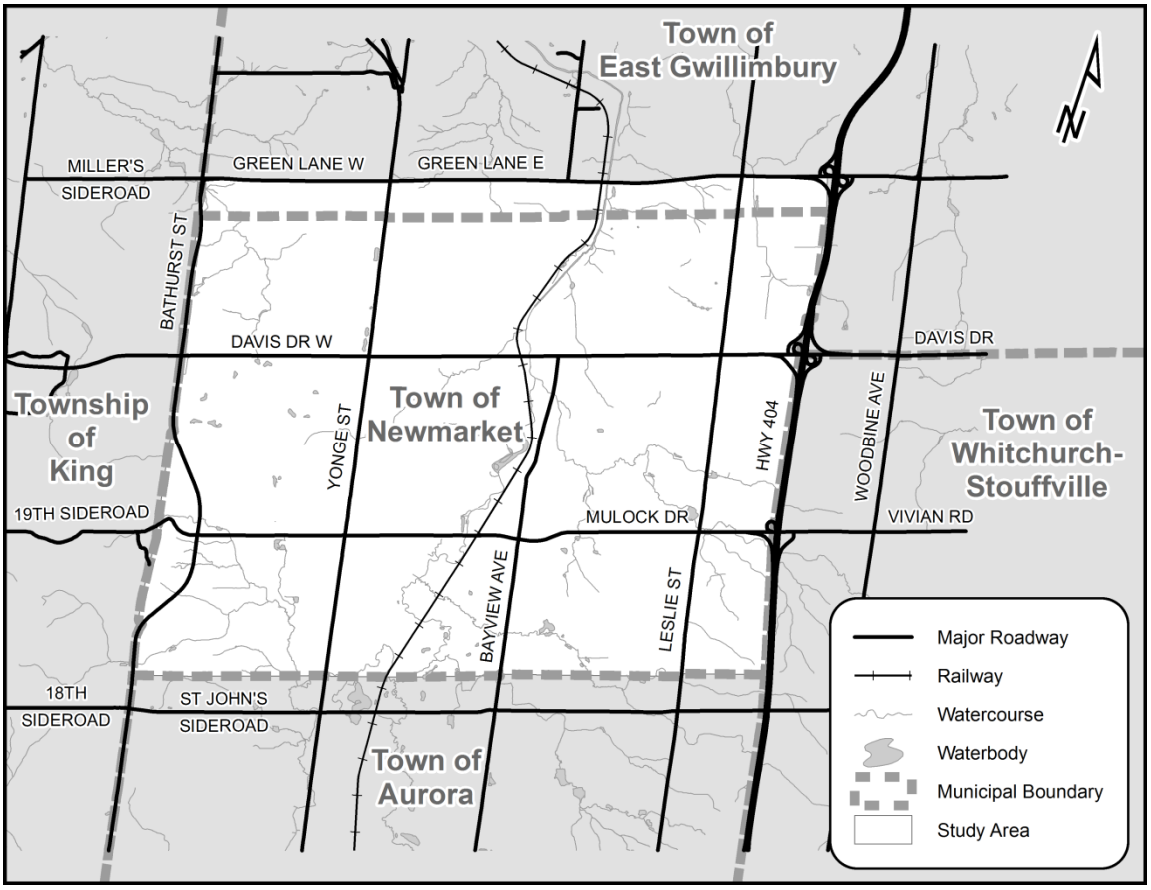
TOWN OF NEWMARKET

NEWMARKET WATER AND WASTEWATER MASTER PLAN

MUNICIPAL CLASS ENVIRONMENTAL ASSESSMENT
NOTICE OF STUDY COMMENCEMENT

The Undertaking

The Town of Newmarket is undertaking a Water and Wastewater Master Plan to identify the required improvements and/or expansion to the Town's water distribution and wastewater collection systems to support existing and proposed growth within the Town, including the intensification of the Urban Centres Secondary Plan area. The Master Plan will be a long-term plan for system improvements to meet servicing demands to 2041. The area considered in the Master Plan is illustrated in the figure below.



The Study Area

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Town of Newmarket
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engineering@newmarket.ca
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Master Plan Process

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Public Consultation

Public consultation is vital to the success of the Master Plan. The Town of Newmarket and WSP Canada Inc. want to ensure that anyone interested in the Master Plan has the opportunity to provide input. It is anticipated that a Public Information Centre (PIC) will be held in the Winter of 2016 to receive public input on the alternative servicing strategies and recommended servicing alternatives presented. A notice of the PIC will be published in advance of the meeting. Interested stakeholders in attendance at the PIC will be able to sign up for a mailing list so that they can be kept informed of the Plan's progress. In addition, the public will be encouraged to provide their comments throughout the Master Plan to ensure that concerns can be adequately addressed. At the completion of the planning process, the Master Plan will be published publicly.

Contact Information

We are interested in hearing any comments or concerns that you may have related to the Water and Wastewater Master Plan. Communications (written and verbal) received during the course of the project will be documented and included in the final Master Plan document. The names of local residents will be excluded from public record to maintain their privacy. Please contact either one of the representatives listed below if you have questions or comments or wish to be included on the mailing list.

Mr. Stan C. Holden, P.Eng.
Director
Municipal Infrastructure
WSP Canada Inc
600 Cochrane Drive, Suite 500
Markham, ON L3R 5K3
Phone: (905) 475-8727 Ext. 18233
Fax: (905) 475-5994
Email: stan.holden@wspgroup.com

Ms. Meredith Goodwin, C.E.T.
Capital Projects Coordinator
Engineering Services
The Town of Newmarket
395 Mulock Drive, P.O. Box 328
Newmarket, ON L3Y 4X7
Phone: (905) 953-5300 Ext. 2518
Fax : 905 953 5138
Email: mgoodwin@newmarket.ca

Comments and information regarding these Municipal Class Environmental Assessments are being collected in accordance with the Municipal Freedom of Information and Protection of Privacy Act. With the exception of personal information, all comments received will become a part of the public record.

Newmarket

NEWMARKET WATER & WASTEWATER MASTERPLAN

MUNICIPAL CLASS ENVIRONMENTAL ASSESSMENT NOTICE OF STUDY COMMENCEMENT

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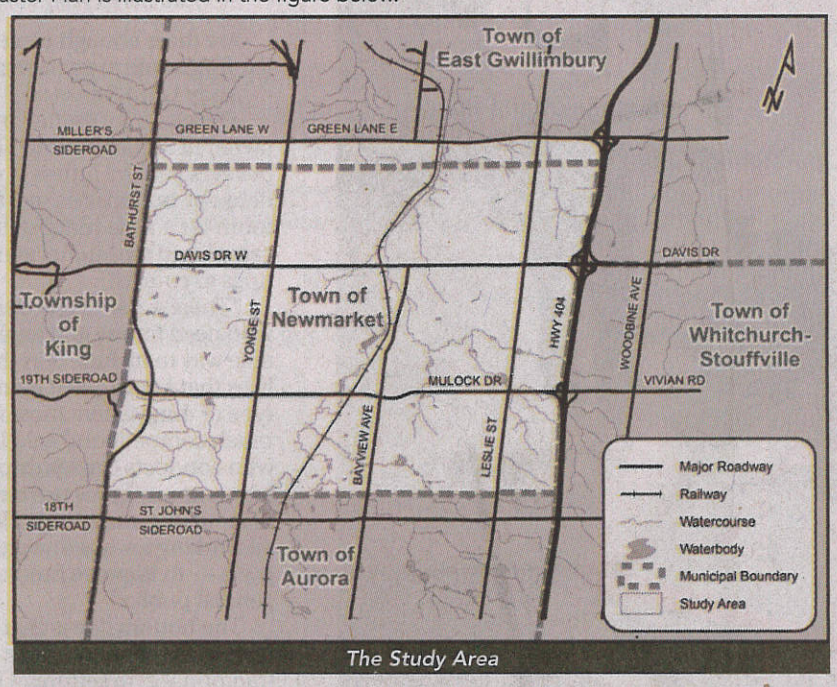

The Study Area

Master Plan Process

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Mr. Stan C. Holden, P.Eng.
Director
Municipal Infrastructure
Phone: (905) 475-8727 Ext. 18233
Email: stan.holden@wspgroup.com

Ms. Meredith Goodwin, C.E.T.
Capital Projects Coordinator
Engineering Services
Phone: (905) 953-5300 Ext. 2518
Email: mgoodwin@newmarket.ca

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COMMUN BRIEFS

Is Newmarket bike-frien community?

Tues., Sept. 29, 2015
7:00-9:00 p.m.
Newmarket Public Library
Cycling is cited as a solution to traffic and health problems. But encouraging cycling means changes to infrastructure, attitudes, habits, and law enforcement. In the midst of intensification, rapidways, and new development, is our town up to the task? Ages 16+
Pre-register 905-953-5110 Ext. 4770

A Presentation o
IdeaMark

IdeaMarket sharing and providing a community share ideas discussions

THE ERA More on IdeaMark at newmarketpl.c

Lega

Canadian Environmental Assessment Agency
55 St. Clair Avenue East,
Room 907
Toronto ON M4T 1M2

Agence canadienne d'évaluation environnementale
55, avenue St. Clair Est,
pièce 907
Toronto ON M4T 1M2

July 31, 2015

Sent by email

Meredith Goodwin
Town of Newmarket
395 Mulock Dr., P.O. Box 328
Newmarket, ON L3Y4X7
engineering@newmarket.ca

Dear Ms. Goodwin:

Re: Information on the *Canadian Environmental Assessment Act, 2012*

Thank you for your correspondence of July 20, 2015 regarding the Town's Water and Wastewater Master Plan.

The *Canadian Environmental Assessment Act, 2012* (CEAA 2012) focuses federal environmental reviews on projects that have the potential to cause significant adverse environmental effects in areas of federal jurisdiction and applies to physical activities described in the *Regulations Designating Physical Activities* (the Regulations). Based on the information provided, your project does not appear to be described in the Regulations. **Kindly review the Regulations to confirm applicability to the proposed project.**

If you believe the project is not subject to a federal environmental assessment, and do not submit a project description, we kindly request that you remove the Agency from your distribution list.

If you have questions, please get in touch with our office through the switchboard at 416-952-1576. The attachment that follows provides web links to useful legislation, regulation, and guidance documents.

Sincerely,

Anjala Puvananathan
Director, Ontario Region
Canadian Environmental Assessment Agency

Attachment – Useful Legislation, Regulation, and Guidance Documents

Attachment – Useful Legislation, Regulation, and Guidance Documents

For more information on CEAA 2012, please access the following links on the Canadian Environmental Assessment Agency's (the Agency) website:

Overview of CEAA 2012
http://www.ceaa.gc.ca/default.asp?lang=En&n=16254939-1

Regulations Designating Physical Activities, and
Prescribed Information for a Description of a Designated Project Regulations
http://www.ceaa.gc.ca/default.asp?lang=En&n=9EC7CAD2-1

If your project is in a federally designated wildlife area or migratory bird sanctuary please check section 1 of the Regulations, which details the designated projects specific to those locations.

If it appears that CEAA 2012 may apply to your proposed project, you must provide the Agency with a description of the proposed project. Please see the link below to the Agency's guide to preparing a project description.

Guide to Preparing a Description of a Designated Project
http://www.ceaa.gc.ca/63D3D025-2236-49C9-A169-DD89A36DA0E6/Guide_to_Preparing_a_Description_of_a_Designated_Project_under_CEAA_2012.pdf

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F: 905 953 5138

July 20, 2015

Ms. Angela Pavananathan, Director
Ontario Regional Office
Canadian Environmental Assessment Agency
55 St. Clair Avenue, Room 907
Toronto, ON M4T 1M2

Re: Newmarket Water and Wastewater Master Servicing Plan
Notice of Study Commencement

Dear Ms. Angela Pavananathan

The Town of Newmarket has obtained WSP Canada Inc. to complete the Town's Water and Wastewater Master Plan. The Master Plan will identify long term servicing strategies for water and wastewater servicing in the Town of Newmarket.

The Master Plan is being conducted in accordance with the requirements of the Municipal Class Environmental Assessment (Class EA) process (October 2000, as amended in 2007 and 2011) using Master Planning Approach 1. Consultation with and input from the public and government review agencies is a vital component to the Class EA process.

For your information, the Notice of Study Commencement is enclosed. The Town of Newmarket is anticipating holding a Public Information Centre in Fall/Winter 2015 to present the recommended alternative servicing strategies. Representatives from the Town of Newmarket and the project consultants, WSP Canda Inc., will be present at the Public Information Centre to answer questions and discuss the next steps. Notification of the Public Information Centre will be provided to you at a later date.

Your Agency has been identified as one that may be interested in the Master Plan. Please take a moment to complete the enclosed **Agency Response Form** to confirm your interest in the Master Plan, and to appoint the appropriate contact person from your organization to receive ongoing information about the Master Plan. When completed, please email or fax it back to us as specified on the form.

If you have any questions or concerns or for any additional information on this project please contact the Project Manager Stan Holden of WSP Canada Inc. at 905-475-8727 Ext. 18233 or via e-mail at stan.holden@genivar.com.

Yours truly,
TOWN OF NEWMARKET

Meredith Goodwin, C.E.T.
Capital Projects Coordinator

encl: Notice of Study Commencement
Agency Response Form

ENGINEERING SERVICES
Town of Newmarket
395 Mulock Drive
P.O. Box 328, STN Main
Newmarket, ON L3Y 4X7

www.newmarket.ca
engineering@newmarket.ca
T: 905 895.5193
F: 905 953 5138

Please return this form to:

Attn: **Athina Wilson**
WSP Canada Inc.
600 Cochrane Drive
Suite 500
Markham, Ontario L3R 5K3

Email: **athina.wilson@wspgroup.com**
Fax No.: **905-475-5994**

Would you, or your organization, like to remain on our Master Plan contact list and receive project updates, documentation for review, etc.?

- ☐ Yes, I will be providing input or participating in the Master Plan.
- ☐ Yes, please continue to send me notices regarding this project.
- ☐ No, I will not be providing input or participating. Please remove me from the Master Plan Contact List and replace with the below contact.

	Current Information on File:	Please Confirm:
Contact Name:		
Title:		
Agency:		
Address:		
Telephone:		
Fax:		
Email:		

Please note any specific comments or concerns below:

Signature: _____ **Date:** _____

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July 20, 2015

TOWN OF NEWMARKET

NEWMARKET WATER AND WASTEWATER MASTER PLAN

MUNICIPAL CLASS ENVIRONMENTAL ASSESSMENT NOTICE OF STUDY COMMENCEMENT

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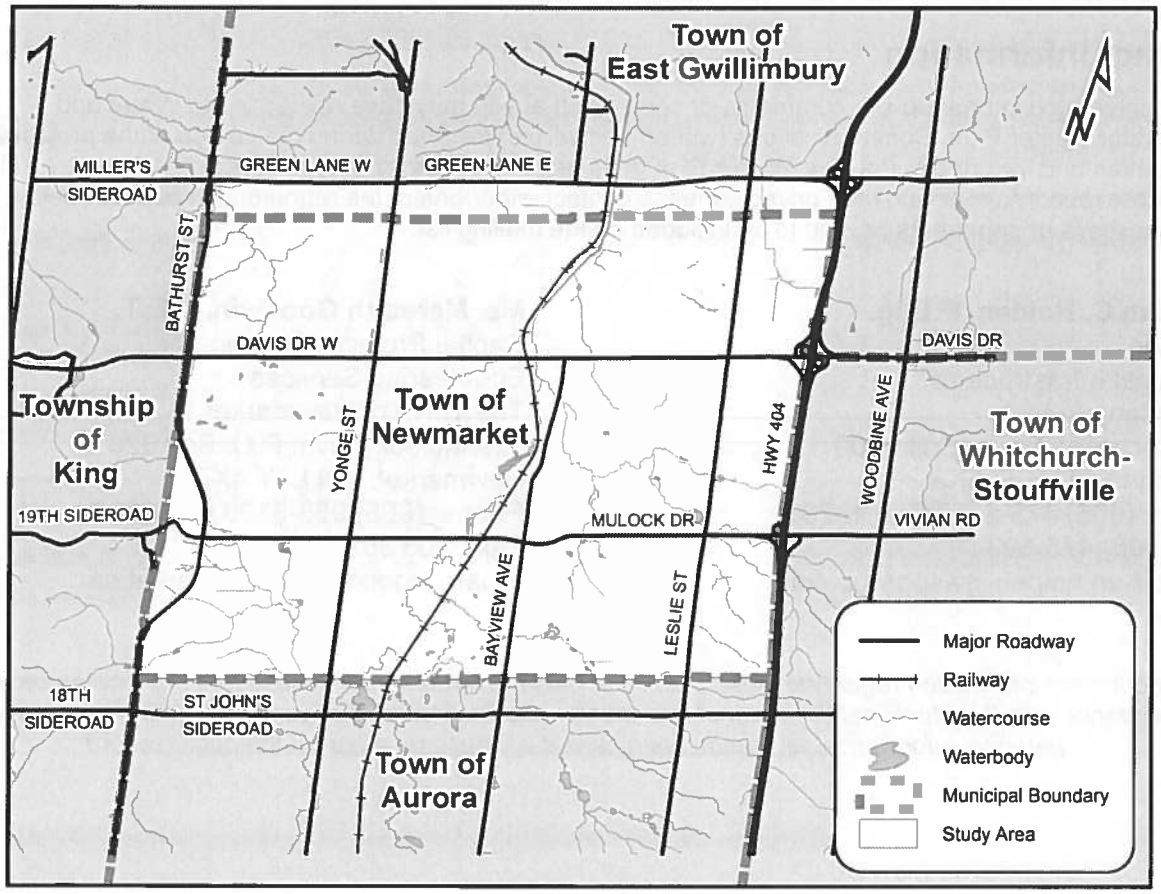

The Study Area

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T: 905 895.5193
F: 905 953 5138

Master Plan Process

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Public Consultation

Public consultation is vital to the success of the Master Plan. The Town of Newmarket and WSP Canada Inc. want to ensure that anyone interested in the Master Plan has the opportunity to provide input. It is anticipated that a Public Information Centre (PIC) will be held in the Fall/Winter 2015 to receive public input on the alternative servicing strategies and recommended servicing alternatives presented. A notice of the PIC will be published in advance of the meeting. Interested stakeholders in attendance at the PIC will be able to sign up for a mailing list so that they can be kept informed of the Plan's progress. In addition, the public will be encouraged to provide their comments throughout the Master Plan to ensure that concerns can be adequately addressed. At the completion of the planning process, the Master Plan will be published publicly.

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Mr. Stan C. Holden, P.Eng.
Director
Municipal Infrastructure
WSP Canada Inc
600 Cochrane Drive, Suite 500
Markham, ON L3R 5K3
Phone: (905) 475-8727 Ext. 18233
Fax: (905) 475-5994
Email: stan.holden@wspgroup.com

Ms. Meredith Goodwin, C.E.T.
Capital Projects Coordinator
Engineering Services
The Town of Newmarket
395 Mulock Drive, P.O. Box 328
Newmarket, ON L3Y 4X7
Phone: (905) 953-5300 Ext. 2518
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F: 905 953 5138

May 31, 2016

MUNICIPAL CLASS ENVIRONMENTAL ASSESSMENT
NOTICE OF PUBLIC INFORMATION CENTRE

NEWMARKET WATER AND WASTEWATER MASTER PLAN

A Public Information Centre (PIC) is scheduled for Tuesday, June 21, 2016 as part of the Town of Newmarket's efforts to undertake a Water and Wastewater Master Plan. This long-term plan will help us identify the required improvements and expansion to the Town's water distribution and wastewater collection systems to support existing and proposed growth within the Town to help meet servicing demands to the year 2041. This includes the intensification of the Town's Urban Centres Secondary Plan area – specifically the Davis Drive and Yonge Street corridor.

The Master Plan is being prepared in accordance with the requirements of the Municipal Class Environmental Assessment (EA) process (October 2000, as amended in 2007 and 2011).

The PIC will provide information on the existing conditions, alternative solutions, evaluation approach, recommended servicing upgrades and next steps and will provide an opportunity for interested stakeholders to provide feedback regarding the Study's process and findings.

Representatives from both the Town of Newmarket and the consultant – WSP Canada Inc. – will be present at the PIC to answer questions and discuss the Study's progress to date. The PIC has been scheduled to take place at:

Tuesday, June 21, 2016
TIME: 6 to 8 p.m.
VENUE: Council Chambers
ADDRESS: Municipal Offices (395 Mulock Drive)
Newmarket, ON

We are interested in hearing any comments or concerns you may have with respect to this Study. Comments will be retained for reference throughout the project and will become part of the public record under the Freedom of Information and Protection of Privacy Act and the Environmental Assessment Act. Unless otherwise stated in your submission, any personal information such as name, address, telephone number and property location included in a submission will become part of the public record files for this matter and will be released, if requested, to any person.

If you are unable to attend the PIC and wish to provide your comments, or require the information in an alternate format, please contact one of the following:

Mr. Stan Holden, P.Eng.
Director, Municipal Infrastructure
WSP Canada Inc.
600 Cochrane Drive, Suite 500
Markham, ON L3R 5K3
Phone: 905-475-7270
Fax: 905-475-5994
Email: stan.holden@wspgroup.com

Mr. Gord MacMillan, PMP, P.Eng.
Acting Manager, Capital Projects
The Town of Newmarket
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Newmarket, ON L3Y 4X7
Phone: 905-953-5300 Ext. 2503
Fax : 905-953-5138
Email: gmacmillan@newmarket.ca

WELCOME TO THE PUBLIC INFORMATION CENTRE

June 21, 2016

Our representatives will be pleased to answer your questions and address any concerns.

Your input is much appreciated.

WSP
XCG
Environmental Engineers & Scientists

Town of Newmarket
Water and Wastewater Master Plan

Newmarket
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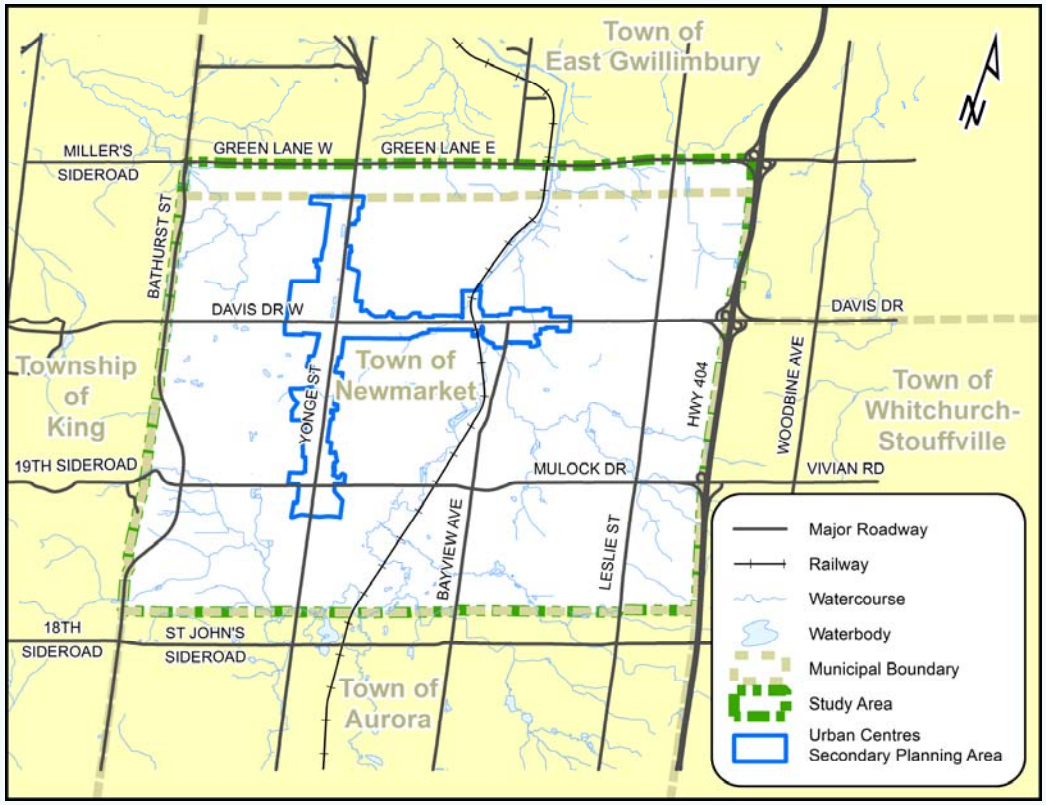
Overview

A Water and Wastewater Master Plan is being undertaken to identify the required improvements and/or expansion to the Town's water distribution and wastewater collection systems to support existing and proposed growth within the Town, including the intensification of the Urban Centres Secondary Plan area. The Master Plan will be a long-term plan for system improvements to meet servicing demands to 2041.

The Urban Centres Secondary Planning area is where most of the future population growth for Newmarket will be located. As such, careful consideration has been given to the future infrastructure required to service the area.



Study Area

Overview

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Opportunity Statement

The Master Plan is being undertaken to identify and evaluate alternatives to provide water and wastewater servicing options for existing and future development in the Town of Newmarket, to 2041, as planned for in the Official Plan, including OPA #10 (the Urban Centres Secondary Plan).

Study Objectives

To identify the required improvements to the Town's water distribution and wastewater collection systems to support existing and future development, including the proposed growth in the Urban Centres Secondary Plan.

Some key aspects of the scope of work for the Master Plan include:

- Identifying existing deficiencies in both the water and wastewater network;
- Identifying key peaking factors and demand rates;
- Determining future requirements of the water distribution and wastewater collection systems;
- Establishing evaluation criteria;
- Proposing works to maintain or enhance water quality;
- Proposing water and wastewater servicing alternatives;
- Evaluating water and wastewater servicing alternatives;
- Preparing cost estimates for proposed infrastructure; and,
- Preparing an infrastructure implementation phasing plan.

Town of Newmarket
Water and Wastewater Master Plan

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Municipal Class EA Process

The Class EA approach streamlines the planning and approvals process for municipal projects. This Master Plan is being prepared in accordance with the requirements of the Municipal Class Environmental Assessment document prepared by the Municipal Engineers Association (MEA) (October 2000, as amended in 2007, 2011 and 2015). The Municipal Class Environmental Assessment document outlines the procedures to be followed to satisfy Class EA requirements for municipal infrastructure projects. The Municipal Class EA process includes these five phases.

Phase 1
Identify Problem or Opportunity

Phase 2
Develop and Evaluate Alternative Solutions

Phase 3
Develop and Evaluate Alternative Design Concepts for Preferred Solution

Phase 4
Prepare an Environmental Study Report

Phase 5
Project Implementation

Class EA Flowchart

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Water and Wastewater Master Plan

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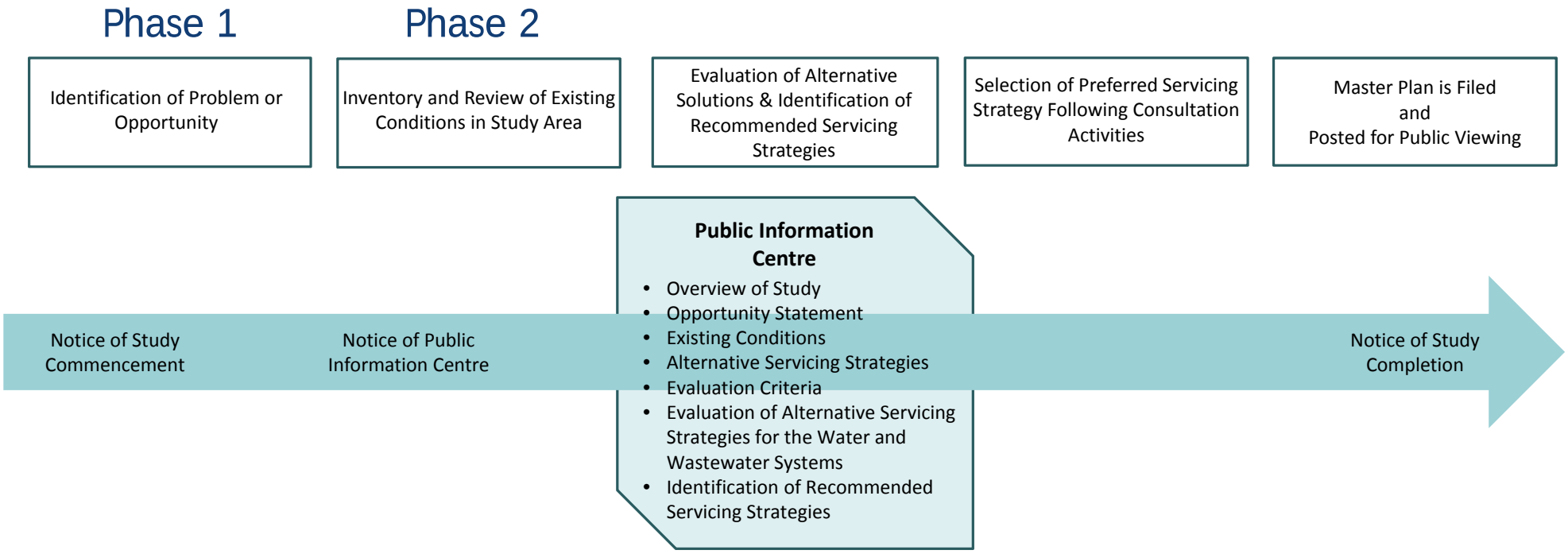
Master Plans are conducted under the framework of the Municipal Engineers Association (MEA) Municipal Class Environmental Assessment (EA) process. The current study uses the Master Plan Approach #1 whereby Phases 1 and 2 of the Class EA process are completed and all Schedule A and A+ projects may proceed to Phase 5 to be implemented without further study. Additional project specific Class EAs will be required for projects identified through the Master Plan requiring Schedule B Municipal Class EA's prior to the implementation of the infrastructure.



Master Plan Municipal Class EA Process

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Water and Wastewater Master Plan

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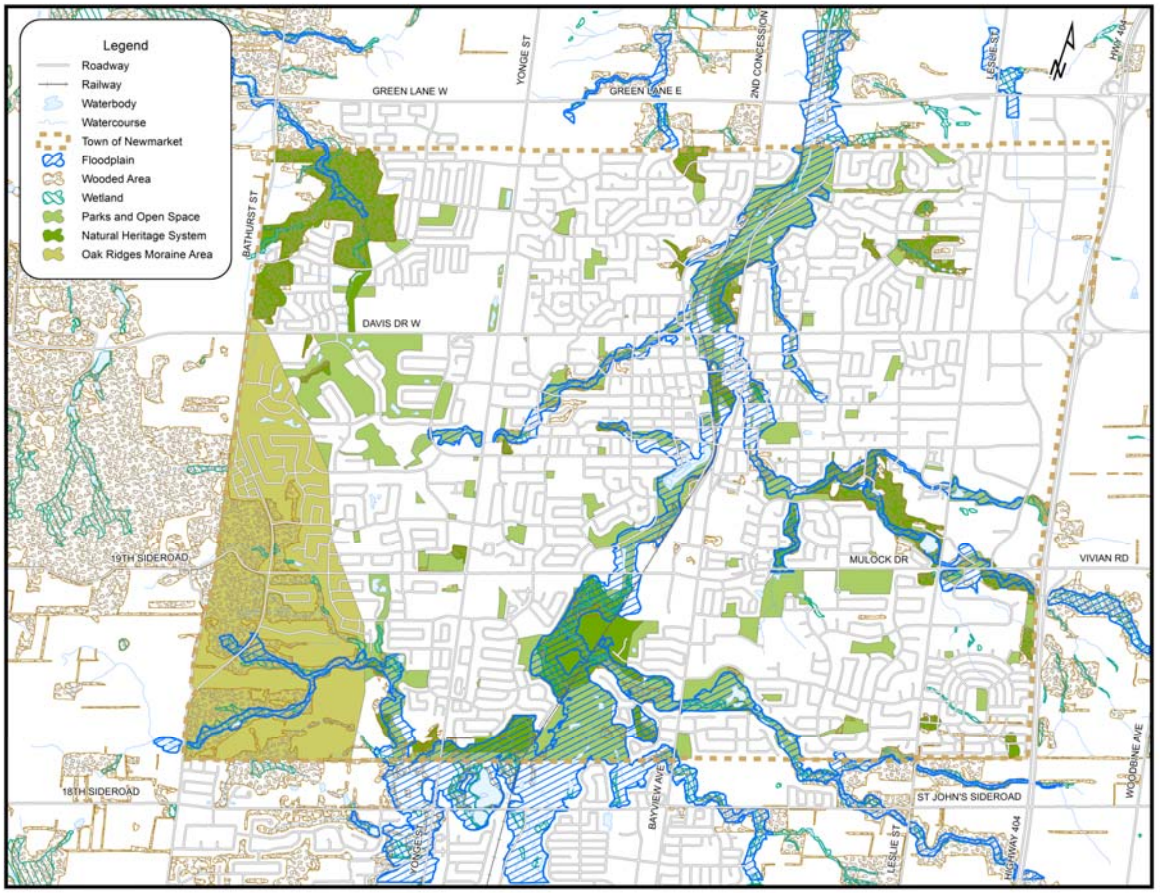

Existing Conditions - Natural Features

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Water and Wastewater Master Plan

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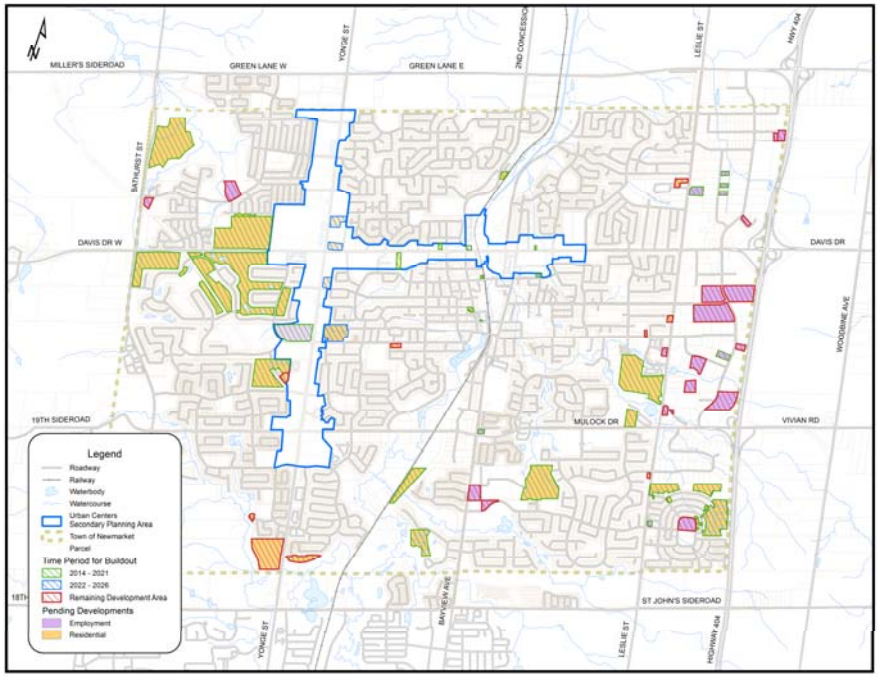


Future Growth Areas

	Outside Urban Centres Secondary Planning Area				Within Urban Centres Secondary Planning Area			
	Residential		Employment		Residential		Employment	
Year Interval	Population Growth	Cumulative Population	Population Growth	Cumulative Population	Population Growth	Cumulative Population	Population Growth	Cumulative Population
2014		86,315		27,276		2,700		17,416
2015-2021	8,129	94,444	190	27,466	492	3,192	1,659	19,075
2022-2026	400	94,844	224	27,690	2,590	5,782	465	19,540
2027-2031	169	95,013	285	27,975	5,603	11,385	465	20,005
2032-2036	169	95,182	285	28,260	5,603	16,988	3,000	23,005
2037-2041	169	95,351	285	28,545	5,603	22,591	3,000	26,005
Total Population (by Area)	**95,351**		**28,545**		**22,591**		**26,005**	
Population Growth (by Area)	**9,036**		**1,269**		**19,891**		**8,589**	
Total Population	**172,492**							
Population Growth	**38,785**							

Population Projections Outside Urban Centres Secondary Plan

WSP XCG Environmental Engineers & Scientists

Water Design Criteria

The following water consumption criteria was used:

	Recommended Rates
Average Day (L/cap/day)	220
Maximum Day Factor	1.7
Peak Hour Factor	2.5

WSP evaluated the ultimate conditions (2041) scenario for the system based on WSP's recommended Required Fire Flow criteria:

Type of Development	Fire Flow Requirement
Detached and Semi-Detached Dwellings	5,400 L/min (90 L/s)
Townhouses	10,000 L/min (167 L/s)
Apartments	15,000 L/min (250 L/s)
Industrial	15,900 L/min (265 L/s)
Commercial/Institutional	10,000 L/min (167 L/s)

Wastewater Design Criteria

The following wastewater generation criteria was used:

	Recommended Rates
Residential Unit Wastewater Flow Rate (L/cap/day)	310
Residential DWF Peaking Factor	Harmon
Residential Infiltration Allowance – New Development (L/s/ha)	0.3
Residential Infiltration Allowance – with foundation drainage to sanitary (L/s/ha)	1.0
Residential Infiltration Allowance – with foundation drainage to storm (L/s/ha)	0.2
Residential Infiltration Allowance – with foundation drainage to sump pump (L/s/ha)	0.7
Unit Wastewater Flow Rate - Employment Land Use (L/cap/day)	310
Employment DWF Peaking Factor	Harmon
Employment Infiltration Allowance	0.3

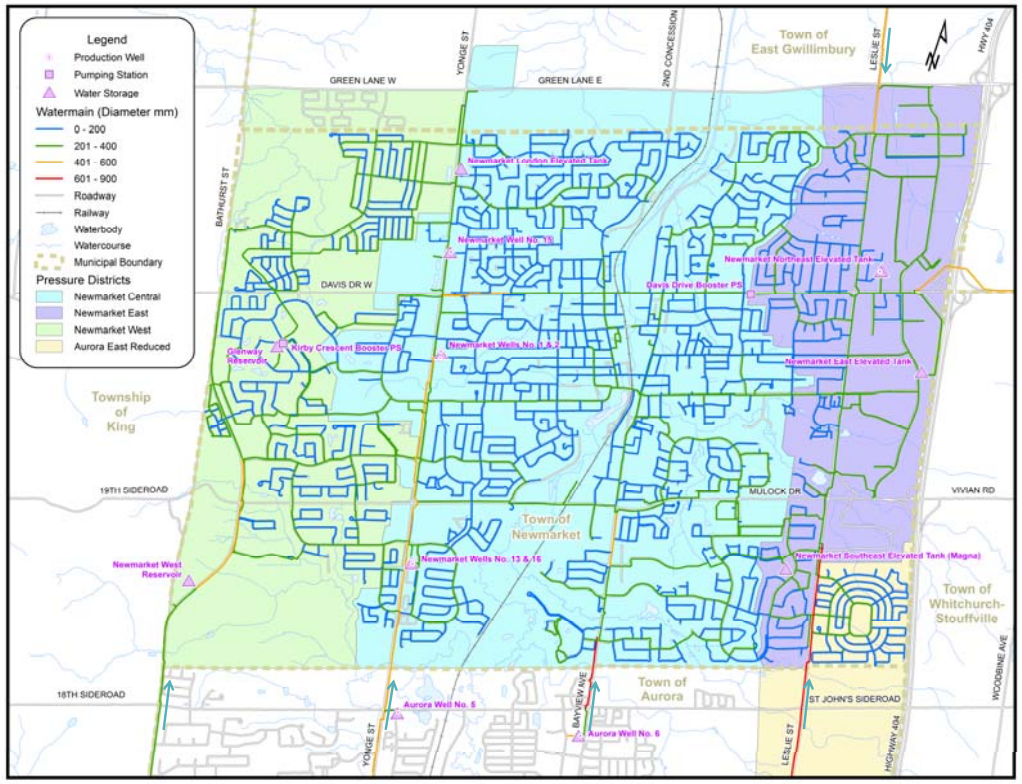
Town of Newmarket
Water and Wastewater Master Plan

Evaluation Criteria and Legend

Town of Newmarket
Water and Wastewater Master Plan

There are four water pressure districts servicing the Town of Newmarket as described below:

- **Newmarket West** supplies the west side of the Town. This zone is supplied by the Kirby Crescent Booster PS. Storage is provided by the Newmarket West Reservoir.
- **Newmarket Central** supplies the Town's central area. The primary supplies are from the London Elevated Tank and Newmarket Wells 1 & 2, 13 & 16 and 15. In addition, Aurora supplies Central Newmarket through two pressure relief valves at Yonge Street and Bayview Avenue. Although the Glenway Reservoir and Newmarket Southeast Elevated Tank (Magna) are located in other pressure districts, they both supply the Newmarket Central pressure district.
- **Newmarket East** supplies the east side of the Town. The east side receives water from Aurora as well as from Queensville through two separate flow control valves. Storage for this pressure district is provided by the Newmarket East Elevated Tank and the Newmarket Northeast Elevated Tank.
- **Aurora East Reduced** supplies the south east area of the Town that is pressure reduced from the Aurora East pressure district.



Existing Water System

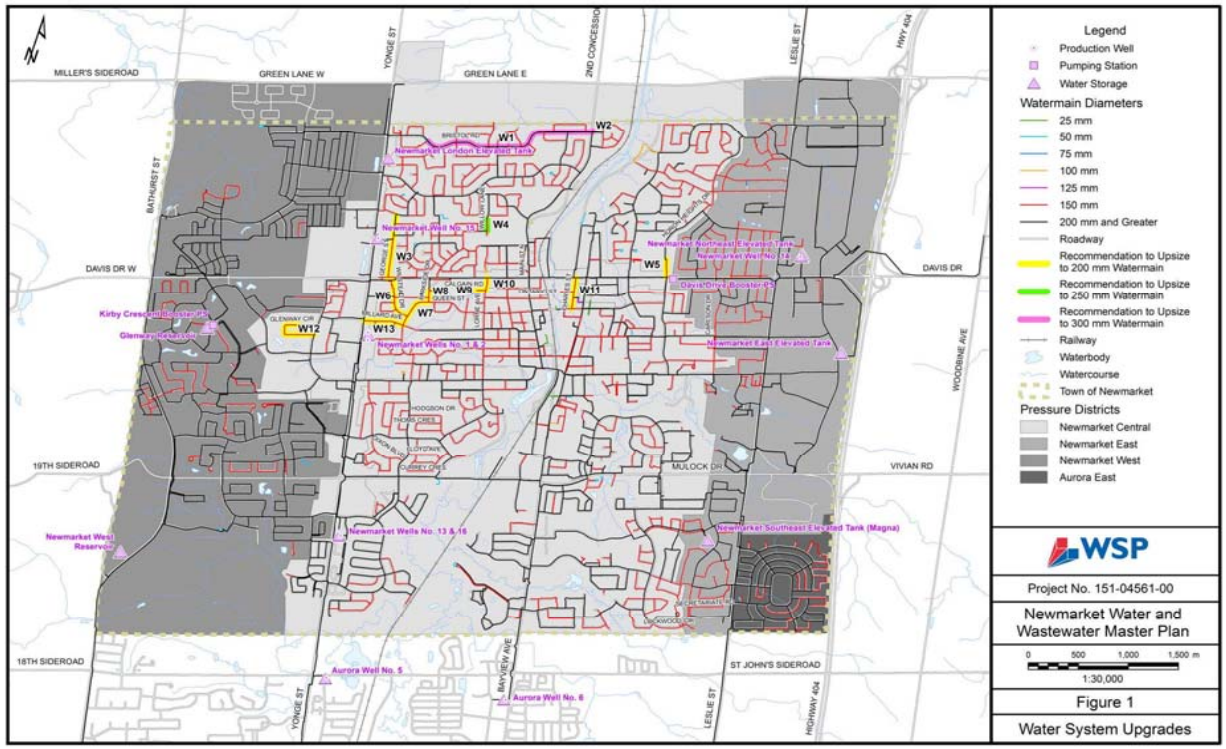
Water alternatives considered for servicing the Town of Newmarket included the following:

- Do Nothing (Required for Evaluation Per the MEA Class EA Process)
- Upgrade and Expand Existing Water System Network

Alternative	Comments
Do Nothing	The "Do Nothing" alternative represents a scenario where no improvements or expansions would be undertaken. It may be preferred for some of the evaluation criteria, but it does not satisfy the Master Plan's core objective to support future growth to 2041. Future planning policies and opportunities to provide water and wastewater servicing for existing and future development would not be adhered to in selecting this alternative. **This alternative is therefore not a viable solution since it does not fulfill the projects' Opportunity Statement.**
Upgrade and Expand Existing Water System Network	York Region is responsible for providing water treatment, storage and transmission to the Town's water distribution system. Since the Town is responsible for the distribution of water to residents and businesses, the recommended alternative is to improve the ability of the water distribution system to provide adequate service pressures and meet fire flow requirements.

Town of Newmarket
Water and Wastewater Master Plan

- The recommended projects for the Town's water distribution system to meet servicing demands to the year 2041 are shown in the figure. The recommended projects require the upgrade of existing watermains, not the installation of entirely new watermains.
- All projects recommended through this study constitute improvements to the system.
- The projects can be implemented over time, when opportunities for implementation arise. Timing for implementation has been recommended in the Master Plan to coincide with the Town's other proposed projects for interrelated infrastructure such as roads, sewers and storm sewers.



Recommended Water System

Town of Newmarket
Water and Wastewater Master Plan

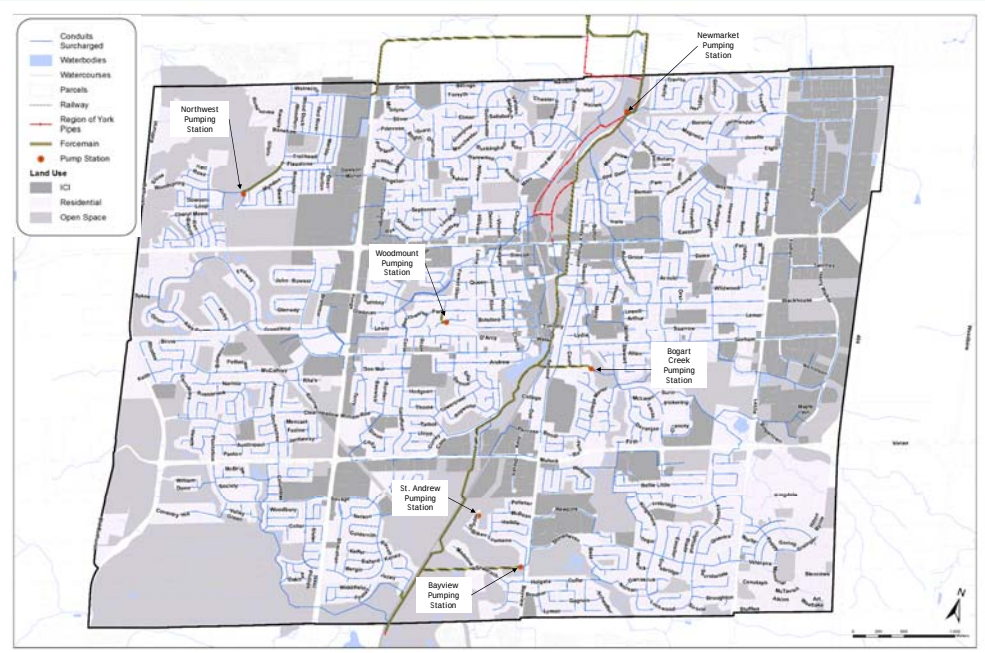
Project Label	Street Name	Extent	Existing ø (mm)	Proposed ø (mm)	Length (m)	Replacement Cost (2016 $)	Phasing Requirements	Schedule Class EA
W1	Bristol Road	Main Street North to Stiver Drive	200	300	1,680	$1,340,000	2037-2041	A
W2	Main Street North	From Regional Main to Bristol	200	300	15	$20,000	2017-2021	A
W3	George Street	Kingston Road to Davis Drive	150	200	657	$430,000	2022-2026	A
W4	Willow Lane	From existing 250 mm WM to Longford Drive	150	250	120	$90,000	2022-2026	A
W5	Huron Heights Drive	Davis Drive to existing 200 mm WM	150	200	185	$120,000	2017-2021	A
W6	Willstead Drive	Queen Street to Davis Drive	150	200	481	$310,000	2017-2021	A
W7	Queen Street	Millard Avenue to Parkside	150	200	390	$260,000	2017-2021	A
W8	Parkside Drive	Queen Street to existing 200 mm WM	150	200	130	$90,000	2027-2031	A
W9	Calgain Rd	Lorne Avenue to End	150	200	95	$60,000	2017-2021	A
W10	Lorne Avenue	Davis Drive to Calgain Road	150	200	135	$90,000	2017-2021	A
W11	Charles Street	Davis Drive to Queen Street	150	200	330	$220,000	2017-2021	A
W12	Glenway Circle	Eagle St. to existing 200 mm WM on Glenway Circle	150	200	540	$350,000	2017-2021	A
W13	Millard Avenue	Yonge Street to Queen Street	150	200	400	$260,000	2022-2026	A
				TOTAL UPGRADE COSTS:		**$3,640,000**		

Infrastructure Costing and Phasing

Town of Newmarket
Water and Wastewater Master Plan

There are four wastewater service areas in the Town of Newmarket as described below:

- Wastewater from the Green Lane area is conveyed by a series of Town local sewers to the York Region Northwest Sub-Trunk Sewer. This sewer conveys wastewater northwards to the Green Lane Trunk Sewer located in East Gwillimbury.
- Wastewater from the Newmarket north area is conveyed by a series of Town local, sub-trunk and trunk sewers to the Region's East Holland and West Holland Trunk Sewers. Town sub-trunk and trunk sewers include the Cherrywood Penn, Davis Drive, East Central, Elgin Street, Holland River, Leslie Valley, London Road, McCafferty Road, Patterson Street, Penn Amelia, Sanford Street, Sparrow Road, Stellar Drive, Wayne Drive, West Central, Western and Wilwood Drive.
- Wastewater from the south east is conveyed by a series of Town local sewers and the Bogart Creek Sub-trunk to the York Region Bogart Creek Pumping Station.
- Wastewater from south Newmarket is conveyed by a series of Town local, sub-trunk and trunk sewers to York Region's YDSS Trunk Sewer. Town sub-trunk and trunk sewers include Bayview Avenue, Colter Street and Doubletree Lane.



Existing Wastewater System

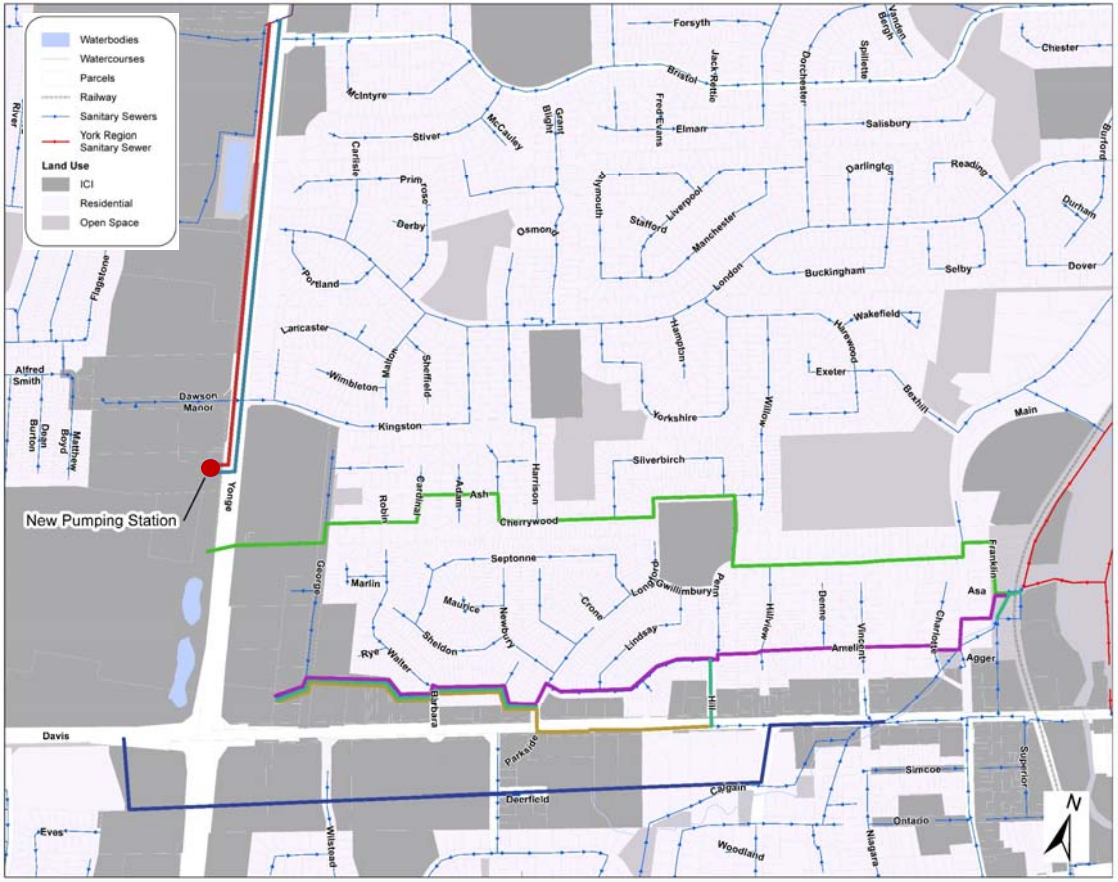
Town of Newmarket
Water and Wastewater Master Plan

Wastewater alternatives considered for servicing the Town of Newmarket were developed for three areas with limited capacity in the Newmarket North area. The three areas are:

- Cherrywood Penn Sub-Trunk Sewer
- East Central Sub-Trunk
- Holland River Trunk Sewer

Wastewater System Gaps

Town of Newmarket
Water and Wastewater Master Plan



- Alternative 1 - New sewer on Yonge Street to Northwest Sub-Trunk Sewer
- Alternative 2 - New pumping station and forcemain on Yonge Street to Northwest Sub-Trunk Sewer
- Alternative 3 - Replace Cherrywood Penn Sub-Trunk with new larger sewer
- Alternative 4 - Optimize Cherrywood Penn and Penn-Amelia Sub-Trunks and replace required sections
- Alternative 5 - Upgrade sections of Penn Amelia Sub-Trunk Sewer and build new sewer on Davis Drive
- Alternative 6 - New sewer on Future / Upgraded Ring Road
- Alternative 7 - Upgrade sections of Penn Amelia Sub-Trunk Sewer and new sewer on Hill Street

Wastewater Alternatives for Cherrywood Penn Sub-Trunk

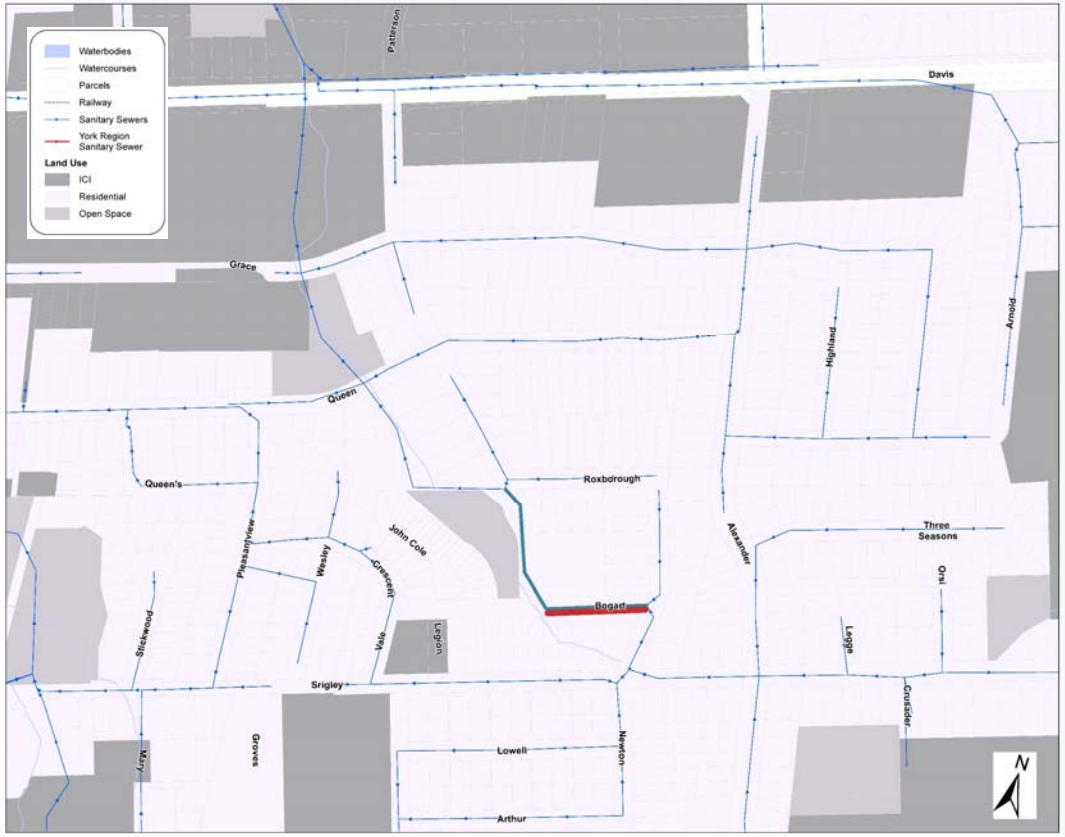
Town of Newmarket
Water and Wastewater Master Plan

	Natural Environment Considerations	Social and Cultural Environment Considerations	Technical and Operational Suitability	Economic Considerations	Overall Rating
Alternative 1	New sanitary sewer to be constructed along Yonge Street road allowance. Any potential impacts on existing trees can be mitigated through good construction practices.	Significant disruption to Regional traffic and transportation due to construction on Yonge Street corridor. Deep construction of sanitary sewer on Yonge Street would likely mean longer construction schedule.	Technically difficult construction on Yonge Street as new trunk sewer needs to be approximately 10m deep. More technically difficult trenchless technologies, such as microtunneling, may be required.	Estimated capital cost of $2.6M with minimal change to Town's existing operating and maintenance costs	Least Preferred
Alternative 2	New sanitary forcemain to be constructed along Yonge Street road allowance. Any potential impacts on existing trees can be mitigated through good construction practices.	Significant disruption to Regional traffic and transportation due to construction on Yonge Street corridor. New forcemain would be relatively shallow which would result in a shorter construction schedule than Alternative 1.	Alternative requires construction of new pumping station. New pumping station will increase Town operating and maintenance requirements.	Estimated capital cost of $6M with increase in Town's operating and maintenance costs	Least Preferred
Alternative 3	New sanitary sewers to be located on existing residential street road allowances. Any potential impacts on existing trees can be mitigated through good construction practices.	Significant disruption to residents on Cardinal, Ash, Cherrywood, Longford and Penn Streets during construction. Total length of construction on residential streets would be 2 km.	Alternative requires upgrade of Cherrywood Penn Sub-Trunk sewer. Construction will be on local roads within existing residential neighbourhoods.	Estimated capital cost of $2.1M with minimal change to Town's existing operating and maintenance costs	Less Preferred
Alternative 4	New sanitary sewers to be located on existing residential street road allowances. Any potential impacts on existing trees can be mitigated through good construction practices.	Significant disruption to residents on Walter, Penn, Amelia and Charlotte during construction. Total length of construction on residential streets would be 1.4km.	Alternative optimizes upgrade of sections of Cherrywood Penn and Penn Amelia Sub-Trunk Sewers. Construction will be on local roads within existing neighbourhoods.	Estimated capital cost of $1.6M with minimal change to Town's existing operating and maintenance costs	Less Preferred
Alternative 5	New sanitary sewers to be located on existing residential street road allowances and Davis Drive road allowance. Any potential impacts on existing trees can be mitigated through good construction practices.	Significant disruption during construction on residential Walter and Penn Streets. Significant disruption to Regional traffic and transportation on Davis Drive during construction. Total length of construction on residential streets would be 0.6km. Length of construction on Davis Drive would be 0.3km.	Alternative optimizes upgrade of sections of Cherrywood Penn and Penn Amelia Sub-Trunk Sewers. Less construction on local roads is required than Alternatives 3 and 4.	Estimated capital cost of $2.1M with minimal change to Town's existing operating and maintenance costs	Less Preferred
Alternative 6	New sanitary sewer to be located on future/ upgraded ring road and alignment would be selected to avoid creek crossing. Existing trees located along new road would likely need to be removed.	Disruption to private property owners on future roads. Construction of sewer will require easements and will impact private property.	Alternative eliminates the need to upgrade existing Penn Amelia or Cherrywood Penn Sub-Trunk Sewers	Estimated capital cost of $1.6M with minimal change to Town's existing operating and maintenance costs	Less Preferred
Alternative 7	New sanitary sewers to be located on existing residential street road allowances. Any potential impacts on existing trees can be mitigated through good construction practices.	Area of significant disruption during construction on residential Walter and Penn Streets. No disruption to traffic on Hill Street during construction as road allowance is not open to traffic. Length of construction on residential streets is 0.6 km.	Alternative optimizes upgrade sections of Cherrywood Penn and Penn Amelia Sub-Trunk Sewers. Less construction on local roads is required than Alternative 5.	Estimated capital cost of $1.0M with minimal change to Town's existing operating and maintenance costs	Most Preferred

Most Preferred Less Preferred Least Preferred

Evaluation of Wastewater Alternatives – Cherrywood Penn

Town of Newmarket
Water and Wastewater Master Plan



Alternative 1 -
Upgrade sewer on Bogart Avenue and on easement between Bogart Avenue and Roxborough Avenue

Alternative 2 -
New In-line storage sewer on Bogart Avenue

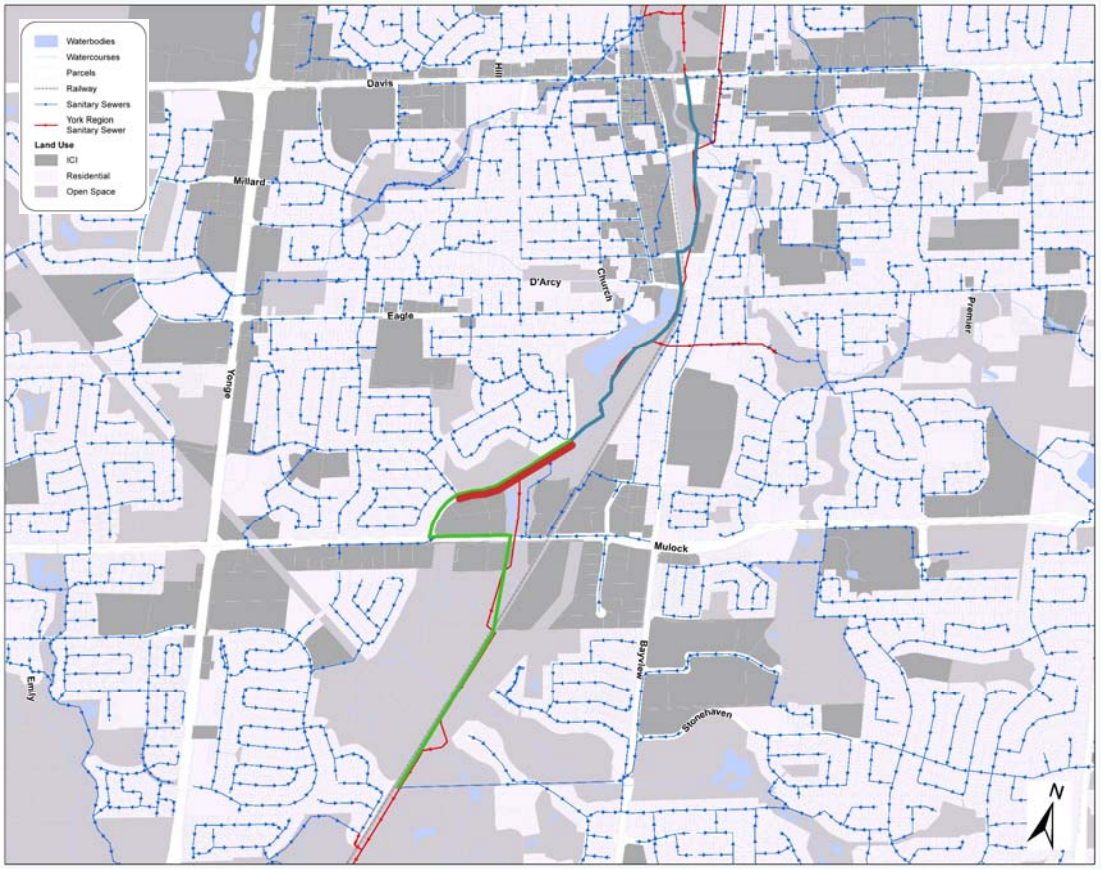
Wastewater Alternatives for East Central Sub-Trunk

	Natural Environment Considerations	Social and Cultural Environment Considerations	Technical and Operational Suitability	Economic Considerations	Overall Rating
Alternative 1	Construction required in wooded area between Bogart Avenue and Roxborough Road. New sewer will be constructed within creek floodplain and Lake Simcoe Region Conservation Area regulated area. Impacts on existing trees are anticipated.	Disruption to local residents on Bogart Avenue and on Roxborough Road during construction including traffic, noise and dust impacts.	Alternative requires construction on Bogart Avenue and existing Town easement. Access to the easement to complete any required inspection or maintenance would be limited due to tree cover and topography.	Estimated capital cost of $0.30M with no change to Town's existing annual operating and maintenance costs.	Least Preferred
Alternative 2	Construction required along Bogart Avenue road allowance. Any potential impacts on existing trees can be mitigated through good construction practices.	Disruption to local residents on Bogart Avenue during construction including traffic, noise, and dust impacts.	Construction will be on local road. Town will have no issues with access to this sewer to complete required inspection or maintenance activities.	Estimated capital cost of $0.97M with marginal increase to Town's existing operating and maintenance costs.	Most Preferred

Most Preferred Less Preferred Least Preferred

Evaluation of Wastewater Alternatives – East Central

Town of Newmarket
Water and Wastewater Master Plan



Alternative 1 -
Upgrade Holland River Trunk Sewer

Alternative 2 -
New In-line storage sewer on Cane Parkway

Alternative 3 -
New sewer on Cane Parkway,
Mulock Drive and rail corridor to YDSS

Wastewater Alternatives for Holland River Trunk Sewer

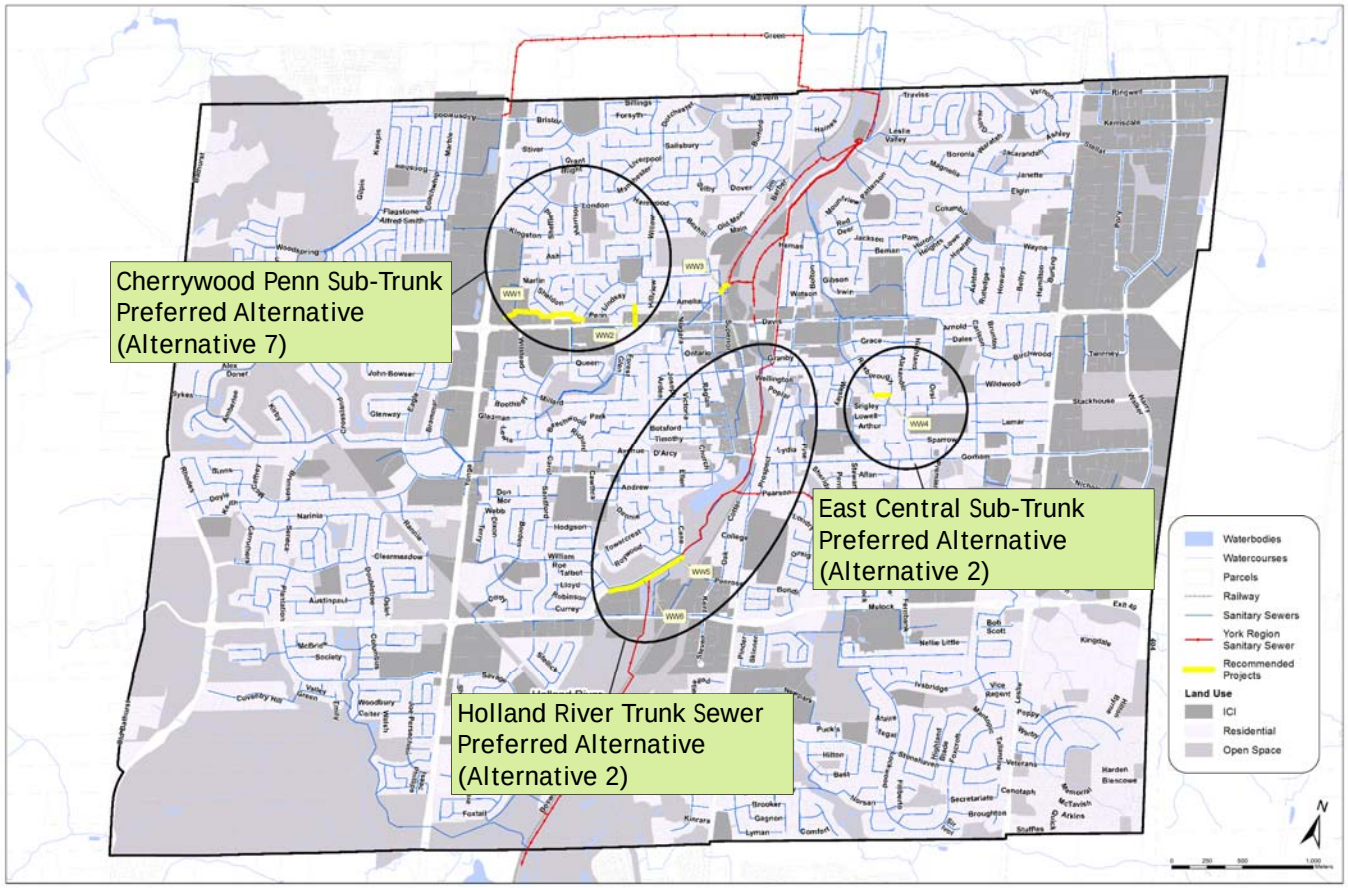
Town of Newmarket
Water and Wastewater Master Plan

	Natural Environment Considerations	Social and Cultural Environment Considerations	Technical and Operational Suitability	Economic Considerations	Overall Rating
Alternative 1	Construction required along East Holland River from Cane Parkway to north of Davis Drive within LRSCA regulated area and valley lands. Any impacts on the East Holland River from construction activities can be mitigated through good construction practices.	Significant disruption to users of parklands and trails located within East Holland River valley lands are anticipated during the construction of this alternative.	Alternative would require technically difficult trenchless technology method, such as microtunneling.	Estimated capital cost of $9.0M with minimal change to Town's existing operating and maintenance costs.	Least Preferred
Alternative 2	Construction required on Cane Parkway within LRSCA regulated area. Construction within floodplain area would be limited. Other potential impacts to the natural environment are limited as the new sewer would be located along the Cane Parkway road allowance.	Disruption to local residents and traffic on Cane Parkway during construction.	New storage pipe would be located to avoid Regional YDSS forcemain. New storage facility would require ongoing maintenance to ensure proper operation.	Estimated capital cost of $2.8M with marginal increase in Town's existing operating and maintenance costs.	Most Preferred
Alternative 3	Construction required on Cane Parkway, Mulock Drive and on rail corridor within LRSCA regulated area. Crossing of East Holland River would be needed.	Disruption to local residents on Cane Parkway and to Regional traffic on Mulock Drive.	Detailed design of new trunk sewer would need to consider location of planned YDSS forcemain along Cane Parkway and Mulock Drive.	Estimated capital cost of $3.0M with minimal change to Town's existing operating and maintenance cost.	Less Preferred

Most Preferred Less Preferred Least Preferred

Evaluation of Wastewater Alternatives – Holland River

Town of Newmarket
Water and Wastewater Master Plan



Recommended Wastewater System

Town of Newmarket
Water and Wastewater Master Plan

Preferred Alternative	Project Label	Street Name	Extent	Existing ø (mm)	Proposed ø (mm)	Length (m)	Replacement Cost (2016 $)	Phasing Requirements	Schedule Class EA
Cherrywood Penn Sub-Trunk (Alternative 7)	WW1	Walter Avenue, Newbury Drive, Longford Drive, Penn Avenue	Walter Avenue from Rye Avenue to Newbury Drive, Newbury Drive from Walter Avenue to Longford Drive, Longford Drive from Newbury Drive to Penn Avenue, Penn Avenue from Longford Drive to Hill Street	300	375	631	$577,000	2022 – 2026	A+
	WW2	Hill Street	Penn Avenue to Davis Drive	-	250	140	$289,000	2022 – 2026	A+
	WW3	Main, Franklin Street and Easement	Main Street from Amelia to easement, easement from Main Street to Franklin Street, Franklin Street from easement to easement	375	450	184	207,000	2022 – 2026	A+
East Central Sub-Trunk (Alternative 2)	WW4	Bogart Avenue	Roxborough Avenue to cul-de-sac end	300	2 m x 3 m box culvert	120	$1,359,000	2017 – 2021	A+
Holland River Trunk Sewer (Alternative 2)	WW5	Cane Parkway	North curve to Regional forcemain easement	300	375	175	$159,000	2017 – 2021	A+
	WW6	Cane Parkway	North of Mulock Drive to Regional forcemain	-	2 m x 3 m box culvert	316	$3,579,000	2017 – 2021	A+
					TOTAL UPGRADE COSTS:		**$6,170,000**		

Wastewater Infrastructure Costing and Phasing

Town of Newmarket
Water and Wastewater Master Plan

Newmarket
www.newmarket.ca

Thank you for attending this Public Information Centre.
Please Complete a Comment Sheet before you leave.

If you have any additional comments or questions please contact:

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Engineering Services Department
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395 Mulock Drive, P.O. Box 328
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Project Team Contacts

WSP
XCG Environmental Engineers & Scientists

Newmarket

Town of Newmarket Water and Wastewater Master Plan

Public Information Centre

June 21, 2016

SIGN-IN SHEET

Please Print Clearly

NAME, ORGANIZATION	ADDRESS	EMAIL ADDRESS	PHONE #	ADD TO MAILING LIST
Gray Cavanagh	373 Howell Circle	graycavanagh@rogers.com	705-853-7075	YES / NO
Elaine Cavanagh	" " "	"	"	YES / NO
Natasha Charles Georgina Is.	Georgina Is	natasha.charles@georgina island.com	—	YES / NO
Kerry-Ann Charles Georgina Island	" "	kerry-ann.charles@georgina island.com	—	YES / NO
Forrest Group	590 Alden Rd Suite 211, Markham L3R 8N2	chris.babyk@bobfor.com	416 573 1776	YES / NO
Oxford Properties Upper Canada Mall	1 MONUE ST	bstuart@oxfordproperties.com		YES / NO

Under the Freedom of Information and Protection of Privacy Act and the Environmental Assessment Act, unless otherwise stated in the submission, any personal information such as name, address, telephone number and property location included in a submission will become part of the public record files for this matter and will be released, if requested, to any person.

Thank you for your participation in this study

Newmarket

Town of Newmarket Water and Wastewater Master Plan

Public Information Centre

June 21, 2016

SIGN-IN SHEET

Please Print Clearly

NAME, ORGANIZATION	ADDRESS	EMAIL ADDRESS	PHONE #	ADD TO MAILING LIST
Joe Lasitz Counterpoint Engineering	8395 Jane Street #100 Vaughan ON L4K 5Y2	jlasitz@counterpointeng.com	416-542-4054	(YES) / NO
Oz Kemal MHBC	7050 Weston Road, Ste 230 Woodbridge, ON L4L8G7	okemal@mhbcplan.com	905.761.5588 x225	(YES) / NO
Farshad Salehzadeh Cole Eng.	70 Valleywood Dr. Unit 4T5	fsalehzadeh@ColeEng.	905.940.6161	YES / (NO)
ED UNBONAUCUS ROXBOROUGH R.R.	1 ROXBOROUGH RD	ESM.Rox@VERVESENIORLIVING.com	905 853 4573	(YES) / NO
IAN MAXWELL ROXBOROUGH R.R.	"	G M. ROX @ VERVESENIORLIVING.CA	"	(YES) / NO
Michael Vani Weston Consulting	201 Millway Ave Suite 19 Vaughan L4K 5K8	mvani@westonconsulting.com	905-738-8080 x252	(YES) / NO

Thank you for your participation in this study

Newmarket

Town of Newmarket Water and Wastewater Master Plan

Public Information Centre

June 21, 2016

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Please Print Clearly

NAME, ORGANIZATION	ADDRESS	EMAIL ADDRESS	PHONE #	ADD TO MAILING LIST
David Woods Tricap Properties	8688 Woodbine Ave Markham ON L3R 8B9	dwoods@tricapproperties.com	905 470 8777	YES / NO
Dan Schneider		electron zeedee hotmail.com		YES / NO
				YES / NO
				YES / NO
				YES / NO
				YES / NO

Under the Freedom of Information and Protection of Privacy Act and the Environmental Assessment Act, unless otherwise stated in the submission, any personal information such as name, address, telephone number and property location included in a submission will become part of the public record files for this matter and will be released, if requested, to any person.

Thank you for your participation in this study

Scott, Beth

	Holden, Stan
Sent:	Monday, June 27, 2016 5:17 PM
To:	Kerry Ann Charles; gmacmillan@newmarket.ca
Cc:	Donna Big Canoe; Janice Taylor; Natasha Charles; Lenkiewicz, Karen; Christine Hill (christine.hill@xcg.com); Scott, Beth; Prudhomme, Rachel; Majdi, Sepideh
Subject:	RE: Newmarket Water and Waste Water Master Plan

Dear Ms. Charles,

Thank you for reaching out to our project team with regards to the ongoing Town of Newmarket Water and Wastewater Master Plan. We understand the value of transparent communications and consultation on Class Environmental Assessments (EA's) such as the Town's Master Plan. As such, we would like to meet with you and any other members of your community to address any questions and concerns regarding the Town's Study. We would like to meet with you at your earliest convenience. Please advise of your team's availability on the week of July 11th or 18th, if those weeks are suitable for you, or advise which other weeks and days you are available.

To ensure our team is best prepared to answer all of your questions and concerns, please let us know in advance of our meeting which components of the consultation materials presented at the June 21st Public Information Centre (PIC) you wish our team to review at the meeting, as well as your major concerns with regards to the Study. We want to ensure we are prepared to fully answer your questions so that we can make optimal use of your time when we meet.

We understand that the proposition of the Upper York Sewage Solution (UYSS) is a major concern to you and your community. Following the PIC, we reached out to York Region regarding the consultation they have undertaken for their proposed project. This was actually the reason for our delay in contacting you to arrange a meeting, as we wanted to first understand what materials were previously presented and discussed with regards to the York Region Water and Wastewater Master Plan. This will allow us to better focus our meeting with you.

We have also checked our study mailing list and confirmed that a Notice of Study Commencement and Notice of PIC was mailed to the Chief of the Chippewas of Georgina Island First Nation at the following address:

Ms. Donna Big Canoe
Chief, Chippewas of Georgina Island
Administration Office
R.R.#2 Box N-13
Sutton West, ON L0E 1R0

Please confirm that this is the address to which we should send written communications. We do follow up by phone with regards to sent notices to Aboriginal communities; however, written notices are always the first step and therefore we want to ensure we have the correct contact information. We have also included the following contacts to our list:

Ms. Kerry-Ann Charles
Environment Co-ordinator, Chippewas of Georgina Island
Administration Office
R.R.#2 Box N-13
Sutton West, ON L0E 1R0
kerry.charles@georginaisland.com

Ms. Natasha Charles
Chippewas of Georgina Island
Administration Office
R.R.#2 Box N-13
Sutton West, ON L0E 1R0
natasha.charles@georginaisland.com

We look forward to hearing from you.

Regards,

Stan C. Holden, P.Eng
Sr. Director, Municipal Infrastructure

WSP Canada Inc.
600 Cochrane Drive, 5th Floor
Markham, Ontario L3R 5K3 Canada
T +1 905 475-7270 #18233
F +1 905 475-5994
C +1 416 779-8313

www.wspgroup.com

Please consider the environment before printing...

From: Kerry Ann Charles [mailto:kerry.charles@georginaisland.com]
Sent: Friday, June 24, 2016 10:46 AM
To: Holden, Stan; gmacmillan@newmarket.ca
Cc: Donna Big Canoe; Janice Taylor; Natasha Charles
Subject: Newmarket Water and Waste Water Master Plan

Good Morning Mr. Holden and Mr. MacMillan

I am writing to you this morning as myself and a colleague attended your Public Information Session on Tuesday June 21st at the Council Chambers in Newmarket in regards to your Water and Waste Water Master Plan. We were very disappointed in the information that was provided and the lack of knowledge about the Duty to Consult to First Nations.

The information that was provided was very technical and without a proper presentation, the general public, in which the PIC was for, would not understand and therefore not be able to ask appropriate questions and make an informed decision about the plan.

Also after reviewing the poster boards, I spoke to one of the representatives (Christine) and posed the question of how this Plan tied into York Regions Plan and was told that consultations with York Region were conducted throughout the development of Newmarkets Plan and that information from the York Plan was integrated into the NewMarket Plan. I then posed the question of how the Upper York Sewage Solutions (UYSS) Project tied into the Newmarket Plan and was not given a definitive answer. I was told that some of the sewage from Newmarkets growth would be pumped to York Regions STP and that it would probably at some point tie into the UYSS but what York Region does with it was not the

concern of Newmarket. This answer was not satisfactory. I informed the representatives that I was the Environment Co-ordinator for the First Nation and until recently was not aware that there had been any consultation with our First Nation during the development of this plan and that there was legislation for the Duty to Consult with First Nations on projects such as these as it may have an effect on our Traditional Territory and/or rights, in which this particular project would. They were unaware of whether or not our Community had been consulted and stated that they would have to check their mailing list. I also stated to them that if they had been in consultation with York Region throughout the development of the Plan that they should be well aware that we have been in discussion with York Region in regards to the UYSS project over the past 4 years and that we are opposed to the UYSS project. At that time I advised the representatives that they need to contact me as my Chief and Council would likely want to set up a meeting with them to discuss this Plan in further detail.

With that said, I have yet to receive any correspondence and I am formally requesting that I be contacted to set up a meeting to discuss the Plan that the Town of Newmarket is proposing to service the water and waste water for future growth.

Respectfully,

Kerry-Ann Charles
Chippewas of Georgina Island First Nation
Environment Co-ordinator
Telephone (705) 437-1337 ex 2233
Fax (705) 437 4597

GEORGINA ISLAND

Scott, Beth

	Holden, Stan
Sent:	Monday, June 27, 2016 4:09 PM
To:	Lenkiewicz, Karen; Scott, Beth
Subject:	Fwd: Further Information
Attachments:	151-04561_Newmarket W&WW MP PIC Boards_v2.1_20160617.pdf; ATT00001.htm

Sent from my iPhone

Begin forwarded message:

From: "MacMillan, Gord" <gmacmillan@newmarket.ca>
To: "dorellana@mhbcplan.com" <dorellana@mhbcplan.com>
Cc: "Majdi, Sepideh" <smajdi@newmarket.ca>, "Holden, Stan" <Stan.Holden@wspgroup.com>
Subject: FW: Further Information

Hi Daniel. Sorry for the late reply but attached is a copy of the presentation Boards for the PIC from last week.

Regards!

Gord MacMillan, P.M.P., P.Eng.
Manager, Capital Projects
Engineering Services Department
905-953-5300, press 2, ext. 2503

Cell: 905-716-2476
gmacmillan@newmarket.ca
www.newmarket.ca
Follow us on Twitter @townofnewmarket
Newmarket: A Community *Well* Beyond the Ordinary

From: Daniel Orellana [mailto:dorellana@mhbcplan.com]
Sent: June-21-16 9:28 AM
To: MacMillan, Gord
Subject: Further Information

Good Morning Mr. MacMillan,

I was recently informed about the PIC being held tonight and I was hoping you could send me the slides or relevant handouts for the meeting as I am unable to attend. I am planning student at Ryerson University and have family who live in Newmarket so this master plan is something I would like to stay knowledgeable about.

Also is there a email list I can be added to, stay informed?

Thanks,

DANIEL ORELLANA | Planning Student

MHBC Planning, Urban Design & Landscape Architecture
7050 Weston Road, Suite 230 | Woodbridge | ON | L4L 8G7 | T 905 761 5588 x 218 | F 905 761 5589 dorellana@mhbcplan.com

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Scott, Beth

From: David Woods <DWoods@tricapproperties.com>
Sent: Thursday, June 23, 2016 5:47 PM
To: Scott, Beth
Subject: RE: Newmarket W&WW Master Plan - PIC

Beth,

Thanks very much.

Regards,

Davde

David Woods
Vice President, Development

TRICAP PROPERTIES
8688 Woodbine Ave, Suite 100 | Markham, ON | L3R 8B9
P: 905 470 8777 | F: 905 475 1877 | http://www.tricapproperties.com/

From: Scott, Beth [mailto:Beth.Scott@wspgroup.com]
Sent: Wednesday, June 22, 2016 9:25 AM
To: David Woods <DWoods@tricapproperties.com>
Subject: Newmarket W&WW Master Plan - PIC

Hi David,

As discussed, please find attached the PIC boards for the Newmarket Water and Wastewater Master Plan.

Beth Scott, B.Eng., E.I.T.

WSP Canada Inc.
600 Cochrane Drive, Suite 5
Markham, Ontario L3R 5K3 Canada
T 905-475-8727 #18338

F 905-475-5994

www.wspgroup.com

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Scott, Beth

From: Patricia Montgomery-Rundle <mbutterfly47@gmail.com>
Sent: Sunday, June 05, 2016 7:01 AM
To: Scott, Beth
Subject: Re: Notice of PIC - Newmarket W&WW Master Plan

Thank you Beth for the attached information. Unfortunately I cannot attend the meeting as I have a previous commitment with the Newmarket Historical Society Board of Directors on that evening.
Please keep me informed about future meetings.
Sincerely,
Patricia Montgomery

On Tue, May 31, 2016 at 10:48 AM, Scott, Beth <Beth.Scott@wspgroup.com> wrote:

> Good morning,
>
> Please see attached the Notice of Public Information Centre (PIC) being held as part of the Town of Newmarket's efforts to undertake a Water and Wastewater Master Plan.
>
> Regards,
>
> **Beth Scott**, B.Eng., E.I.T.
>
> **WSP Canada Inc.**
> 600 Cochrane Drive, Suite 5
>
> Markham, Ontario L3R 5K3 Canada
> T 905-475-8727 #18338
>
> F 905-475-5994
>
> www.wspgroup.com

Please consider the environment before printing...

Scott, Beth

From: Holden, Stan
Sent: Thursday, August 04, 2016 2:45 PM
To: Scott, Beth; Lenkiewicz, Karen; Christine Hill
Subject: Fwd: Newmarket W&WW MP PIP

FYI m

Sent from my iPhone

Begin forwarded message:

> **From:** Melinda Bessey <M.Bessey@lsrca.on.ca>
> **Date:** August 4, 2016 at 11:55:27 AM EDT
> **To:** "Holden, Stan" <Stan.Holden@wspgroup.com>
> **Subject: RE: Newmarket W&WW MP PIP**
>
> Hi Stan,
>
> Thank you for providing the information regarding the Newmarket Water and Wastewater Master Plan. We do not have any concerns with the "most preferred" options for the water and wastewater alternatives. We do note with respect to the wastewater alternative for the Holland River Trunk Sewer which runs through an area regulated by Ontario Regulation 179/06 under the Conservation Authorties Act that appropriate measures be taken with respect to site alteration and construction within a floodplain area.
>
> Should you have any questions, please feel free to call.
>
> Kind regards,
>
> **Melinda Bessey, MSc, MCIP, RPP**
> Development Planner
> **Lake Simcoe Region Conservation Authority**
> 120 Bayview Parkway,
> Newmarket, Ontario L3Y 3W3
> 905-895-1281, ext. 151 | 1-800-465-0437 | Mobile: 905-955-3730
> m.bessey@LSRCA.on.ca | www.LSRCA.on.ca
>
> Twitter: @LSRCA
> Facebook: LakeSimcoeConservation
>
>

From: Holden, Stan [mailto:Stan.Holden@wspgroup.com]
Sent: Thursday, July 28, 2016 9:22 AM
To: Melinda Bessey
Cc: Lenkiewicz, Karen; Scott, Beth; Majdi, Sepideh (smajdi@newmarket.ca)
Subject: Newmarket W&WW MP PIP

Melinda

Further to our discussion, attached is a copy of the PIC boards for the Newmarket Water and Wastewater Master Plan held on June 21st in Newmarket. We are in the process of drafting the final report but would welcome any comments you may have. If you have any question please call me.

Regards

Stan C. Holden, P.Eng
Sr. Director, Municipal Infrastructure

WSP Canada Inc.
600 Cochrane Drive, 5th Floor
Markham, Ontario L3R 5K3 Canada
T +1 905 475-7270 #18233
F +1 905 475-5994
C +1 416 779-8313

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Please consider the environment before printing...

Scott, Beth

From: Lynn Barkey <lbarkey@baifdev.com>
Sent: Tuesday, May 31, 2016 2:45 PM
To: Scott, Beth
Subject: FW: Notice of PIC - Newmarket W&WW Master Plan
Attachments: 20160530-Notice_of_PIC_Newmarket_W&WW_MP.pdf

Hi Beth. Please take Ms Houser off your list and add my name for Criterion. We own 2 parcels of land that front on Yonge Street (one is at the southwest corner of Yonge and Mulock and the other is on the west side of Yonge, just north of the Mulock Family Estate lands.

Thanks

L

Lynn Barkey | **BAIF Developments Limited** | **Criterion Development Corporation** | 3625 Dufferin Street, Suite 404 | Downsview, ON | M3K 1N4 | Phone (416) 638-9000 ext. 304 | Fax (416) 636-7218 | lbarkey@baifdev.com | Cell (416) 986-9889

From: Houser, Roslyn [mailto:rhouser@goodmans.ca]
Sent: May-31-16 2:34 PM
To: Lynn Barkey <lbarkey@baifdev.com>
Subject: FW: Notice of PIC - Newmarket W&WW Master Plan

Hi Lynn,

Not sure why this came to me. Is this something you are already aware of?

Roz

Roslyn Houser
Goodmans LLP

416.597.4119
rhouser@goodmans.ca

Bay Adelaide Centre
333 Bay Street, Suite 3400
Toronto, ON M5H 2S7
goodmans.ca

From: Scott, Beth [mailto:Beth.Scott@wspgroup.com]
Sent: Tuesday, May 31, 2016 10:48 AM
To: Scott, Beth
Cc: Lenkiewicz, Karen
Subject: Notice of PIC - Newmarket W&WW Master Plan

Good morning,

Please see attached the Notice of Public Information Centre (PIC) being held as part of the Town of Newmarket's efforts to undertake a Water and Wastewater Master Plan.

Regards,

Beth Scott, B.Eng., E.I.T.

WSP Canada Inc.
600 Cochrane Drive, Suite 5
Markham, Ontario L3R 5K3 Canada
T 905-475-8727 #18338
F 905-475-5994

www.wspgroup.com

Please consider the environment before printing...

151-04561-00

July 12, 2016

Ministry of Indigenous Relations and Reconciliation
Consultation Unit
4th floor
160 Bloor St E
Toronto ON M7A 2E6

Subject: Town of Newmarket Water and Wastewater Master Plan
Consulting Indigenous Communities

To Whom It May Concern,

We are contacting you, the Consultation Unit of the Ministry of Indigenous Relations and Reconciliation (MIRR), to confirm that the appropriate Indigenous communities have been consulted for the ongoing Town of Newmarket Water and Wastewater Master Plan project. The Master Plan is being undertaken to identify the required improvements and/or expansion to the Town's water distribution and wastewater collection systems to support existing and proposed growth within the Town. The Master Plan will be a long-term plan for system improvements to meet servicing demands (meeting the Places to Grow Act) to 2041.

The Master Plan addresses the system improvements only related to the Town of Newmarket's local water distribution and wastewater collection systems, as the Regional Municipality (York Region) is responsible for providing water and wastewater treatment, pumping as well as water storage for the Town's local water distribution and wastewater collection systems.

The Master Plan is being prepared in accordance with the requirements of the Municipal Class Environmental Assessment document prepared by the Municipal Engineers Association (MEA) (October 2000, as amended in 2007, 2011 and 2015). Consultation with the public, which includes stakeholders, interested parties and government review agencies, is a necessary and important component of the Municipal Class Environmental Assessment (Class EA) process. A Public Information Centre (PIC) was held on June 21, 2016 to present to the public and relevant stakeholders the status and findings of the Town of Newmarket Water and Wastewater Master Plan and to address any concerns they may have. The PIC consisted of display boards that presented an overview of the Master Plan's purpose and background, the alternative and recommended servicing solutions, and the evaluation criteria used to determine the recommended servicing solutions.

WSP Canada Inc.
600 Cochrane Drive
5th Floor
Markham, ON L3R 5K3

Phone: 905-475-7270
Fax: 905-475-5994
www.wspgroup.com

As part of this inquiry we are providing the following information for you to review to understand the project and to provide a basis for confirming the appropriate Indigenous Communities that should be consulted with for this Master Plan project.

1. Project description and key map
2. Contact information for First Nation and Metis communities consulted
3. Previous and future approvals related to the Master Plan

The next steps in the Master Plan are to complete the public consultation process by addressing any outstanding questions and concerns, and to develop a Master Plan report that will be used as an overall guide for planning and implementing the water and wastewater infrastructure within the Town of Newmarket.

Should you have any questions or wish to discuss the Town of Newmarket Water and Wastewater Master Plan directly, please do not hesitate to call the undersigned at 905 475-7270, ext.18233

Yours truly,

WSP Canada Inc.

Stan Holden, P.Eng.
Senior Director, Municipal Infrastructure

1 PROJECT DESCRIPTION

The Corporation of the Town of Newmarket has retained WSP to undertake a Water and Wastewater Master Plan to identify the required improvements and/or expansion to the Town's water distribution and wastewater collection systems to support existing and proposed growth within the Town, including the intensification of the Urban Centres Secondary Plan area. The Master Plan will be a long-term plan for system improvements to meet servicing demands to 2041.

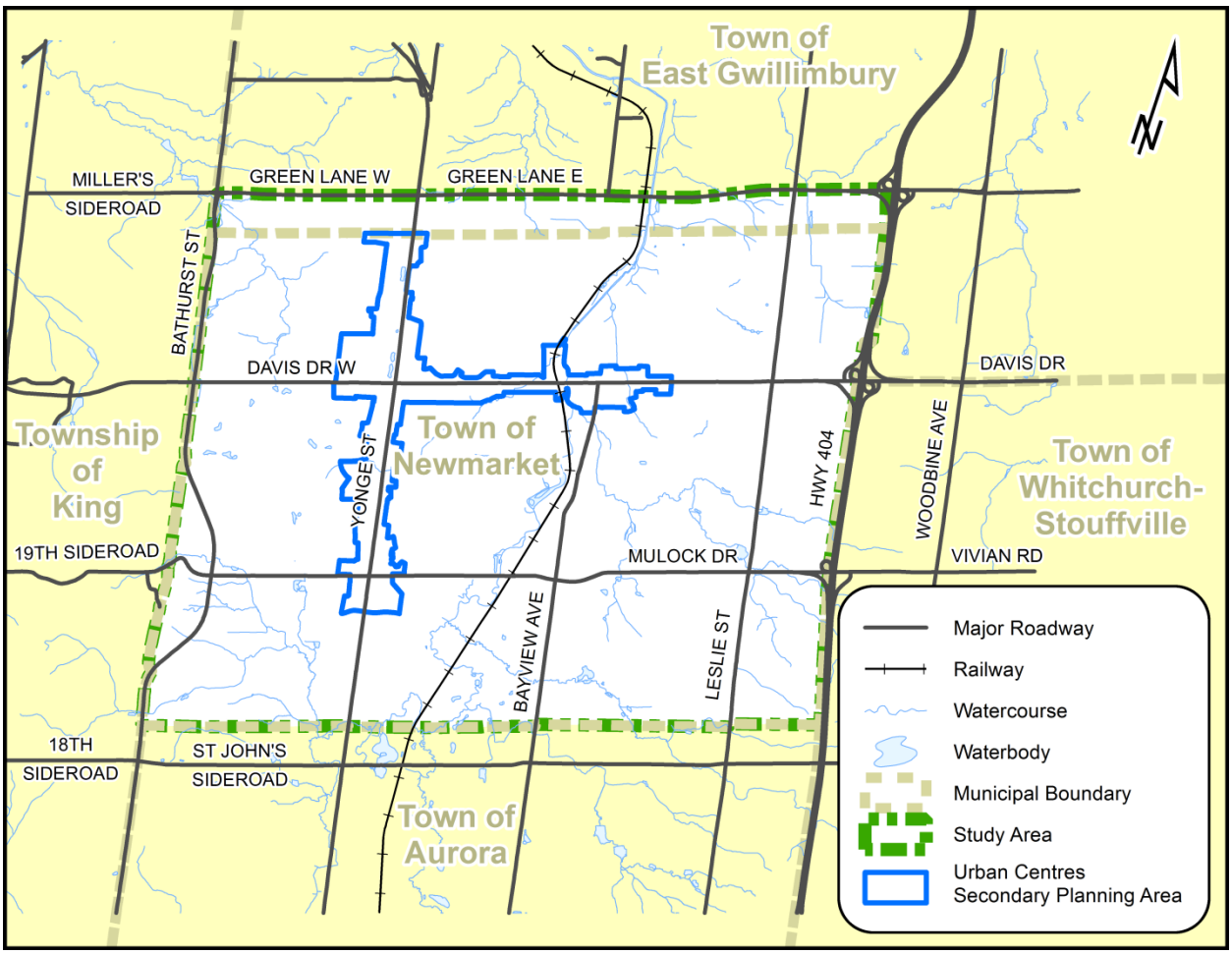
Master Plans are long-range plans that identify infrastructure requirements for existing and future land use within a larger study area through the application of environmental assessment principals. There are several approaches to undertaking Master Plans; however, a general requirement of all Master Plan studies is that they satisfy Phase 1 and part of Phase 2 of the Municipal Class Environmental Assessment (Class EA) process. The five phases outlining the procedures to be followed to satisfy the Class EA requirements for municipal infrastructure projects are listed below.

- Phase 1: Problem Definition
- Phase 2: Identification and Evaluation of Alternative Solutions to Determine a Preferred Solution
- Phase 3: Examination of Alternative Methods of Implementation of the Preferred Solution
- Phase 4: Documentation of the Planning, Design and Consultation Process
- Phase 5: Implementation and Monitoring

The Town of Newmarket is completing this Master Plan using Approach #1 of the Class EA process, whereby Phases 1 and 2 of the Class EA process are completed and all Schedule A and A+ projects may proceed to be implemented without further study. See Section 3 of this submission for a description of Schedule A and A+ projects. The Study will make recommendations regarding the water and wastewater infrastructure projects required to service the Town, focusing solely on the Town's local distribution and conveyance systems, and not treatment requirements (as the Regional Municipality, York Region, is responsible for water and wastewater treatment). That said, any projects identified as Schedule B or C projects will require a separate Class EA study.

The Study Area considered in the Master Plan is illustrated in Figure 1. All infrastructure improvements and/or expansions to the Town's local water and wastewater systems will be located within the Study Area. The Urban Centres Secondary Planning Area is where most of the future population growth for Newmarket will be located. As such, careful consideration has been given to the future infrastructure required to service the area.

Figure 1 Study Area



OPPORTUNITY STATEMENT

The first step within the Class EA process is to develop an opportunity statement identifying the issue(s) to be addressed by the Study. The opportunity statement for the Town of Newmarket's Water and Wastewater Master Plan is shown below.

The Master Plan is being undertaken to identify and evaluate alternatives to provide water and wastewater servicing options for existing and future development in the Town of Newmarket, to 2041, as planned for in the Official Plan, including OPA #10 (the Urban Centres Secondary Plan).

STUDY OBJECTIVE

To identify the required improvements to the Town's water distribution and wastewater collection systems to support existing and future development, including the proposed growth in the Urban Centres Secondary Plan.

2 FIRST NATION AND METIS COMMUNITIES CONSULTED

Federal and provincial websites including Indigenous and Northern Affairs Canada (INAC) and Aboriginal and Treaty Rights Information System (ATRIS), respectively, were consulted to develop a list of all Indigenous communities affected by the Town of Newmarket's Water and Wastewater Master Plan. To meet the Class EA consultation requirements for this study, the Town of Newmarket ensured that the following First Nation and Metis Communities were informed of the study and given the opportunity to provide input (both written and verbal) on the assessment and evaluation process for the Master Plan.

- Chippewas of Georgina Island First Nation

  Ms. Donna Big Canoe
  Chief, Chippewas of Georgina Island
  Administration Office
  R.R.#2 Box N-13
  Sutton West, ON L0E 1R0

- Metis Nation of Ontario

  Metis Nation of Ontario (Head Office)
  Consultation Unit
  500 Old Patrick Street, Unit D
  Ottawa, ON K1N 9G4
  Phone: 613-798-1488
  Email: mno@metisnation.org

The key points of contact that have been undertaken throughout the course of the project include the Notice of Study Commencement issued on September 17, 2015, Notice of Public Information Centre (PIC) issued May 31, 2016 and the Public Information Centre (PIC) held on June 21, 2016. In addition to Ms. Donna Big Canoe of the Chippewas of Georgina Island First Nation, included on our mailing list since the commencement of the project, the following individuals were added to our contact list, as requested, following the PIC.

Ms. Kerry-Ann Charles
Environment Co-ordinator, Chippewas of Georgina Island
Administration Office
R.R.#2 Box N-13
Sutton West, ON L0E 1R0
kerry.charles@georginaisland.com

Ms. Natasha Charles
Chippewas of Georgina Island
Administration Office
R.R.#2 Box N-13
Sutton West, ON L0E 1R0
natasha.charles@georginaisland.com

3 PREVIOUS AND FUTURE APPROVALS RELATED TO THE MASTER PLAN

PREVIOUS APPROVALS

There are no previous approvals associated with the recommended preferred servicing solutions (projects) identified in the Town of Newmarket's Water and Wastewater Master Plan.

FUTURE APPROVALS

The study uses Master Plan Approach #1 whereby Phases 1 and 2 of the Class EA process are completed and all Schedule A and A+ projects may proceed to be implemented without further study. All the recommended preferred servicing solutions (projects) identified in the Town of Newmarket's Water and Wastewater Master Plan have been categorized as either Schedule A or A+, and therefore do not require further study.

The following provides some general characteristics of Schedule A and Schedule A+ projects.

Schedule A

- → These projects generally include normal or emergency operational and maintenance activities.
- → The environmental effects of these activities are usually minimal and, therefore, these projects are pre-approved.
- → Typical projects that follow a Schedule A process will be the construction of watermains and sewers within existing road allowances where no watercourse crossings are required.

Schedule A+

- → In 2007, the MEA introduced the Schedule A+ classification. These projects are pre-approved; however, the public is to be advised prior to project implementation. The manner in which the public is advised is to be determined by the proponent.

AGENDA

The Town of Newmarket Water/Wastewater Master Plan
Meeting with the Chippewas of Georgina Island First Nation

Chippewas of Georgina Island First Nation Community Centre, September 29, 2016 - 1:30 to 2:30 am

Invited:

- Chippewas of Georgina Island First Nation (as coordinated by Kerry-Anne Charles, Environmental Co-ordinator)
- Sepideh Majdi, ToN, Capital Projects Engineer
- Gord MacMillan, ToN, Manager, Capital Projects
- Stan Holden, WSP
- Christine Hill, XCG
- Karen Lenkiewicz, WSP
- Beth Scott, WSP

1. Introductions
2. Status of the Master Plan
   - 2.1. Update Since the PIC (June 21, 2016)
3. Purpose of Today's Meeting
4. Review of PIC Materials
   - 4.1. Development of the Master Plan
   - 4.2. Wastewater Servicing Alternatives and Recommended Solutions
5. Discussion on Consistency with the Regional Master Plan
6. Other

WSP Canada Inc.
600 Cochrane Drive, 5th Floor
Markham, Ontario
www.wspgroup.com

MEETING SUMMARY

The Town of Newmarket Water & Wastewater Master Plan
Meeting with the Chippewas of Georgina Island First Nation

Date:	September 29, 2016	**Project:**	151-04561-00
Time:	2:30 – 3:45 pm	**Location:**	Chippewas of Georgina Island First Nation Administration Building

Bill McCue (BM)	Chippewas of Georgina Island
Kerry-Anne Charles (KAC)	Chippewas of Georgina Island
Donna Big Canoe (DBC)	Chippewas of Georgina Island
Patricia Big Canoe (PBC)	Chippewas of Georgina Island
Janice Taylor (JT)	Chippewas of Georgina Island
Sepideh Majdi (SM)	ToN, Capital Project Engineer
Karen Lenkiewicz (KL)	WSP, Consultant Assistant Project Manager
Beth Scott (BS)	WSP, Consultant Project Coordinator
Christine Hill (CH)	XCG, Wastewater System Analysis/Hydraulics Lead

Purpose: Meeting with the Chippewas of Georgina Island First Nation

Distribution: Attendees, Stan Holden (WSP), Shu He (York Region), Mark Ortiz (York Region)

Prepared By: Beth Scott

1. Introductions

1.1 The Project Team (SM, KL, BS and CH) was introduced including each team members' role on the development of the Town of Newmarket's Water and Wastewater Master Plan (referred to as the Town's Master Plan henceforth), followed by the introductions of the members of the Chippewas of Georgina Island First Nation in attendance.

2. Purpose of the Meeting

2.1 KL opened the meeting by inviting the Chippewas of Georgina Island to express their concerns with regards to the Town's Master Plan and any other items that they wanted addressed during the meeting. KAC communicated that the Chippewas of Georgina Island wanted to understand how the Town's Master Plan was developed, including how the Region's proposed UYSS (Upper York Sewage Solution) ties into the Town's Master Plan since the Chippewas of Georgina Island do not support the Upper York Sewage Solutions (UYSS) Environmental Assessment The Chippewas of Georgina Island First Nation wanted to note that their main concern is whether the Town's Master Plan has been developed on the premise that the recommendations of the UYSS EA will be implemented.

3. Development of the Master Plan

3.1 Conveyance and Treatment of Wastewater Flows Generated within the Town of Newmarket

- The Project Team explained that the Town's wastewater is currently conveyed to the Regional York Durham Sewage System (YDSS) where it flows south and receives wastewater treatment at the Duffin Creek Water Pollution Control Plant (WPCP) on Lake Ontario.
- PBC asked if the Town's wastewater will flow north, to the proposed WRC, in the future. The Project Team explained that the Town of Newmarket is not responsible for deciding

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where wastewater flows generated within the Town are treated, as this is a decision that is not within the Town's jurisdiction.

- JT asked if it is ultimately the Region who decides where the wastewater generated within the Town will be treated. The Project Team confirmed that decisions regarding the treatment of wastewater flows generated within the Town are made by the Region of York.
- KAC asked which wastewater pumping stations are owned by the Town. CH responded that the Town owns four small local wastewater pumping stations. She also explained that there are two Regional pumping stations (Newmarket Pumping Station and Bogart Creek Pumping Station) located within Newmarket and that both of these stations currently pump wastewater generated within the Town to the YDSS.
    - PBC indicated that the Newmarket Pumping Station receives wastewater flows generated by the Southlake Hospital in Newmarket. The Chippewas of Georgina Island have concerns regarding any proposed conveyance of wastewater flows from this hospital to the proposed Water Reclamation Centre (WRC) on Lake Simcoe given the assumed presence of pharmaceuticals in the wastewater flows collected from the hospital.
    - DBC also indicated that the Chippewas of Georgina Island have met with the Ministry of the Environment and Climate Change (MOECC) about their concerns regarding the presence of pharmaceuticals in the wastewater flows that could be conveyed to the proposed WRC on Lake Simcoe per the Region's UYSS Environmental Assessment (EA).
- JT asked if wastewater generated within the northern part of Newmarket is conveyed to the East Holland Trunk Sewer. XCG confirmed the East Holland Trunk Sewer is one of the trunk sewers that convey wastewater from the northern part of Newmarket.
- JT asked if development is expected in the area of the Cherrywood Penn Sub-Trunk Sewer. XCG showed JT on a map where most development is expected, within the Urban Centres Secondary Planning Area. XCG explained that most of the growth will be due to re-development/intensification as opposed to new development.
- JT asked if flow from any other developments will be redirected to the East Holland Trunk Sewer. It was confirmed that flow will not be redirected. The Town's Master Plan does not consider changing the direction of flow and all flows would continue to be conveyed to the Regional system as they are today. If the UYSS EA were approved in the future, then the Region would be redirecting flow, if necessary.

3.2 Consultation Regarding the Region and Town's Infrastructure Planning Studies

- DBC stated that the Chippewas of Georgina Island do not support the Region's UYSS EA. DBC indicated that the Chippewas of Georgina Island wanted to confirm whether the proposed wastewater infrastructure plans within the Town's Water and Wastewater Master Plan have been developed on the basis of wastewater flows being conveyed to the Region's proposed WRC. The Town of Newmarket's Project Team indicated that the wastewater infrastructure plans within the Town's Master Plan address wastewater conveyance needs within the Town's system only.
- KAC inquired about the extent of consultation with the Region regarding the Town's Water & Wastewater Master Plan.
    - The Project Team explained that the Region provided input to the Town regarding the remaining capacity of their conveyance system. The Town analyzed the local (Town) wastewater collection system and identified needs within the Town's system.
    - WSP pointed out PIC (Public Information Centre) slide 8, "Water and Wastewater Design Criteria", and explained that the wastewater criteria were developed with

input and collaboration with a representative from the Region's Master Plan team to ensure that the water and wastewater demands calculated in both the Town and Region's studies were aligned.

3.3 Population Growth

- PBC asked if the Town foresees much population growth.
  - WSP pointed out PIC slide 7 and explained that most of the population growth will be within the Urban Centres Secondary Planning Area, generally located at the intersection of Yonge Street and Davis Drive. The total growth expected for the Town was confirmed to be 38,785 by 2041.
  - The Town explained that the population growth was set in 2005 through the Province's Places To Grow Act. The Town of Newmarket will have less growth than some of its neighbouring municipalities, as the Town is mostly built-out and growth will result from re-development/intensification within the existing urban boundary.

3.4 Public Consultation and Status of the Master Plan

- KAC inquired about the extent of public consultation undertaken as part of the Town's Master Plan. The Project Team confirmed that one PIC was held as part of the process in addition to the issuance of the Notice of Project Commencement which was mailed to the project's stakeholders.
- KAC explained that the Chippewas of Georgina Island were surprised by the limited consultation between the Region and the Town regarding the impact of the UYSS on the Town's Master Plan.
  - The Town explained that the Region did consult with the Town regarding the UYSS, but while the Town can provide input into the process, it does not have jurisdiction to make any decisions regarding the future plans for wastewater treatment within the Region.
- KAC asked about the status of the Town's Master Plan.
  - WSP indicated that the PIC was held on June 21, 2016 to present the preferred servicing solutions and there is no additional technical analysis to be undertaken.
  - The Town added that the wastewater works recommended in the Town's Master Plan all address local conveyance requirements.

4. Meeting Closing Comments

- BM thanked the project team for speaking with the Chippewas of Georgina Island and for providing access to and openly sharing information on the Town's Master Plan. He also communicated his understanding that the Town does not have the jurisdiction to make decisions regarding wastewater treatment projects. He added that it is also understood that progress and development needs to happen, but the Chippewas of Georgina Island want it to be done properly with respect to the environment.
- The Chippewas of Georgina Island explained that they are not opposed to the recommendations within the Town's Master Plan so long as the planned infrastructure is not being implemented to redirect wastewater flows to the Region's proposed WRC. Should infrastructure works be recommended to redirect wastewater flows to the proposed WRC as an amendment or in the Town's next Master Plan, the Chippewas of Georgina Island would not be in support of the Town's Master Plan wastewater infrastructure recommendations.
- The Project Team indicated that they will prepare a Meeting Summary of the discussion held today and that this Meeting Summary would be circulated to the Chippewas of

Georgina Island for review. The Project Team indicated that the Meeting Summary will be included as part of the Public Record for the Town's Master Plan.

Action: WSP

End of Meeting Summary

Scott, Beth

From: Kerry Ann Charles <kerry.charles@georginaisland.com>
Sent: Tuesday, November 08, 2016 10:35 AM
To: Scott, Beth
Cc: Donna Big Canoe; Janice Taylor; Natasha Charles; Lenkiewicz, Karen; Holden, Stan
Subject: RE: Newmarket Water and Waste Water Master Plan

Good Morning Beth

I have reviewed the minutes of the meeting held on September 29th 2016 and at this time only have one request for change (in red).

Section 4. Meeting Closing Comments - bullet 2

- The Chippewas of Georgina Island explained that they are not opposed to the recommendations within the Town's Master Plan so long as the planned infrastructure is not being implemented to redirect wastewater flows to the Region's proposed WRC. Should infrastructure works be recommended to redirect wastewater flows to the proposed WRC as an amendment or in the Town's next Master Plan, the Chippewas of Georgina Island would not be in support of the Town's Master Plan wastewater infrastructure recommendations.

Sorry for the delay.

Respectfully,

Kerry-Ann Charles
Chippewas of Georgina Island First Nation
Environment Co-ordinator

From: Scott, Beth [Beth.Scott@wspgroup.com]
Sent: October-19-16 1:44 PM
To: Kerry Ann Charles
Cc: Donna Big Canoe; Janice Taylor; Natasha Charles; Lenkiewicz, Karen; Holden, Stan
Subject: RE: Newmarket Water and Waste Water Master Plan

Hi Kerry-Anne,

As requested, please find attached the draft minutes for our meeting on September 29, 2016 regarding the Newmarket Water and Wastewater Master Plan.

Please let us know if you have any questions or comments. We have sent you the minutes in Word so you can make your comments using track changes if you wish to comment directly in the document.

Regards,

Beth Scott, B.Eng., E.I.T.

WSP Canada Inc.
100 Commerce Valley Drive West
Thornhill, Ontario L3T 0A1 Canada
T 905-882-4211 #6119

www.wspgroup.com

Please consider the environment before printing...

From: Kerry Ann Charles [mailto:kerry.charles@georginaisland.com]
Sent: Friday, July 29, 2016 9:47 AM
To: Scott, Beth
Cc: Donna Big Canoe; Janice Taylor; Natasha Charles; Lenkiewicz, Karen; Holden, Stan
Subject: RE: Newmarket Water and Waste Water Master Plan

Good Morning Beth

Thank you for your confirmation. You are correct that the UYSS project is of major concern to the First Nation and that we would like detail as to how the Newmarket Master Plan ties into that. I will send you an email within the next couple of weeks with other the discussion points.

Respectfully,

Kerry-Ann Charles
Chippewas of Georgina Island First Nation
Environmental Co-ordinator
Telephone (705) 437-1337 ex 2233
Fax (705) 437 4597

GEORGINA ISLAND

From: Scott, Beth [mailto:Beth.Scott@wspgroup.com]
Sent: July-25-16 10:08 AM
To: Kerry Ann Charles
Cc: Donna Big Canoe; Janice Taylor; Natasha Charles; Lenkiewicz, Karen; Holden, Stan
Subject: RE: Newmarket Water and Waste Water Master Plan

Hi Kerry-Anne,

Thanks for getting back to us with an alternate meeting date. We have contacted our team and can confirm we will be able to meet with you on September 29th at 1:30pm.

In advance of the meeting, can you please confirm the names of the Georgina Island First Nation members that plan to attend? We will need to include this information in a record of the meeting for the Master Plan report.

Can you also please let us know what components of the Master Plan/PIC materials you would like us to review, as well as your major concerns that you wish to discuss? We understand that the proposed Upper York Sewage Solution (UYSS) is a major concern to the Georgina Island First Nation. Please let us know if there are any other items you wish to discuss, as we want to ensure that we are fully prepared to answer your questions and make optimal use of your time at the meeting.

Thank you,

Beth Scott, B.Eng., E.I.T.

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F 905-475-5994

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Please consider the environment before printing...

From: Kerry Ann Charles [mailto:kerry.charles@georginaisland.com]
Sent: Monday, July 18, 2016 2:43 PM
To: Scott, Beth
Cc: Donna Big Canoe; Janice Taylor; Natasha Charles; Lenkiewicz, Karen; Holden, Stan
Subject: RE: Newmarket Water and Waste Water Master Plan

Good Afternoon Beth

I have spoken with my Chief and the next avaible date that Chief and Council and staff are available is September 29th . We would like to meet here on the First Nation at our Community Centre at 1:30pm. You and your team can catch the 1:00pm Ferry. Please advise if this date will work for you so that I can confirm with everyone.

Respectfully,

Kerry-Ann Charles
Chippewas of Georgina Island First Nation
Environmental Co-ordinator
Telephone (705) 437-1337 ex 2233
Fax (705) 437 4597

GEORGINA ISLAND

From: Kerry Ann Charles
Sent: July-15-16 10:22 AM
To: 'Scott, Beth'
Cc: Donna Big Canoe; Janice Taylor; Natasha Charles; Lenkiewicz, Karen; Holden, Stan
Subject: RE: Newmarket Water and Waste Water Master Plan

Good Morning Beth

I have sent out an email to all to receive dates and will get back to you as soon as I have alternatives.

Respectfully,

Kerry-Ann Charles
Chippewas of Georgina Island First Nation
Environmental Co-ordinator
Telephone (705) 437-1337 ex 2233
Fax (705) 437 4597

GEORGINA ISLAND

From: Scott, Beth [mailto:Beth.Scott@wspgroup.com]
Sent: July-14-16 2:20 PM
To: Kerry Ann Charles
Cc: Donna Big Canoe; Janice Taylor; Natasha Charles; Lenkiewicz, Karen; Holden, Stan
Subject: RE: Newmarket Water and Waste Water Master Plan

Hi Kerry-Anne,

We've communicated the proposed meeting date and time (July 20th at 1:30pm) to our team and other parties that would attend the meeting. Unfortunately, this date does not work for everyone that would need to be at the meeting in order to fully answer all of your questions regarding the Master Plan.

We realize the next available time you and the other members of the Georgina Island First Nation are available would likely be in September. Can you please let us know the earliest potential dates that you are available to meet?

Thank you,

WSP

Beth Scott, B.Eng., E.I.T.

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Markham, Ontario L3R 5K3 Canada
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F 905-475-5994

www.wspgroup.com

Please consider the environment before printing...

From: Kerry Ann Charles [mailto:kerry.charles@georginaisland.com]
Sent: Thursday, July 14, 2016 9:24 AM
To: Scott, Beth
Cc: Donna Big Canoe; Janice Taylor; Natasha Charles; Lenkiewicz, Karen; Holden, Stan
Subject: RE: Newmarket Water and Waste Water Master Plan

Good Morning Beth

I have received confirmation that a quorum of my Chief and Council as well as pertinent staff are available to meet with the Town of Newmarket and York Region to discuss the Water and Waste Water Masterplan. We would like to meet here on the First Nation at our Administration Building at 1:30pm. The representatives from Newmarket and York Region can catch the 1:00pm ferry leaving the mainland side at out Marina located at 7751 Black River Road Sutton West Ont L0E 1R0.

Please confirm that this will work for you.

Respectfully,

Kerry-Ann Charles
Chippewas of Georgina Island First Nation
Environmental Co-ordinator
Telephone (705) 437-1337 ex 2233
Fax (705) 437 4597

GEORGINA ISLAND

From: Scott, Beth [mailto:Beth.Scott@wspgroup.com]
Sent: July-07-16 4:54 PM
To: Kerry Ann Charles
Cc: Donna Big Canoe; Janice Taylor; Natasha Charles; Lenkiewicz, Karen; Holden, Stan
Subject: RE: Newmarket Water and Waste Water Master Plan

Hi Kerry-Anne,

Thanks for asking for your Chief and Council's availability. If it is not too late, we would also be interested in your availability during the first week of August. We want to be sure that all parties from the Town and Region that need to

be involved to fully answer your questions and concerns can attend the meeting. The first week of August may provide more flexibility if it is needed.

Thank you,

Beth Scott, B.Eng., E.I.T.

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Markham, Ontario L3R 5K3 Canada
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F 905-475-5994

www.wspgroup.com

Please consider the environment before printing...

From: Kerry Ann Charles [mailto:kerry.charles@georginaisland.com]
Sent: Thursday, July 07, 2016 3:41 PM
To: Scott, Beth
Cc: Donna Big Canoe; Janice Taylor; Natasha Charles; Lenkiewicz, Karen; Holden, Stan
Subject: RE: Newmarket Water and Waste Water Master Plan

Good Afternoon Beth

As this is a busy time of year for most I have sent out an email to my Chief and Council to receive some dates. I am hoping to get back to you tomorrow or Monday.

Respectfully,

Kerry-Ann Charles
Chippewas of Georgina Island First Nation
Environmental Co-ordinator
Telephone (705) 437-1337 ex 2233
Fax (705) 437 4597

GEORGINA ISLAND

From: Scott, Beth [mailto:Beth.Scott@wspgroup.com]
Sent: July-07-16 10:59 AM
To: Kerry Ann Charles
Cc: Donna Big Canoe; Janice Taylor; Natasha Charles; Lenkiewicz, Karen; Holden, Stan
Subject: RE: Newmarket Water and Waste Water Master Plan

Ms. Charles,

I wanted to follow up my call to confirm some dates when you and any other members of your community are available to meet. We would like to meet with you preferably the week of July 18th, or the week of July 25th, to address your questions and concerns about the Town's Master Plan. At your earliest convenience, can you please let us know what dates and times you are available?

Thank you,

Beth Scott, B.Eng., E.I.T.

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Markham, Ontario L3R 5K3 Canada
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F 905-475-5994

www.wspgroup.com

Please consider the environment before printing...

From: Holden, Stan
Sent: Monday, June 27, 2016 5:17 PM

To: Kerry Ann Charles; gmacmillan@newmarket.ca
Cc: Donna Big Canoe; Janice Taylor; Natasha Charles; Lenkiewicz, Karen; Christine Hill (christine.hill@xcg.com); Scott, Beth; Prudhomme, Rachel; Majdi, Sepideh
Subject: RE: Newmarket Water and Waste Water Master Plan

Dear Ms. Charles,

Thank you for reaching out to our project team with regards to the ongoing Town of Newmarket Water and Wastewater Master Plan. We understand the value of transparent communications and consultation on Class Environmental Assessments (EA's) such as the Town's Master Plan. As such, we would like to meet with you and any other members of your community to address any questions and concerns regarding the Town's Study. We would like to meet with you at your earliest convenience. Please advise of your team's availability on the week of July 11th or 18th, if those weeks are suitable for you, or advise which other weeks and days you are available.

To ensure our team is best prepared to answer all of your questions and concerns, please let us know in advance of our meeting which components of the consultation materials presented at the June 21st Public Information Centre (PIC) you wish our team to review at the meeting, as well as your major concerns with regards to the Study. We want to ensure we are prepared to fully answer your questions so that we can make optimal use of your time when we meet.

We understand that the proposition of the Upper York Sewage Solution (UYSS) is a major concern to you and your community. Following the PIC, we reached out to York Region regarding the consultation they have undertaken for their proposed project. This was actually the reason for our delay in contacting you to arrange a meeting, as we wanted to first understand what materials were previously presented and discussed with regards to the York Region Water and Wastewater Master Plan. This will allow us to better focus our meeting with you.

We have also checked our study mailing list and confirmed that a Notice of Study Commencement and Notice of PIC was mailed to the Chief of the Chippewas of Georgina Island First Nation at the following address:

Ms. Donna Big Canoe
Chief, Chippewas of Georgina Island
Administration Office
R.R.#2 Box N-13
Sutton West, ON L0E 1R0

Please confirm that this is the address to which we should send written communications. We do follow up by phone with regards to sent notices to Aboriginal communities; however, written notices are always the first step and therefore we want to ensure we have the correct contact information. We have also included the following contacts to our list:

Ms. Kerry-Ann Charles
Environment Co-ordinator, Chippewas of Georgina Island
Administration Office
R.R.#2 Box N-13
Sutton West, ON L0E 1R0
kerry.charles@georginaisland.com

Ms. Natasha Charles
Chippewas of Georgina Island
Administration Office
R.R.#2 Box N-13
Sutton West, ON L0E 1R0
natasha.charles@georginaisland.com

We look forward to hearing from you.

Regards,

Stan C. Holden, P.Eng
Sr. Director, Municipal Infrastructure

WSP Canada Inc.
600 Cochrane Drive, 5th Floor
Markham, Ontario L3R 5K3 Canada
T +1 905 475-7270 #18233
F +1 905 475-5994
C +1 416 779-8313

www.wspgroup.com

Please consider the environment before printing...

From: Kerry Ann Charles [mailto:kerry.charles@georginaisland.com]
Sent: Friday, June 24, 2016 10:46 AM
To: Holden, Stan; gmacmillan@newmarket.ca
Cc: Donna Big Canoe; Janice Taylor; Natasha Charles
Subject: Newmarket Water and Waste Water Master Plan

Good Morning Mr. Holden and Mr. MacMillan

I am writing to you this morning as myself and a colleague attended your Public Information Session on Tuesday June 21st at the Council Chambers in Newmarket in regards to your Water and Waste Water Master Plan. We were very disappointed in the information that was provided and the lack of knowledge about the Duty to Consult to First Nations.

The information that was provided was very technical and without a proper presentation, the general public, in which the PIC was for, would not understand and therefore not be able to ask appropriate questions and make an informed decision about the plan.

Also after reviewing the poster boards, I spoke to one of the representatives (Christine) and posed the question of how this Plan tied into York Regions Plan and was told that consultations with York Region were conducted throughout the development of Newmarkets Plan and that information from the York Plan was integrated into the NewMarket Plan. I then posed the question of how the Upper York Sewage Solutions (UYSS) Project tied into the Newmarket Plan and was not given a definitive answer. I was told that some of the sewage from Newmarkets growth would be pumped to York Regions STP and that it would probably at some point tie into the UYSS but what York Region does with it was not the concern of Newmarket. This answer was not satisfactory. I informed the representatives that I was the Environment Co-ordinator for the First Nation and until recently was not aware that there had been any consultation with our First Nation during the development of this plan and that there was legislation for the Duty to Consult with First Nations on projects such as these as it may have an effect on our Traditional Territory and/or rights, in which this particular project would. They were unaware of whether or not our Community had been consulted and stated that they would have to

check their mailing list. I also stated to them that if they had been in consultation with York Region throughout the development of the Plan that they should be well aware that we have been in discussion with York Region in regards to the UYSS project over the past 4 years and that we are opposed to the UYSS project. At that time I advised the representatives that they need to contact me as my Chief and Council would likely want to set up a meeting with them to discuss this Plan in further detail.

With that said, I have yet to receive any correspondence and I am formally requesting that I be contacted to set up a meeting to discuss the Plan that the Town of Newmarket is proposing to service the water and waste water for future growth.

Respectfully,

Kerry-Ann Charles
Chippewas of Georgina Island First Nation
Environment Co-ordinator
Telephone (705) 437-1337 ex 2233
Fax (705) 437 4597

GEORGINA ISLAND

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ENGINEERING SERVICES
Town of Newmarket
395 Mulock Drive
P.O. Box 328, STN Main
Newmarket, ON L3Y 4X7

www.newmarket.ca
engineering@newmarket.ca
T: 905 895.5193
F: 905 953 5138

TOWN OF NEWMARKET

NEWMARKET WATER AND WASTEWATER MASTER PLAN

MUNICIPAL CLASS ENVIRONMENTAL ASSESSMENT
NOTICE OF STUDY COMPLETION

The Town of Newmarket has completed a Class Environmental Assessment (Class EA) Master Plan Study to identify the required improvements and/or expansion to the Town's water distribution and wastewater collection systems to support existing and proposed growth within the Town, including the intensification of the Urban Centres Secondary Plan area. The Master Plan is a long-term plan for system improvements to meet servicing demands to 2041.

The Study has been conducted in accordance with the requirements of the Municipal Class EA process (October 2000, as amended in 2007, 2011 and 2015) using the Master Planning Approach #1. The Master Servicing Plan document has been finalized and is now available for viewing on the Town's website through the following web page: newmarket.ca/waterwastewater. This document has incorporated all comments received from the public and agencies during the course of the Study.

Based on the infrastructure recommended in the Master Plan, all projects were classified as Schedule A+ and therefore are not required to fulfill additional Class EA requirements.

If you have any questions regarding the Master Plan, please contact one of the study representatives listed below:

Ms. Karen Lenkiewicz, P.Eng.
Project Manager
Municipal Infrastructure
WSP Canada Inc.
100 Commerce Valley Drive West
Thornhill, ON L3T 0A1
Phone: (905) 882-1100 Ext. 6886
Fax: (905) 882-7300
Email: karen.lenkiewicz@wspgroup.com

Ms. Sepideh Majdi, P.Eng.
Capital Projects Engineer
Engineering Services
The Town of Newmarket
395 Mulock Drive, P.O. Box 328
Newmarket, ON L3Y 4X7
Phone: (905) 953-5300 Ext. 2522
Fax : (905) 953-5138
Email: smajdi@newmarket.ca