

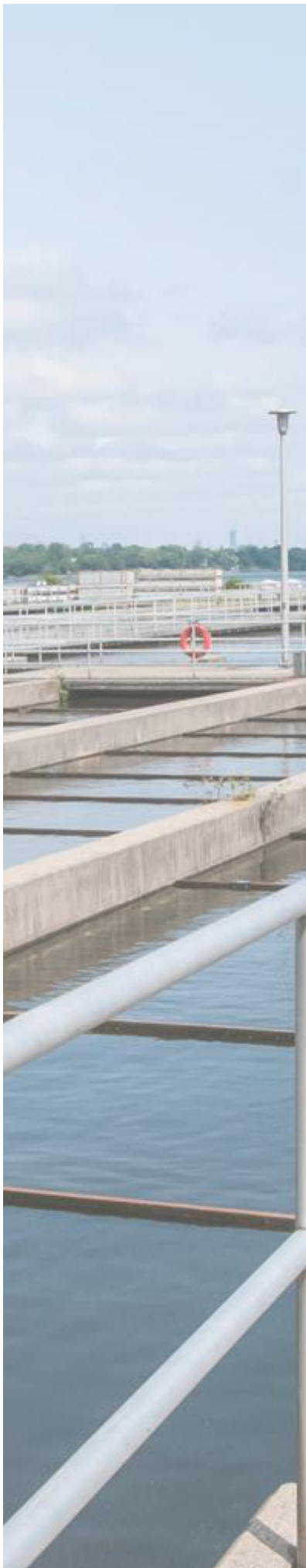
City of Hamilton

The 2025 Interim Water, Wastewater and Stormwater Master Servicing Strategy

Water Volume

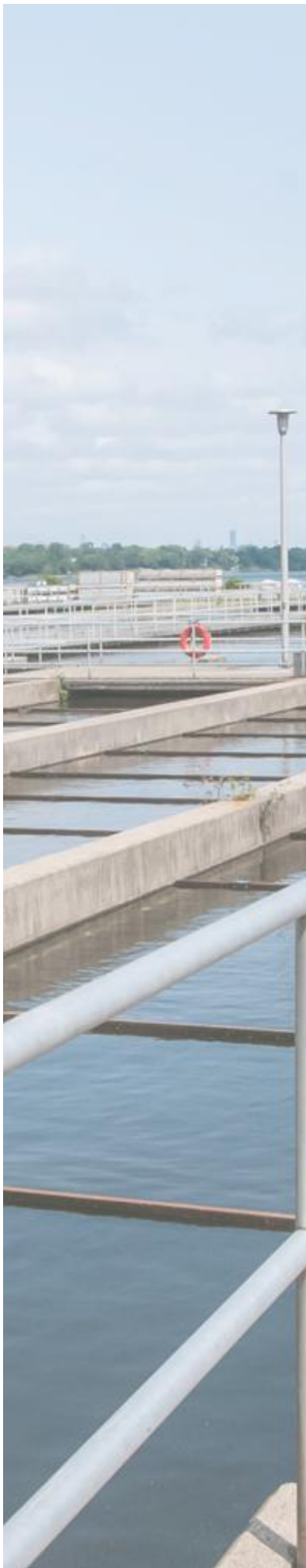
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ACRONYMS AND ABBREVIATIONS

Acronym	Definition
ADD	Average Day Demand
AEGD	Airport Employment Growth District
CPR	Canadian Pacific Railway
DC	Development Charge
DWQMS	Drinking Water Quality Management Standard
EA	Environmental Assessment
EPS	Extended Period Simulations
ET	Elevated Tank
GRIDS2	Growth Related Integrated Development Strategy Update
HGL	Hydraulic Grade Line
I/I	Inflow and Infiltration
ICI	Institutional, Commercial and Industrial
IMSS	Interim Master Servicing Strategy
L/cap/d	Litres per capital per day
L/s	Litres per Second
LOS	Level of Service
MCR	Municipal Comprehensive Review
MDD	Maximum Day Demand
MEA	Municipal Engineers Association
MECP	Ministry of the Environment, Conservation and Parks
ML/d	Megalitres per Day
NoUBE	No Urban Expansion
O&M	Operation and Maintenance
OCWA	Ontario Clean Water Agency
OLT	Ontario Land Tribunal
OMB	Ontario Municipal Board
PD	Pressure District
PHD	Peak Hour Demand
PIC	Public Information Centre
PRV	Pressure Reducing Valves
PS	Pumping Station
PWWF	Peak Wet Weather Flow
RES	Reservoir
RHVP	Red Hill Valley Parkway
ROW	Right-of-Way
SCADA	Supervisory Control and Data Acquisition
SOGR	State-of-Good-Repair
SP	Standpipe
TSZ	Traffic Survey Zone
UHOP	Urban Hamilton Official Plan
WM	Watermain
WTP	Water Treatment Plan

1.0 Introduction

1.1 Background

The City of Hamilton is part of the Greater Golden Horseshoe area located in Southern Ontario. The city is made up of several communities surrounding the core city, including Stoney Creek, Dundas, Waterdown, Mount Hope, Binbrook, and Ancaster.

The scope of this **Interim Master Servicing Strategy (IMSS)** includes developing a strategy in support of the Growth Related Integrated Development Strategy Update (GRIDS2), last revised in July 2024, and ultimately preparing a capital program to support the City's growth to 2051.

The IMSS study was initiated in 2017 with the primary goal of developing a robust infrastructure servicing strategy for the City of Hamilton, originally targeting a 2041 planning horizon. While the City has adopted a no urban boundary expansion growth strategy, the *Provincial Planning Statement, 2024*, removed the requirement for municipalities to undertake a Municipal Comprehensive Review (MCR) prior to considering urban boundary expansions. In addition, amendments to the *Planning Act through Bill 185* permit landowners and proponents to submit *Official Plan Amendment* applications for urban boundary expansions at any time and without restrictions on size, provided the lands are outside of the *Greenbelt Plan* area. Approximately 44,320 hectares of land meet this criterion and may be subject to privately initiated applications. As of December 2025, the City has received four urban boundary expansion applications, which total ~1,673 hectares and have all been appealed to the Ontario Land Tribunal (OLT).

Since initiation of the Master Plan, its scope and objectives have evolved in response to changing planning scenarios, delays in growth projection approvals, and increasing development pressures, alongside these provincial policy changes. These factors have introduced uncertainty in forecasting growth and servicing needs, challenged the concept of a firm urban boundary, and shifted decision-making authority for urban boundary expansions from municipal and ministerial approval to the OLT. As such, the City has agreed to rescope the study based on the 2024 No Urban Expansion (NoUBE) Traffic Survey Zone (TSZ) data, which is essential for addressing the City's infrastructure needs up to 2051.

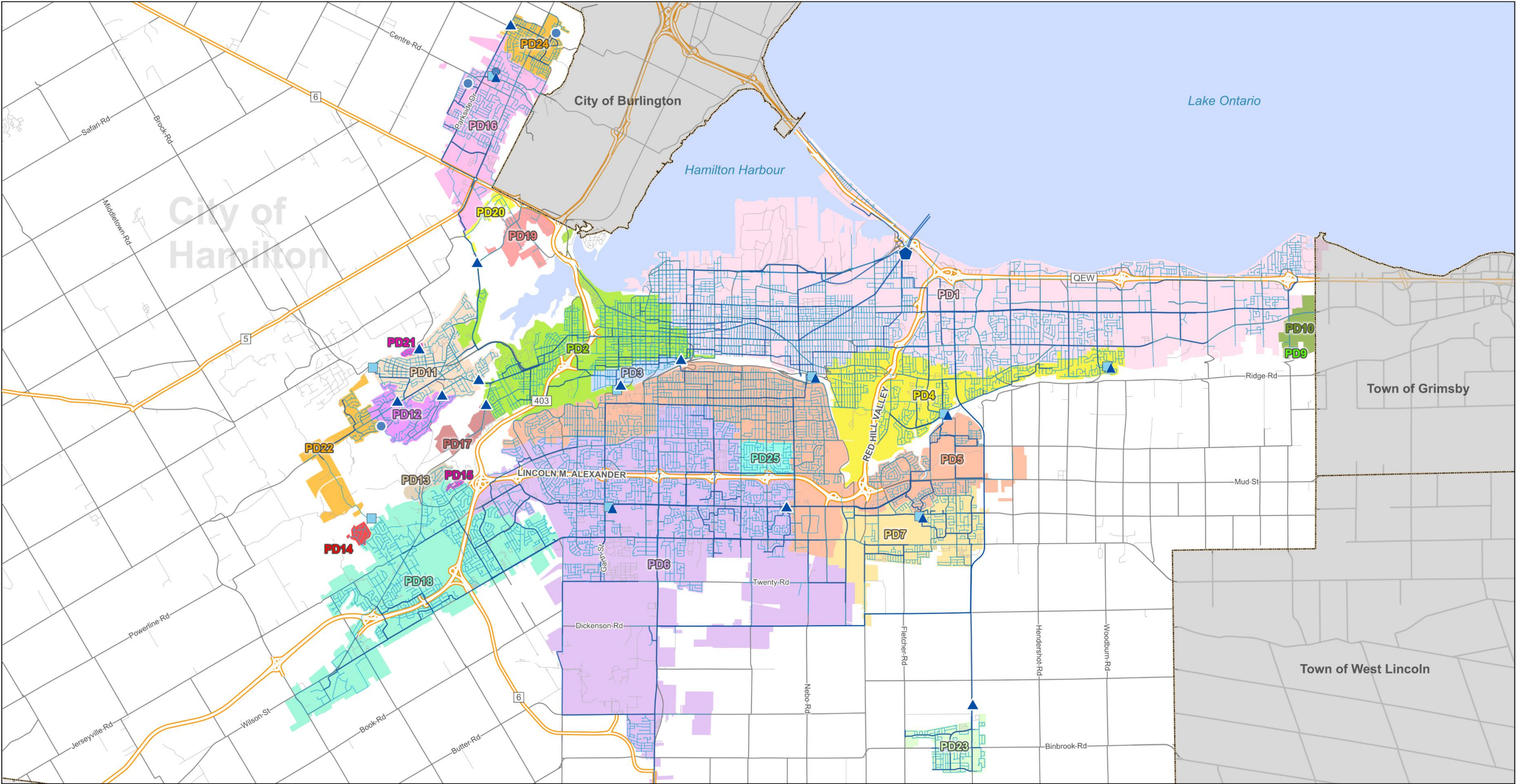
The original scope of the Master Plan was to follow the formal Municipal Engineers Association (MEA) Class Environmental Assessment (Class EA) process. However, the new scope of the Master Plan was agreed to be a "Streamlined" Technical Strategy Project also known as the "Interim Water, Wastewater, Stormwater Master Servicing Strategy". The IMSS will produce similar final outcomes in terms of Servicing Strategies and Capital Program; however, it will be completed outside of the MEA Class EA process.

This IMSS Volume provides a summary of the background review undertaken and the baseline water data. It also provides a summary of the planning growth projections, an overview of how the planned growth leads to various system opportunities and constraints, a summary of the various water servicing strategies considered as part of the evaluation and identifies the preliminary preferred water strategies with their associated estimated costs and timing. This volume is dedicated solely to the drinking water system, providing an assessment of its current and future needs. The wastewater and stormwater systems are documented in accompanying volumes.

1.2 Study Area

The City of Hamilton is located in the Greater Golden Horseshoe (GGH), situated at the southwestern end of Lake Ontario. The study area shown in **Figure 1-1** demonstrates the existing lake-based water and wastewater servicing area for the City of Hamilton.

The City's lake-based service area is made up of the City of Hamilton and the former municipalities surrounding the urban core, including: Waterdown, Dundas, Ancaster, Mount Hope, Binbrook, and Stoney Creek. The study area for the IMSS extends to the urban boundary of the City of Hamilton.



Water Treatment Plant (WTP)

Elevated Tank (ET)

Pumping Station (PS)

Reservoir (RES)

Watermain Trunk

Watermain Distribution

Pressure District

PD1

PD2

PD3

PD4

PD5

PD6

PD7

PD9

PD10

PD11

PD12

PD13

PD14

PD15

PD16

PD17

PD18

PD20

PD21

PD22

PD23

PD24

PD25

General Feature

Municipal Boundary

Reference(s)

1. Projection EPSG:26917

2. Base Data: City of Hamilton, 2024

Map Title: Water System Overview

Project Name:
Water, Wastewater, Stormwater Interim Master Plan

Client Name:
City of Hamilton
(Ontario, Canada)

Last Updated: March 2025

Document ID: 717010-W-028

Document Path: E:\Working\HAMILTON ON, CITY OF\2402126 - 717010 Hamilton W, WW & SW Master Plans\5 Work in Progress\GIS and Databases\717010-W-028-IMP Update.aggz

2.0 Related Studies and Background Information

The section reviews the major background reports and studies relevant to the Interim Master Servicing Strategy (IMSS). These documents were assessed to identify existing conditions, planning assumptions, and servicing strategies that directly support the analysis and recommendations of this study.

1. Preliminary Traffic Survey Zone (TSZ) Projections Approach and Method for Discussion, Dillon Consulting Ltd (June 2024)

- Provides a description of the preliminary approach and method used for the distribution of growth forecasts to 2051 at the Traffic Survey Zone (TSZ) level.
- Population, household, and employment growth are distributed in accordance with the growth forecast totals and allocation policies set out in the *Urban Hamilton Official Plan* (UHOP).

2. 2006 City of Hamilton Water and Wastewater Master Plan Reports

- City of Hamilton Water and Wastewater Systems Baseline Report, KMK Consultants Limited (2006)
 - Summarizes the inventory and evaluation of the water and wastewater systems at the time of the report along with the design criteria for the water and wastewater systems.
 - Provides an overview of the water and wastewater hydraulic models previously used in the 2006 Mastre Plan analysis.
- Water and Wastewater Master Plan Policy Framework Paper, City of Hamilton (2005)
 - Summarizes the process completed for developing and enacting water and wastewater policies, which provide direction and guidelines for development, evaluation, and implementation of servicing strategies.
- City of Hamilton Water and Wastewater MP Class EA, KMK Consultants Limited (2006)
 - Provides a detailed framework for the planning and development of the City's water and wastewater infrastructure following the Class EA process.

3. Main and Whitney Water Pumping Station (HD17A) Class Environmental Assessment (2023; Public Information Centre No. 2; Arcadis)

- Summarizes the ongoing Class EA study to develop and assess alternative solutions for a new water Pumping Station (PS) to replace the existing Main and Whitney PS (HD17A).
- The preferred site has been confirmed as 1845 Main Street West for replacing the existing PS. As such, the IMSS is not re-assessing different servicing options for the Pressure District 17 PS.

4. Reports for Stages 1 to 5, Woodward Avenue Water Treatment Plant (WTP) Study, CMH2Hill (2014 – 2016)

- Investigates the performance and conditions of the unit processes and determines process upgrades needed for the plant to meet regulatory requirements and maintain an appropriate level of reliability.
- Established the following implementation plan as a result of the study with an estimated capital construction cost of \$95M to \$120M (2015 costs):
 - Contract Package 1 - Upgrades to refurbish existing WTP unit processes (2018-2021)
 - Contract Package 2 - Upgrades to improve WTP unit process performance (2022-2025)
 - Future Upgrades Group 3 – Long term upgrades to increase WTP process capacity (2028+)

5. Airport Employment Growth District (AEGD) Related Reports

- AEGD – Phase 2 Water & Wastewater Servicing Master Plan Update, GM BluePlan (Dec 2016)
 - February 17th, 2015, the Ontario Municipal Board (OMB) approved the AEGD Secondary Plan.
 - Boundaries were modified since the last version of the Secondary Plan with areas added to the urban boundary.
 - Provides a comparison with AEGD 2010 along with the water and wastewater strategy update.
- Internal AEGD Implementation Plan, Dillon Consultants Limited (Dec 2016)
 - Identifies short-term (phase 1) and medium-term (phase 2) transportation, water, and wastewater projects, and presents the EA schedules and capital costs for projects.

6. Elevated Water Storage Facility and Pumping Station for Pressure District (PD) 7 Class Environmental Assessment (2019; Project File Report; Cole Engineering)

- Summarizes the process to identify the different long-term servicing options for PD7's pumping and storage to address expected growth.
- Opportunity statement:

"a solution is required to provide additional storage and pumping capacity to support the future growth within PD7 and PD23, to enhance water system security and reliability, and to meet the MECP guidelines and City design standards, while improving system operating efficiencies".
- Preferred location for the new storage facility was at 420 Trinity Church Road and south of Rymal Road East. Preferred location for a new pump station was at the north-east corner of Rymal Road East and Upper Centennial.

7. City of Hamilton Development Charges (DC) Background Study Update. Watson & Associates (2023)

- Establishes rules for the Development Charges (DC) by-law, and sets out background information on the legislation, Hamilton's DC policy, and post-adoption implementation requirements.
- Provides updated water and sewer capital projects to service growth, as well as capital cost estimates.
- City of Hamilton Water Distribution System GIS (2025)
- Hamilton Drinking Water Works Permit (2014)
- Draft Drinking Water Quality Management Standard (DWQMS) description of Hamilton Drinking Water System (2015)
- City of Hamilton Comprehensive Development Guidelines and Financial Policies Manual (2016)
- *Urban Hamilton Official Plan* (2022)

8. Waterdown Trunk Watermain Twinning Class Environmental Assessment (2024; Public Information Centre No. 3; GM BluePlan)

- The need for a watermain twinning at downstream of Pumping Station (PS) #16 was identified in the City's DWQMS Infrastructure Review due to the criticality of the single trunk main to supply water to Waterdown community, as described in the City's Water and Wastewater Master Plan (2006).
- The purpose of this Class EA study is to determine the preferred alternative to construct the trunk watermain twinning within the study area.
- The preferred alignment has been carried across to this IMSS.

9. York and Valley Road (HD016) Booster Pumping Station Capacity Upgrades (2022; Environmental Assessment Addendum Report; AECOM)

- Summarizes the conceptual site plan layout of the preferred solution, which involves: Upgrades to the existing pump station facility; addition of a new building extension to accommodate new pumps, valves, and ancillary equipment; increasing the firm capacity from 18 ML/d to 28 ML/d; providing redundancy in the pumping systems and connections for the proposed future twinned discharge feedermain (Waterdown Trunk Twinning).

10. Other Documents Prepared by the City of Hamilton

- City of Hamilton Water Distribution System GIS (2025)
- Hamilton Drinking Water Works Permit (2014)
- Draft DWQMS Description of Hamilton Drinking Water System (2015)
- City of Hamilton Comprehensive Development Guidelines and Financial Policies Manual (2016)
- *Urban Hamilton Official Plan* (2022)

2.1 2006 Water Master Plan Projects – Status

The 2006 Water and Wastewater Master Plan established the preferred water servicing strategies to support growth within the City to 2031. These servicing strategies consisted of a wide range of linear and facility projects. The water program consisted of 30 capital projects with a total estimated cost of \$171M. Since 2006, these projects have been further reviewed, refined, constructed, or remain awaiting implementation. As part of the IMSS, a review of the 2006 Master Plan project status was undertaken. Based on a review of existing data, models, GIS data, reports, capital budgets, and other available information, the 2006 Master Plan Project Status is summarized in **Table 2-1**.

Table 2-1- 2006 Master Plan Project Status – Water

Master Plan ID	Project Name	Comment	Status	
W-01	Waterdown North Elevated Tank (HDT16)	Elevated tank construction complete, currently in City GIS and model	Completed	In Model / GIS
W-02	New HD16A Pumping Station	Project modified since 2006 MP -constructed as HD024	Completed	In Model / GIS
W-03	Parkside Drive Watermain	Watermain complete, currently in City GIS and Model	Completed	In Model / GIS
W-04	HD12A Governor's Road Pumping Station Upgrades	- Class EA Schedule for 2019 - Last Upgrade in 2017	Project scope and requirement to be confirmed through this study as per PD12 / PD22 work	Existing facility in model
W-05	Governor's Road PD11 Watermain Extension	Watermain extension complete, currently in City GIS and Model	Completed	In Model / GIS
W-06	Governor's Road PD22 Watermain Extension	Watermain extension complete, currently in City GIS and Model	Completed	In Model / GIS
W-07	Waterdown South Elevated Tank (HDT24)	Elevated Tank construction complete, currently in City GIS and Model	Completed	In Model / GIS
W-08	New HD03B PS (Highland Gardens PS)	- Project completed - PS is now named HD03A not HD03B	Completed	In Model / GIS
W-09	Garner Road Watermain	- Watermain diameter range from 500 mm to 600 mm in 2023 DC - Ancaster Tank Class EA completed August 2025 (Project W-14)	Part of the Garner Road watermain was commissioned in late 2024; Rest expected in 2025	Segments of Garner Road will be added to the MP model, with their respective completion dates
W-10	HD007 Highland Pumping Station Upgrades	PS upgrade completed	Completed	In Model / GIS
W-11	HD007 Highland Reservoir Expansion	- Reservoir expansion was originally scheduled for 2020-2023. It has since been deferred. - Project need / scope to be confirmed in MP	Existing Facility in model; expansion scope to be decided as part of MP	Existing Facility in Model
W-12	Centennial Pkwy Trunk Feedermain	Feedermain complete, currently in City GIS and Model	Completed	In Model / GIS
W-13	Centennial Pkwy Trunk Feedermain	- Feedermain complete, currently in City GIS and Model - Alignment different than 2006 MSP. Built along Queen Mary; Bedrock and First	Completed	In Model / GIS
W-14	Pressure District 18 Elevated Tank	- Class EA Phase - Project need / scope to be confirmed in MP - Other HD018 PS upgrades made recently	Project scope and requirements to be confirmed through this study	Upgrade not built
W-15	HD002 Ferguson Pumping Station Upgrades (Standby Power)	Upgrades complete	Completed	Ferguson PS in Model / GIS
W-16	HD012 Lynden Ave Pumping Station Upgrades	Additional pumping capacity and standby power	Completed	Latest Pump Curves in Model
W-17	Sedimentation Tank upgrades (Part of W-29)	Upgrades complete	Completed	Details not critical to hydraulic model
W-18	Pre-Chlorination system upgrades	Upgrades complete	Completed	Details not critical to hydraulic model
W-19	Locke St Watermain	- Watermain previously scheduled for 2018 / 2019 Design - Currently, in design and implementation phase	- Design Phase - Planned upgrades to be incorporated in the MP model.	Details required
W-20	HD019 Binbrook/Hwy56 Pumping Station Upgrades	- PS was originally scheduled for 2019 design / 2020 Construction - Currently, in design phase and MCEA will be initiated in 2026	- Design phase - Internal GEI coordination and will be incorporated in the MP model.	Details being incorporated into model future scenarios

Master Plan ID	Project Name	Comment	Status	
W-21	New PD7 PS Upgrades (previously called Tunbridge Pumping Station Upgrades HD07A in prior Master Plan)	- Class EA completed by Cole Engineering - New PD 7 PS was recommended in 2014 DC update, PD 7 is potentially a large growth area within the City - Project scope to be confirmed in MP	Class EA Completed. Planned upgrades will be incorporated in the MP model.	Preferred PD7 PS site (Rymal / Upper Centennial) included in model for future scenarios
W-22	HD07A Feedermain	- Currently in planning phase - Project need / scope to be confirmed in MP	- Planning phase - Planned upgrades will be incorporated in the MP model	Mud Street to Proposed New PD7 pump station site included in model for future
W-23	Pressure District 7 Elevated Tank	- Elevated tank was in Class EA phase with 2019 - 2021 design and construction. MP Update to review and confirm - Project scope and requirements to be confirmed	Project scope and requirements to be confirmed through this study	Preferred elevated tank site (Trinity Church / Twenty Road) included in model for future scenarios
W-24	Stone Church Trunk Feedermain	- Feedermain construction completed up to First Road and Mud Street - Second phase from Mud Road and First Street towards HD06B PS in design / tender phase	- Completed - Planned upgrades will be incorporated in the MP model	Included in model
W-25	HD016 Trunk Feedermain	- Feedermain feasibility study completed - GM BluePlan - May 2017 - alignment modified from MP - Class EA (property requirements) was expected to be completed in 2019 - Currently in Class EA Phase	- Class EA. - Planned upgrade/alignment will be incorporated in the MP model.	Details being incorporated into model future scenarios
W-26	HD016 York/Valley Road Pumping Station upgrades	- PS upgrades conceptual design completed in April 2017 - Was originally scheduled for 2018 / 2019 design and construction - Currently in design phase	- Design phase - Planned upgrades will be incorporated in the MP Model.	Details required
W-27	Airport Lands Trunk Watermains	Project removed / scope modified through AEGD MP		
W-28	HD05A Greenhill Pumping Station Upgrades	- PS upgrades were originally scheduled for 2018 design / 2019 construction - HD04B and HD05A estimated construction start was June 2019 - Project scope and requirements to be confirmed	Project scope and requirements to be confirmed through this study	Planned interim pump addition being included in model—larger pumping station upgrades to be assessed
W-29	Woodward Ave. WTP Expansion	- Updated WTP recommendations completed by CH2M Hill 2014-2016 to refurbish and improve existing WTP processes and increase WTP Capacity. Project divided into 3 phases - Project completed	Being completed in phases.	Details Required. Not critical for hydraulic model
W-30	Binbrook Trunk Feedermain	- Feedermain originally scheduled for 2019 Design / 2020 Construction - Project scope and requirements to be confirmed	Project scope and requirements to be confirmed through this study	Not in model. Upgrade not built yet.

3.0 Water Servicing Principles and Policies

A principles and policies paper was developed during the 2006 Master Plan and updated in 2020 as part of this study. Through this study, the principles and policies were reviewed and updated to guide the development of water servicing strategies, which were adopted by the City Council.

In general, the City's goal is to build and maintain efficient, reliable, sustainable, and well-managed water systems that provide a high level of service to the public. To capture these goals, the servicing principles and policies are structured as follows.

General Water and Wastewater Policies – Outlines policies and guiding principles that impact both water and wastewater servicing.

-
- | | |
|--|---|
| • G.01: Planning and Servicing | • G.11: Services and Facility Location |
| • G.02: Planning and Servicing | • G.12: Monitoring |
| • G.03: New Development | • G.13: Environmental Protection |
| • G.04: Servicing Strategy Municipal Servicing | • G.14: System Reliability and Security |
| • G.05: Planning Horizon | • G.15: Climate Change |
| • G.06: Existing Infrastructure | • G.16: Level of Service |
| • G.07: Reserve Capacity | • G.17: Program Costing |
| • G.08: Standards and By-Laws | • G.18: Strategic Plan |
| • G.09: Efficiency and Optimization | • G.19: Operations |
| • G.10: Communication | • G.20: Coordination |

Water Policies – Outlines policies and guiding principles that impact water servicing only.

-
- | | |
|--|--|
| • W.01: Raw Water Sources | • W.07: Emergency Conditions |
| • W.02: Water Supply Distribution System
Water Quality | • W.08: Water Conservation, Efficiency
and Consumption Trends |
| • W.03: Drinking Water Quality Management
System (DWQMS) | • W.09: Health and Safety |
| • W.04: Distribution Requirements | • W.10: Water Demand Projections |
| • W.05: Water Supply Distribution System
Reliability and Security | • W.11: Water Storage |
| • W.06: Fire Flow | • W.12: Operational Flexibility and Energy
Management |

For the complete list of servicing principles and policies please refer to **Appendix A**.

4.0 Planning and Growth Projections

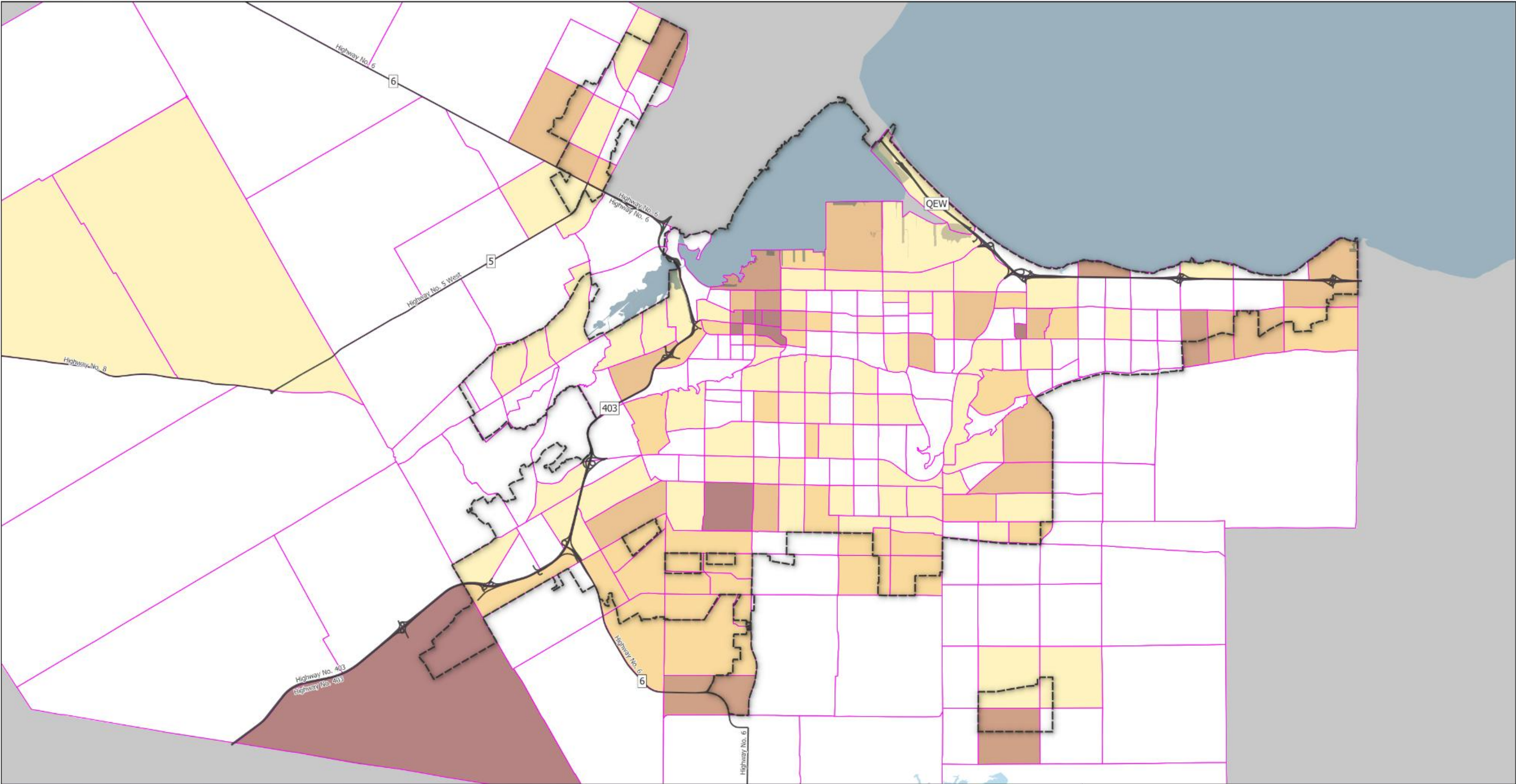
This section provides an overview of the population and employment growth projections that form the basis for the Interim Water Master Servicing Strategy analysis. The forecasts are based on the 2024 No Urban Expansion (NoUBE) Traffic Survey Zone (TSZ) data, endorsed by Council, and extend to 2051. These projections establish the foundation for assessing future infrastructure needs and identifying servicing strategies.

4.1 Population and Employment Planning Projections

The 2024 NoUBE TSZ dataset, endorsed by council, forecasts future population and employment growth to 2051. This growth is distributed in accordance with the totals and allocation policies set out in the current *Urban Hamilton Official Plan* (UHOP). **Table 4-1**, and **Figure 4-1** illustrates the residential and employment growth to 2051.

Table 4-1- Project Residential and Employment Population for the City of Hamilton to 2051

Year	Residential Population	Employment Population
2021	583,720	240,310
2031	653,820	278,680
2041	735,500	318,720
2051	820,610	360,610
Change from 2021-2051	236,890	120,300



- GRIDS 2 / TZ outline
- Urban Boundary
- Waterbody

Total Growth 2021 - 2051	
< 500	
500 - 1500	
1500 - 3000	
3000 - 5000	
5000 - 7500	
>7500	

Reference(s)
1. Projection EPSG:26917
2. Base Data: City of Hamilton, 2024



Map Title: Total Growth 2021 - 2051
(Updated July 2024 No UBE Scenario)

Project Name:
Integrated Water, Wastewater, and Stormwater
Master Plan

Client Name:
City of Hamilton
(Ontario, Canada)



4.2 Water Service Area Projections

The 2024 NoUBE TSZ population forecasts were used to update the water service area projections, aligning them with the City of Hamilton's existing pressure district framework. Each TSZ was analyzed and mapped to the City's 25 distinct water pressure districts based on geographic boundaries and service area delineations. Population estimates within each TSZ were then allocated to the corresponding pressure districts, ensuring that the projections accurately reflect anticipated growth patterns across the City's water service infrastructure. This approach provides a more precise basis for assessing future water demand and infrastructure requirements within each pressure district, supporting strategic and sustainable system planning up to the year 2051.

Table 4-2- Water Service Area Residential and Employment Population Projections to 2051

Facility ID	2021		2031		2041		2051	
	POP	EMP	POP	EMP	POP	EMP	POP	EMP
PD1	143,220	75,410	162,630	84,120	188,490	93,700	218,670	104,520
PD2	58,750	35,460	77,040	43,980	83,250	50,980	115,980	62,160
PD3	7,090	5,360	7,200	5,390	7,580	5,450	7,740	5,470
PD4	35,540	6,250	37,440	6,560	40,360	7,020	42,480	7,370
PD5	72,350	26,309	77,350	28,050	84,320	30,070	87,330	31,470
PD6	112,740	33,728	121,740	43,910	136,560	54,880	145,230	65,200
PD7	21,270	6,840	24,850	8,200	28,900	9,620	30,570	10,750
PD9	8	2	9	2	17	3	19	4
PD10	920	3290	1,130	360	1,960	480	2,868	530
PD11	13,760	5,860	14,130	5,930	14,620	6,030	15,950	6,210
PD12	5,560	1,820	5,770	1,850	5,950	1,890	6,241	1,930
PD13	510	170	530	170	550	170	568	180
PD14	500	110	520	120	550	120	563	120
PD15	100	30	100	30	100	30	107	30
PD16	17,840	8,880	19,350	9,910	26,090	11,630	26,785	12,550
PD17	2,180	530	2,210	540	2,230	540	2,331	560
PD18	32,930	15,330	35,480	20,490	40,230	25,950	42,279	31,070
PD19	460	70	460	70	470	70	470	70
PD20	180	30	170	30	180	30	180	30
PD21	440	230	450	230	460	240	510	240
PD22	3,340	930	3,430	950	3,820	1,000	3,980	1,030
PD23	11,910	2,430	14,980	2,850	18,490	3,340	19,080	3,430
PD24	6,300	1,590	9,290	2,000	13,360	2,280	11,680	2,330
PD25	6,520	1,060	6,670	1,090	6,810	1,120	7,090	1,170
Total	554,440	228,730	622,900	266,820	703,330	306,630	787,710	348,420

5.0 Existing Water Distribution System

5.1 Existing Water Infrastructure

The City of Hamilton's water supply system is a lake-based system supplied by Lake Ontario. The serviced area is supplied by the Woodward Avenue Water Treatment Plant (WTP). The City is also responsible for the supply and treatment of water in four rural communities, including Carlisle, Freelon, Greensville, and Lynden supplied by groundwater well in rural communities; however, these areas do not fall within the study area for the IMSS. Additionally, the City of Hamilton provides water supply to four (4) other drinking water systems in other municipalities, including:

- North Aldershot Water Distribution System (within the Regional Municipality of Halton), which is supplied via the City's Pressure District 16 at Waterdown Road.
- Snake Road Water Distribution System (within the Regional Municipality of Halton), which is also supplied via the City's Pressure District 16 at Snake Road.
- Bridgeview Community Water Distribution System (within the Regional Municipality of Halton), which is supplied via the City's Pressure District 19 at Northcliffe Avenue.
- Caledonia / Cayuga / York Water Distribution System (within Haldimand County), which is supplied via the City's Pressure District 6 at Highway 6 / Haldibrook Road.

The existing water system consists of the Woodward WTP, a series of reservoirs, elevated storage tanks, water pumping stations, and the transmission and distribution system. Based on the change in topography (including the Niagara Escarpment) and the wide geographical servicing area, 24 pressure districts have been established to maintain adequate levels of service. Two (2) pressure districts, PD9 and PD10, have an interconnection to the Town of Grimsby (Niagara Region) water system and are not normally serviced by the Woodward Avenue WTP and the Hamilton System. **Table 5-1** provides a summary of the pressure districts and their respective storage and pumping facilities.

The existing water system has two (2) primary feeder mains up the escarpment to service the Hamilton Mountain—a 1200 mm watermain along Greenhill Avenue from Barton Street to HD04B / HD05A and up to Stone Church Road East, and a 1050 mm watermain along the Kenilworth Access to Upper Ottawa. There is also a 750 mm trunk watermain along Cootes Drive which provides service to Dundas and feeds the 600 mm trunk watermain along York Road to service Waterdown. Based on historical City standards, the City of Hamilton water system has a large amount of storage available for supply (both floating storage and suction-side storage for pumping), equalization of system flows and pressures, and fire and emergency conditions.

Figure 5-1 presents a schematic representation of the existing water system, which is intended to show the following key details:

- Pressure District Connectivity;
- Pressure District Hydraulic Grade Line (HGL);
- Water Storage Facility HGL and Capacity;
- Pumping Station / Serviced pressure district and firm capacity with the following info:
 - PD with floating storage: Firm Capacity = Installed Capacity – largest pump out of service.
 - PD without floating storage: Firm Capacity = Installed Capacity – two largest pumps out of service.
- Key Pressure Reducing Valves (PRV) and Altitude Control Valves within the network;
- Re-chlorination facility locations, and;
- Locations where servicing is from either multiple facilities/feeds or single facility / feed.

Table 5-1- Water Facilities and Pressure Districts

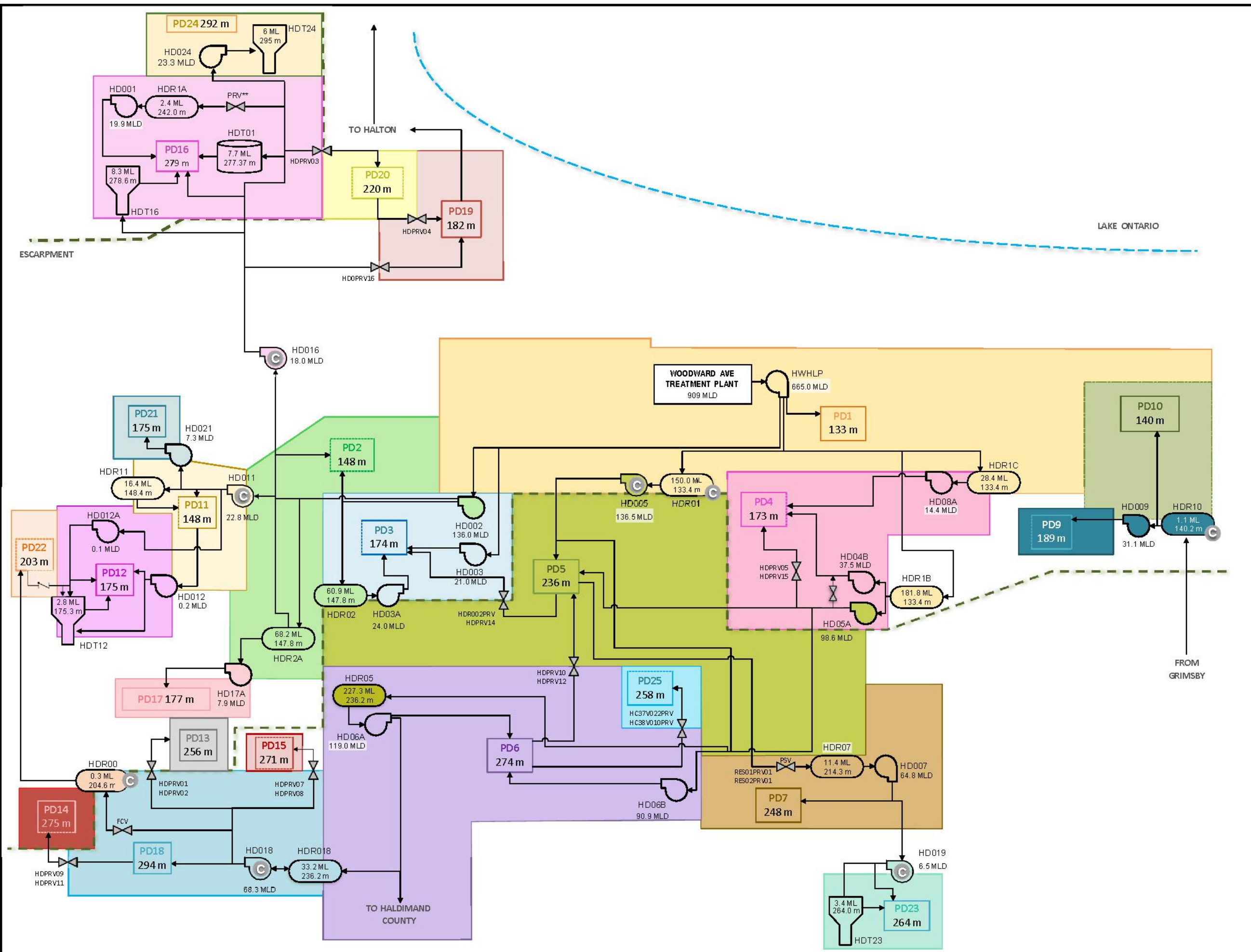
Pressure District	Closed or Floating	Max HGL (m)	Key Control Valve Supply	Storage	Pumping	Existing Storage Capacity (ML)	Existing Firm Pumping Capacity (ML/d)
PD1	Floating	133.35	-	- HDR01 Kenilworth Access Reservoir - HDR1B Greenhill Avenue Reservoir - HDR1C DeWitt and Ben Nevis Reservoir	HWHLP Water Treatment Plant High Lift Pumps	360	665
PD2	Floating	147.83	-	- HDR02 Hillcrest and Mountain Reservoir - HDR2A Bowman and Scenic Reservoir	HD002 Ferguson PS	129	136
PD3	Closed	173.74	- HDPRV14 (Sam Lawrence Park) supply from PD5 - HD003-PRV01 (HD003) from PD5 - HD003-PRV03 (HD003) from PD5	-	- HD003 Ferguson PS - HD03A Hillcrest PS	-	33
PD4	Closed	173.13	- HDPRV05 (Greenhill) from PD5 - HD05A-PRV (HD05A) from PD5 - HPRV15 (Greenhill) from PD5	-	- HD04B Greenhill Ave PS - HD08A DeWitt and Ben Nevis PS	-	51.10
PD5	Floating	236.22	- HDPRV10 (Lavender Drive) from PD6 - HDPRV12 (Upper Paradise Drive) from PD6	HDR05 Stone Church and Garth Reservoir	- HD005 Kenilworth Access PS - HD05A Greenhill Ave PS	227	233.60
PD6	Closed	273.86	-	Although not considered a PD6 storage, HDR05 provides pumped storage to PD6. PD6 also refills HDR18	- HD06A Stone Church and Garth PS - HD06B Stone Church and Tunbridge PS	-	290.90
PD7	Closed	248.41	-	HDR07 Highland Road Reservoir	HD007 Highland Road PS	11.37	43.20
PD9	Closed	188.97	-	HDR10 Fifty Road Reservoir	HD009 Fifty Road PS	1.14	0.36
PD10	Closed	140.21	- Supplied via Grimsby Water System. - Connected to the Hamilton Water Distribution System through an isolation valve which is normally closed. - Note that HDR10 Fifty Road Reservoir does not currently float PD10, but it is filled by the Grimsby supply. Its volume is used for PD9 pumped storage			-	-
PD11	Floating	148.44	-	HDR11 Woodley Lane Reservoir	HD011 Osler Drive PS	16.37	15.70
PD12	Floating	175.26	HDPRV13 (Jerome Park Drive) from PD22	HDT12 Dundas Elevated Tank	- HD0012 Old Ancaster Road PS - HD012A Governors Road PS	2.84	13
PD13	Closed	256.00	- HDPRV01 (Mewburn Road) from PD18 - HDPRV02 (Old Dundas Road) from PD18	Supplied via PRVs at Mewburn Road (HDPRV01), at Old Dundas Road (HDPRV02), and Brookview Cres (HDPRV09) from PD18	-	-	-
PD14	Closed	274.62	- HDPRV09 (Crestview Avenue) from PD18 - HDPRV11 (Colleen Crescent) from PD18	Supplied via HDPRV11 at Crestview Avenue and Colleen Crescent from PD18	-	-	-
PD15	Closed	271.00	- HDPRV07 (Deervalley Road) from PD18 - HPRV08 (Greenview Drive) from PD18 - AM12V080 (Green Ravine Drive) from PD18 - AM12V081 (Highvalley Road) from PD18	Supplied via PRV at Deer Valley Road (HDPRV07), and HDPRV08 at Greenview Drive and High Valley Road from PD18	-	-	-
PD16	Floating	278.59	-	- HDT01 Kelly Street Standpipe¹ - HDR1A Kelly Street Reservoir¹ - HDT16 Waterdown North Elevated Tank	- HD001 Kelly Street and Main Street PS¹ - HD016 York and Valley Road PS	ET = 8.25 Standpipe = 7.68	18.00 (HD016). 19.90 (HD001)
PD17	Closed	176.78	Check valve from PD2 in an emergency (HA16V027)	-	HD17A Main Street West and Whitney Avenue PS	-	7.85
PD18	Closed	294.00	-	HDR18 Garner Road and Glancaster Road Reservoir	HD018 Garner Road and Glancaster Road PS	33.16	68.30

Pressure District	Closed or Floating	Max HGL (m)	Key Control Valve Supply		Storage	Pumping	Existing Storage Capacity (ML)	Existing Firm Pumping Capacity (ML/d)
PD19	Closed	182.30	- HD016-PRV (HD016) from PD16 - HDPRV04 (Old Guelph Road) from PD20		-	-	-	-
PD20	Closed	220.00	HDPRV03 (Valley Road) from PD16		-	-	-	-
PD21	Closed	175.00	Check valve from PD11 in an emergency (DM09V070)		-	HD021 Royal Summit PS	-	1.58
PD22	Floating	202.69	- Altitude valve from PD18 opens to refill HDR00 - Check valve from PD12 in an emergency (DN12V003)	HDR00 Lee Smith Reservoir		-	0.27	-
PD23	Floating	264.00	-	HDT23 Binbrook Elevated Tank	HD019 Binbrook PS		3.40	6.48
PD24	Closed	292.00	-	HDT24 Waterdown South Elevated Tank	HD024 Upcountry Estates PS		6	23.30
PD25	Closed	258.00	- HC37V022 (Jasmine Street) from PD6 - HC38V010 (Parkplaza Drive) from PD6 - HD18V047 (Upper Sherman Avenue) from PD6		-	-	-	-

Note 1. HDR1A (Kelly Street Reservoir) and HD001 (Kelly Street and Main Street Pumping Station) are generally no longer in service. Future status to be discussed/confirmed as part of Interim Master Servicing Strategy.

Note 2. The firm capacity for a pumping station is the installed capacity, less the capacity of the largest pump (at each station, if multiple) for districts with floating storage and for districts with multiple pump stations. For closed pressure districts with one pumping station, the firm capacity is the installed capacity, less the capacity of the two largest pumps (except for PD9 and PD17 which are closed districts, with only two pumps)

Source: Data generally sourced from a combination of available files, including: "Pressure District Narratives Reference Manual" (AECOM -2020), Facility Process Control Narratives, Drinking Water Works Permit, and the "TM#1 – Background Review & Data Gap Analysis" from the WaterCAD Model Update Project.



Infrastructure

- WTP** Water Treatment Plant
- Pumping Station**
- Reservoir**
- Elevated Tanks**
- Standpipe**
- Pressure Reducing Valves**
- Check Valves**
- Chlorination Facility**
- Trunk Watermain Network**

*** Assumed / To be Confirmed*

Pressure Districts

PD1 133 m	PD10 140 m	PD18 294 m
PD2 148 m	PD11 148 m	PD19 182 m
PD3 174 m	PD12 175 m	PD20 220 m
PD4 173 m	PD13 256 m	PD21 175 m
PD5 236 m	PD14 275 m	PD22 203 m
PD6 274 m	PD15 271 m	PD23 264 m
PD7 248 m	PD16 279 m	PD24 292 m
PD9 189 m	PD17 177 m	PD25 258 m

Figure 5-1
Existing Water System Schematic

Project Name:
Water, Wastewater, Stormwater
Interim Master Servicing Study

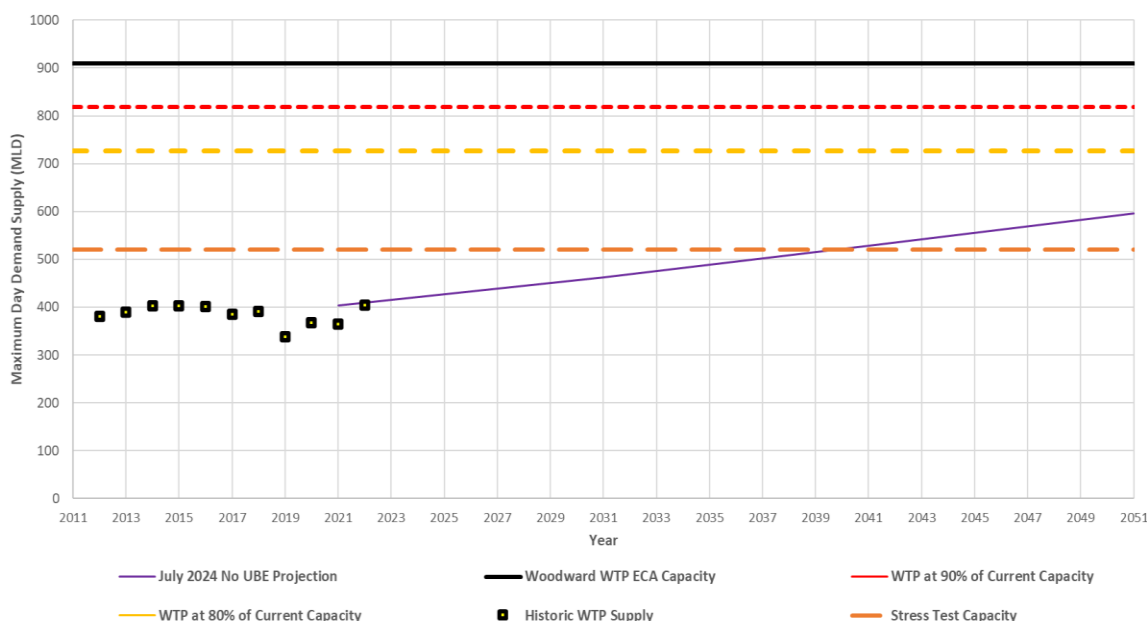
Client Name:
City of Hamilton
(Ontario, Canada)

5.2 Water Treatment

Treated water within the City of Hamilton Interim Master Servicing Strategy (IMSS) study area is provided by the Woodward WTP. The plant is currently permitted to take up to its rated MDD capacity of 909 ML/d from Lake Ontario. Historical stress testing of Woodward WTP indicates a max achievable capacity of ~520 ML/d currently for short periods of time. However, some limitations at the plant indicates that continuous achievable capacity is currently below 520 ML/d due to hydraulic restrictions and plant limitations.

Based on existing (2023) average daily demand from plant production of 209 ML/d, and existing MDD of 403 ML/d, the plant is operating within its rated capacity. This, along with historical ADD data from plant production (2016 to 2021), indicates a common annual average range between 200 ML/d to 230 ML/d and a MDD commonly around 400 ML/d.

Figure 5-2- Woodward WTP Capacity and Demand Projections to 2051



Although Woodward WTP indicates sufficient existing capacity, City could potentially explore a future investigation into new secondary water treatment plants for diversification of future supply to provide increased resiliency. Woodward WTP includes two (2) raw water intake pipes (1.52 metres and 2.44 metres in diameter). The overall water treatment process includes the following.

- Pre-chlorination (for zebra mussel control);
- Low lift pumping station with screening (three travelling screens to remove debris prior to pumping the water to Woodward WTP);
- Pre-treatment: Polyaluminum chloride is added to the water to coagulate suspended solids. Additional chlorine is also added at this stage to ensure disinfection;
- Clarification of the water is completed by: Flocculation by mechanical mixing and Sedimentation, and; Filtration using granular activated carbon media filters to remove taste and odour.
- Secondary disinfection includes: Chlorine and ammonia are added to the filtered water to bring the combined chlorine residual to ~2.5 to 2.7 mg/L. Chlorine is added as the primary means to ensure disinfection. Ammonia is added to convert the chlorine to mono-chloramine to help maintain stable chlorine residuals in the distribution system.
- Hydrofluorosilicic acid (fluoride) is added to the drinking water to promote dental health.
- Orthophosphate (phosphoric acid) is added to help reduce lead corrosion.
- A high lift pumping station pumps the treated water into the distribution system.

5.3 Water Storage

A summary of the storage facilities and key information related to each is provided below in **Table 5-2**.

Table 5-2- Storage Facilities

Facility ID	Name	Type	Pressure District	Top Water Level (m)	Total Available Storage (ML)	Number of Cells
HDR00	Lee Smith	Reservoir	PD22	204.60	0.27	1
HDR01	Kenilworth Access	Reservoir	PD1	133.35	150	2
HDR1A	Kelly Street	Reservoir	PD16	277.40	2.41	2
HDR1B	Greenhill Avenue	Reservoir	PD1	133.35	182	2
HDR1C	Dewitt and Ben Nevis	Reservoir	PD1	133.35	28.40	2
HDR02	Hillcrest and Mountain	Reservoir	PD2	147.83	60.90	2
HDR2A	Bowman and Scenic	Reservoir	PD2	147.83	68.20	2
HDR05	Stone Church and Garth	Reservoir	PD5	236.22	227	4
HDR07	Highland Road	Reservoir	PD7	214.27	11.40	2
HDR10	Fifty Road	Reservoir	PD10	140.21	1.140	1
HDR11	Woodley Lane	Reservoir	PD11	148.44	16.40	2
HDR18	Garner Road and Glancaster Road	Reservoir	PD18	236.20	33.20	2
HDT01	Kelly Street	Standpipe	PD16	278.59	7.70	1
HDT12	Dundas	Elevated Tank	PD12	175.30	2.840	1
HDT16	Waterdown North	Elevated Tank	PD16	278.60	8.20	1
HDT23	Binbrook	Elevated Tank	PD23	264.00	3.40	1
HDT24	Waterdown South	Elevated Tank	PD24	295	6	1

Source: Data generally sourced from a combination of available files, including: "Pressure District Narratives Reference Manual" (AECOM -2020), Facility Process Control Narratives, and the "TM#1 – Background Review & Data Gap Analysis" from the WaterCAD Model Update Project.

5.4 Water Pumping Stations

A summary of the pumping stations (PS) and key information related to each is provided in **Table 5-3**.

Table 5-3- Water Pumping Stations

Facility ID	Name	Pressure District	Pumps	Installed Capacity (ML/d)	Firm Capacity* (ML/d)
HWHLP	Woodward Avenue HWHLP	PD1	6 pumps @ 133 MLD	798	665
HD001	Kelly Street PS	PD16	2 pumps @ 19.87 MLD	39.74	19.87
HD002	Ferguson PS	PD2	2 pumps @ 68 MLD 2 pumps @ 34 MLD	204	136
HD003	Ferguson PS	PD3	2 pumps @ 14 MLD 1 pump @ 7 MLD	35	21
HD03A	Highland Gardens Park PS	PD3	3 pumps @ 6 MLD	18	12
HD04B	Greenhill and Summercrest PS	PD4	4 pumps @ 12.5 MLD	50	37.50
HD05A	Greenhill and Summercrest PS	PD5	2 pumps @ 75.9 MLD 1 pump @ 22.7 MLD	175	98.60
HD005	Kenilworth Access PS	PD5	4 pumps @ 45.5 MLD	182	137
HD06A	Stone Church and Garth PS	PD6	3 pumps @ 47.7 MLD 1 pump @ 22.7 MLD	166	118
HD06B	Stone Church and Tunbridge PS	PD6	3 pumps @ 86.4 MLD	259	173
HD007	Highland PS	PD7	4 pumps @ 21.6 MLD	86.40	43.20
HD08A	Ben Nevis and Dewitt PS	PD4	2 pumps @ 11.35 MLD 1 pump @ 2.27 MLD	24.97	13.62
HD009	Fifty Road PS	PD9	2 pumps @ 0.173 MLD	0.34	0.17
HD011	Osler PS	PD11	3 pumps @ 7.85 MLD	23.55	15.70
HD012	Old Ancaster Road PS	PD12	3 pumps @ 5.8 MLD	17.40	11.60
HD12A	Governor's Road and Huntingwood PS	PD12	1 pump @ 1.31 MLD 1 pump @ 3.27 MLD	4.58	1.31
HD016	York and Valley Road PS	PD16	2 pumps @ 8.9 MLD 2 pumps @ 4.55 MLD	26.90	18
HD17A	Main and Whitney PS	PD17	2 pumps @ 7.85 MLD	15.70	7.85
HD018	Garner Road. PS	PD18	2 pumps @ 23.3 MLD 2 pumps @ 22.5 MLD	91.60	68.30
HD019	Binbrook PS	PD23	3 pumps @ 3.24 MLD	9.72	6.48
HD021	Royal Summit PS	PD21	2 pumps @ 6.54 MLD 2 pumps @ 0.79 MLD	14.66	1.58
HD024	Upcountry Estates PS	PD24	3 pumps @ 9.5 MLD 1 pump @ 4.32 MLD	32.82	23.32

Source: Data generally sourced from a combination of available files, including: "Pressure District Narratives Reference Manual" (AECOM -2020), Facility Process Control Narratives, and the "TM#1 – Background Review & Data Gap Analysis" from the WaterCAD Model Update Project.

5.5 Water Distribution System

The lake-based system is divided into 24 pressure districts (PD1 through PD25, excluding PD8). The following sections outline baseline water system details by pressure district (PD) for each service area.

5.5.1 Downtown Hamilton (PD1, PD2, PD3)

Downtown Hamilton is serviced by PD1, PD2, and PD3. PD1 is serviced directly from the high lift pumps located at the Woodward WTP. The high lift pumps also provide capacity for all pressure districts. There are three (3) reservoirs in PD1 (HDR01, HDR1B, and HDR1C)

PD2 is serviced by pumping station HD002, located on the same site as HD03A which services PD3. PD2 is also equipped with two (2) storage facilities (HDR2A and HDR02).

PD3 is supplied with water from PD1 through the Ferguson Avenue WPS (HD003), which receives water from the high lift pumps at Woodward WTP, and boosts supply directly to PD3. PD3 can also be supplied by Highland Gardens Park PS (HD03A), which draws water from Hillcrest Reservoir (HDR02) during periods of high demand. Lastly, PD3 can be fed by gravity from PD5 through two (2) pressure reducing valves (PRV) located in the Ferguson Avenue PS.

5.5.2 Stoney Creek (PD1, PD4, PD9, PD10)

Stoney Creek is serviced through PD1, and also has areas located within PD4. There are two pumping stations which feed PD4 - HD04B and HD08A. There is no elevated storage in PD4, though there is pumped storage at HD04B.

PD9 and PD10 are located at the east end of Stoney Creek and are serviced through an interconnection with the Grimsby water system (Niagara Region). Grimsby provides direct supply to the PD10 system, while also supporting the fill cycle at the HDR10 reservoir. Currently, HDR10 (located along Fifty Road) does not float the PD10 system and is only used as pumped storage to PD9.

5.5.3 Dundas (PD11, PD12, PD17, PD21, PD22)

Dundas is primarily serviced through PD11 and is adjacent to and supplied through PD2. Storage in PD11 is provided by HDR11.

PD12 is supplied from PD11 through pumping stations HD012 and HD12A, as well as with an emergency interconnection from PD22. HDT12 provides equalization storage for PD12 but has limited capacity, so some storage needs (emergency / fire) are met by pumped storage from PD11.

PD22 services the northwest area of Dundas and is currently supplied through a single 300 mm watermain on Sulphur Springs Road from PD18 via HDR00. Backup supply to PD22 is currently provided via check valves from PD12. The previous MP identified new PD22 pumping capacity at the future Governor's Road WPS, which will provide a new primary source of supply to PD22.

PD21 is located in the north end of Dundas and is supplied by HD021 via PD11. PD17 is located in the south end of Dundas, on the border of Dundas and Ancaster and is serviced by HD17A via PD2. An ongoing Class EA has selected a preliminary preferred location for a replacement of HD17A.

5.5.4 Waterdown (PD16, PD19, PD20, PD24)

Waterdown is primarily located within PD16, which is supplied through PD2. PD19 and PD20 are serviced through PRVs via the pumped flow from HD016. PD24 is supplied from pumping station HD024 via PD16. PD24 has storage provided by the HDT24 elevated tank.

PD16 is supplied by HD016 located below the escarpment at York Road and Valley Road in Dundas through a single 600 mm trunk watermain along York Road. Storage in PD16 is currently provided by the HDT16 tank. There are also two older storage facilities in PD16 that are currently not utilized, HDR1A and HDT01. HDR1A (Kelly Street Reservoir) is a ground storage reservoir that can be pumped into PD16 via the HD001 PS. HDT1A is a standpipe, which could be used as back-up floating storage for the PD.

PD19 and PD20 are located at the south end of Waterdown and are both serviced by HD016 via PRVs. PD19 is also serviced from an additional feed in PD20 through PRVs.

5.5.5 Hamilton Mountain (PD5, PD6, PD7, PD25)

The Hamilton Mountain is located within PD5, PD6 and PD25. PD5 is fed from PD1 through two (2) water pumping stations, HD005 and HD05A. PD5 can also be serviced through two (2) PRVs from PD6; however, under normal conditions, these remain closed and only open when pressure drops in PD5. PD6 is fed from PD5 through two (2) additional pumping stations—HD06A in the west and HD06B in the east. HDR05 provides floating storage for PD5 and pumped storage for PD6.

PD7 services the southern part of Stoney Creek (east side of Hamilton Mountain), which is supplied through PD5. While there is no floating storage within PD7, there is currently pumped storage via HD007, which pulls from a ground reservoir (HDR07). The PD7 network subsequently feeds Binbrook (PD23) through HD019 via a 400 mm trunk watermain from PD7.

PD25 is a small, isolated pressure district located adjacent to and fed via three PRVs from PD6.

The existing water system has the following escarpment crossings:

- 1200 mm along Greenhill Avenue from HD05A (bringing supply into PD5)
- 1050 mm along the Kenilworth Access from HD005 (bringing supply into PD5)
- 400 mm from Upper Wellington Street and Concession Street down to HD003 through a PRV for additional security in PD3 (bringing water from PD5 back down to PD3, in an emergency)

5.5.6 Mount Hope and Binbrook (Part of PD6, PD23)

Mount Hope (PD6) is serviced by a 400 mm trunk watermain along Upper James. A 600 mm trunk watermain along Glancaster Road services the John C. Munro Hamilton International Airport, and Mount Hope.

The Town of Binbrook (PD23) is supplied by HD019 located at Highway 56, north of Cemetery Road. HD019 receives water from a 400 mm trunk watermain from PD7 via the HD007 WPS. The Binbrook Elevated Tank (HDT23), located west of the Binbrook Fairgrounds, provides floating storage for PD23.

5.5.7 Ancaster (PD13, PD14, PD15, PD18)

Ancaster is located within PD13, PD14, PD15, and PD18. PD18 is supplied through PD6 via HDR18 and HD018 located at Rymal Road and Glancaster Road. There are PRVs to PD13, PD14, and PD15. While there is no floating storage within PD18, there is pumped storage (HDR018) at pumping station HD018.

6.0 Analysis Process and Tools

The following section provides a summary of the various processes, criteria and tools used and / or developed as part of the Interim Master Servicing Strategy (IMSS). The IMSS Design Criteria, Levels of Service (LOS) targets, the water system hydraulic model, and a risk and resiliency study were updated as to provide guidelines and direction, while also ensuring that water demand estimates are adequately representative to support decision making regarding the sizing and timing of future infrastructure. A more detailed look at the design criteria and levels of service can be found in **Appendix C** (Technical Memorandum 3.2).

6.1 Design Criteria

Based on the review of City of Hamilton production, billing, and SCADA data, **Table 6-1** provides a summary of the recommended IMSS Design Criteria to be applied to new growth.

Table 6-1- Summary of Design Criteria

Demand Criteria	2025 Interim Master Servicing Strategy ¹
Residential Average Day Demand (L/cap/d)	300
Employment Average Day Demand (L/cap/d)	260
Max Day Peak Flow	1.9
Peak Hour Peak Flow	3.0

Notes 1: ADD – Residential and Employment demand for IMSS vary from the Comprehensive Development Guideline Standards

6.2 Levels of Service

Based on the review of City of Hamilton water system guidelines, as well as other related guidelines (e.g. MECP, other similar municipalities in Ontario, etc.), **Table 6-2** provides a summary of the recommended IMSS LOS to be applied to the water system assessment.

Table 6-2- Summary of Levels of Service (LOS)

LOS Criteria	2025 Interim Master Servicing Strategy
Pumping Capacity	Firm Capacity to provide the sum of downstream pressure district pumping needs. A detailed flow chart showing the pumping requirement by operating conditions is included in the design criteria Tech Memo 3.2.
Storage Capacity	MECP Storage Requirements Storage Needs (by PD) = Equalization (A) + Fire (B) + Emergency (C) (A) 25% MDD volume (equalization) (B) MECP Fire Storage Requirements (C) 25% of A+B (emergency)
Distribution Capacity	The distribution system is sized to convey the greater of peak hour flows or max day plus fire flows, while maintaining pressure targets (276 kPa to 689 kPa during normal operations; >20 psi during fire)
Treatment Capacity	When flows reach 80% of plant capacity, the planning process for plant expansion will be flagged. When 90% of plant capacity has been reached, expansion should be completed.

6.3 Hydraulic Model

The City's hydraulic water model was developed using *WaterCAD*, a water distribution modelling and analysis software package by *Bentley*. The model's physical infrastructure was updated based on GIS information received from the City in June 2021. The system watermain and network appurtenances (including system valves and nodes) were imported directly into the model using the City's existing GIS water system infrastructure data. Each of these elements includes a directly relatable GIS ID in the model, so that the elements are related one-to-one between GIS and the model (except at facilities).

The model was calibrated to existing conditions (Fall 2021) and offers a reasonable and accurate representation of those conditions. Model calibration was conducted using seven-day extended period simulation (EPS) scenarios; as such, system operations are reasonably well modelled across a wide range of operating conditions (pump station flow rates, etc.). Additionally, 240 hydrant flow tests were used to calibrate the local network (local distribution pipes) across the system.

The current water model includes both steady-state scenarios and extended period simulations for existing (2021) conditions and is being updated as part of the IMSS to also include up to date 2031, 2041, and 2051 scenarios with any required infrastructure upgrades. All pressure districts in the lake-based system are included, and all facilities are represented, including pump curves. For the extended period simulation scenarios, both average day demand (ADD) and maximum day demand (MDD) scenarios are included. For steady-state scenarios, ADD, MDD and peak hour demand (PHD) scenarios are included.

Generally, it is recommended to utilize EPS scenarios (rather than steady-state scenarios) wherever possible since they provide more variability in system conditions by mimicking the drain / fill cycles at storage facilities and the varying operations from pump stations. However, steady-state scenarios are also provided for ADD, MDD and PHD conditions since it may be desirable to use these for Form 1 development applications to assess the baseline and future planning horizons (2031/2041/2051). As part of the IMSS, EPS scenarios will primarily be used for the assessment of infrastructure. However, steady-state fire flow analyses will also be conducted.

Overall, the model is suitable for use in the IMSS modelling analysis. In addition to the hydraulic model, there are also desktop analysis tools (Excel) that are used to complete a range of different calculations including:

- **Water Treatment Plant Starting Point and Demand Projections:** confirming an appropriate starting point for demands based on historical data over the past 10 years. Subsequently, growth is also applied based on the agreed design criteria for the projected population growth.
- **Demand Calculations by PD:** used to support the storage and pumping desktop assessments.
- **Storage Need Assessments by PD:** using MECP criteria and the projected demands by pressure district, storage needs are identified for each pressure district to see if sufficient equalization, fire and emergency storage exists.
- **Pumping Capacity Need Assessments by PD:** assessment of the governing demand for each pressure district compared to the actual capacity of the pump stations that feed the pressure district. It is noted that pumping capacities also consider the subsequent upstream needs for pressure districts that transfer flows to other pressure districts. These calculations also consider the governing demand, which can be MDD, PHD, or MDD+Fire Flow, depending on whether sufficient floating storage exists.

6.4 Risk and Resiliency

Risk and resiliency within a water distribution system have been comparatively assessed through the scoring and weighting of various infrastructure-specific criteria for both linear and vertical (pumping and storage) infrastructure groups (**Appendix D Techn Memo 5**). In general, the City's water system is designed with a good level of security and redundancy in most pressure districts. However, some PDs are at higher risk due to being fed by a single station with no floating storage.

With limitations identified as part of the risk analysis, and the potential responses considered, refined, and evaluated through the IMSS process, the study's recommendations consist of both infrastructure upgrades and non-infrastructure response plans. Infrastructure projects are then incorporated into the IMSS recommended solutions where they best address risk and improve system resiliency. Preliminary recommendations for new infrastructure are proposed in **Table 6-3**.

Table 6-3- Preliminary Pressure District Recommendations

Pressure District	Limitations	Preliminary Potential Recommendations Considered to Address the Limitation
PD1	East Side Transmission (High Reliance on Barton Street watermain towards Stoney Creek)	- Twin existing watermain on Barton Street crossing Red Hill Creek and further east towards Green Road - Provide a continuation of the dead-end Queenston Road watermain between Nash Road and Gray Road
PD2	Pumping and Transmission Limitation (High Reliance on HD002 PS and Transmission to HDR2A)	- Installation of a second PD2 pumping station - Installation of a new Hwy 403 crossing watermain to better connect the PD2 storages and PD2 pump stations to the west side of PD2
PD5	Reliance on Single Floating Storage (HDR05) for PD5 and PD6	Installation of an additional floating storage facility within either PD5 or PD6
PD5	Transmission Limitations (From HD05A to HD06B)	Installation of a twinned trunk watermain from HD05A to PD5 (and the HD06B site), including the Felker's Creek crossing
PD6	Reliance on Single Floating Storage (HDR05) for PD5 and PD6	Installation of an additional floating storage facility within either PD5 or PD6
PD6	Transmission Limitation (High Reliance on existing Garth Watermain towards AEGD)	Improved looping of watermains, potentially along Glancaster and with an extension of Rymal Road's transmission from Upper Wentworth to Garth
PD7	Lack of Floating Storage and High Reliance on Single PS (HD007)	- Installation of floating storage within PD7 - Addition of a second PD7 pumping station to improve resiliency of supply in PD7 and PD23
PD16	Transmission Limitation (High reliance on single feed to and from HD016)	Installation of a twinned trunk watermain to Waterdown, both upstream and downstream of HD016, plus internal resiliency at HD016 PS
PD18	Lack of Floating Storage Capacity	Installation of floating storage within PD18
PD18	Pumping and Transmission Limitations (Reliance on HD018 PS and single feed)	Installation of an additional pumping station and supply watermain from PD6 into PD18 to mitigate for lack of storage and reliance on HD018 PS
PD22	Transmission Limitation (Single Feed to PD22 – Backfeed from PD18)	Installation of a pumping station to convey water from PD11 into PD22. New primary supply, while maintaining backfeed as secondary supply.
PD23	Transmission Limitation (PD7 to HD019)	Twinned primary feed to PD23

7.0 Assessment of Existing and Future Water Infrastructure

Following the established approach in the 2006 Water and Wastewater Master Plan, a critical initial step in the Interim Master Servicing Strategy (IMSS) process was the assessment of the existing infrastructure to determine the updated water system baseline conditions. These updated baseline conditions became the basis of the future recommendations of the IMSS and therefore it was important to ensure that they were determined through a comprehensive detailed analysis of the system. Once the existing system conditions were established, the potential impact(s) of the future growth demands on the water distribution system were analyzed to develop and recommend future servicing strategies.

The following sections describe current opportunities and constraints in the existing water system and assess the system's ability to accommodate growth within the 2051 planning horizon.

7.1 Assumptions and Limitations

As part of the IMSS analysis, a comprehensive assessment of potential transmission main alignments and facility (site) locations has not been undertaken, as this level of detail is beyond the scope of the IMSS. The intent at this stage is to define overall servicing concepts and identify the most reasonable and representative alignment options for costing and mapping purposes. These conceptual corridors and facility sites are appropriate for long-range planning that meet level of service requirements but are not intended to represent final design or routing decisions. More detailed investigations will be required in subsequent Class EA or design phases to identify, assess, and evaluate site-specific alternatives once additional environmental, technical, and financial information becomes available.

The focus of the IMSS is on developing overall servicing strategies for pumping, storage, and transmission infrastructure. Separately, there are distribution-level challenges that exist in the system, such as localized fire flow deficiencies, insufficient looping, aging infrastructure, etc. These types of localized distribution upgrades are not assessed or identified in the IMSS. They should be addressed separately through intensification studies, state-of-good-repair assessments, or other localized area-by-area reviews.

7.2 Opportunities and Constraints

The assessment of opportunities and constraints primarily focuses on the urban water service areas within the lake-based system of the City of Hamilton. As such, the IMSS documentation is generally organized into the various smaller communities within Hamilton, including Downtown Hamilton, Stoney Creek, Dundas, Waterdown, Hamilton Mountain, Mount Hope, Binbrook, and Ancaster.

Existing and future water opportunities and constraints were identified through discussions with City staff, as well as through hydraulic analyses, desktop calculations for pumping and storage, and a review of other related infrastructure data (e.g., GIS, design reports, etc.). The recently re-calibrated *WaterCAD* hydraulic model for the City of Hamilton was used to analyze the performance of the existing and future system under different demand conditions such as ADD, MDD, PHD, and, to a lesser extent, MDD+FF. Fire flow scenarios were generally used to identify broader system-level fire flow deficiencies that would be pumping, storage, or transmission driven. They were not used to identify localized issues in the distribution system.

The City should consider conducting localized studies (for intensification areas; or areas with known fire flow deficiencies) to identify the local upgrade needs (replacement; upsizing; etc.) that would be needed in the distribution system. These are best implemented over time as part of state-of-good-repair (SOGR) projects.

7.2.1 Downtown Hamilton (PD1, PD2, PD3)

The following section summarizes any outstanding opportunities and constraints for the various components of the water system that support PD1, PD2 and PD3, including treatment / supply, pumping, storage, and transmission / distribution. The key existing / future issues and constraints identified include the following:

1. Transmission limitations that limit the ability of the Water Treatment Plant (WTP) to achieve its full flow capacity into the PD1 system.
2. PD2 pumping capacity is insufficient to accommodate significant growth in the future and there is currently a high reliance (and low resiliency) due to the presence of a single pumping station.
3. Existing transmission limitations in PD2 system, with a high reliance on the primary transmission between the pumping station and HDR2A and across Hwy 403 towards Dundas / Waterdown.

The following summarizes key opportunities identified based on a combination of outcomes from the risk assessment, desktop analysis (pumping and storage assessment), and modelling of future growth conditions:

- There is an opportunity for improved long-term transmission from Woodward WTP by Strengthening the hydraulic capacity from the WTP towards the west side of the system (towards HDR01).

One opportunity under consideration is replacing existing aging cast iron watermain (450/500/750) within the utilities corridor with a single or multiple larger transmission mains. The intent is to support future growth while also improving system resiliency and facilitating the ongoing replacement of aging cast iron mains.

- Instead of meeting the growth by expanding the existing single PD2 pumping station, a new PD2 pumping station is identified as a long-term opportunity that can support growth while improving the resiliency of the system. From a transmission perspective, there would need to be improvements in east to west capacity to bring supply from Woodward WTP / HDR01 towards the PD2 pumping stations.

One opportunity identified for this is to take advantage of the existing 1200 mm watermain from the WTP, which currently ends at Sherman Avenue / Burlington Street, and extend this transmission west towards the PD1 – PD2 boundary.

- There is a high risk watermain through Chedoke Park to HDR2A. There could be an opportunity to address this through an additional Hwy 403 crossing for additional conveyance west, potentially with an improved linkage from the proposed new PD2 pumping station.
- It is also noted that a Downtown local servicing study in PD2 identified various localized upgrades required to improve fire flow and system looping.

7.2.2 Stoney Creek (PD1, PD4, PD9, PD10)

The following section summarizes any outstanding opportunities and constraints for the various components of the water system that support PD1, PD4, PD9 and PD10, including pumping, storage, and transmission / distribution. The key existing / future issues and constraints identified include the following:

1. In PD1, there is a high reliance currently on the existing 2250 mm crossing of Red Hill Valley Parkway. This is currently the primary supply across to the east side of Hamilton, which ultimately acts as the primary supply towards Stoney Creek and as the supply to the Greenhill and Dewitt PD1 Reservoirs. Without the 2250 mm crossing, the only remaining crossings are a 600 mm crossing at Melvin and a 900 mm crossing at Queenston.

2. In PD1, there is a high reliance on the existing Barton Street East (1200 mm / 1050 mm) transmission main, particularly the 1200 mm Barton segments between Nash Road and Grays Road. Without this 1200 mm feed, the only remaining east-west feeds in PD1 (across Battlefield Creek) are a 500 mm watermain (aging cast iron) along Barton Street, a 300 mm on Huckleberry Drive; a 250 mm along Queenston Road; and a 200 mm along Randall Avenue. Overall, these remaining feeds have limited capacity to support the east side of Hamilton, so additional east-west resiliency should be considered.
3. Currently, there are limitations in the available fire flow provided to the PD10 service area. The PD10 area currently only receives supply directly from the connection with Grimsby, and there is no backfeed currently from HDR10. The limitations in fire flow in PD10 are driven by a combination of the limited watermain size and the lack of a backfeed from the storage (HDR10).

The following summarizes key opportunities identified based on a combination of the outcomes of the risk assessment, desktop analysis (pumping and storage assessment), and modelling of future growth conditions:

- Increase transmission resiliency in PD1 (East) by providing an additional transmission main crossing of the Red Hill Valley Parkway that supports long-term growth and system resiliency.
- Increase transmission resiliency in PD1 (East) by providing an additional transmission main east of Nash Road towards at least Gray Road that supports long-term growth and system resiliency.
- Consider operational opportunities that could help to improve fire flow availability in PD10. The storage need in PD10 is generally supported by instantaneous increases in supply from Grimsby (as is currently practiced during emergencies). Since this is still limited compared to a traditional fire flow target, the fire flow availability in PD10 could be improved by introducing back feed capability at HDR10 or by agreeing that the area should remain as a rural firefighting area (tanker / pumper trucks; to supplement hydrants).

7.2.3 Dundas (PD11, PD12, PD17, PD21, PD22)

The following section summarizes any outstanding opportunities and constraints for the various components of the water system that support PD11, PD12, PD17, PD21 and PD22, including pumping, storage, and transmission / distribution. The key existing / future issues and constraints identified include the following:

1. PD11 pumping capacity is insufficient to accommodate existing and future growth. Separately, limited transmission network also contributes to the pumping limitations from HD011 pump station towards the Woodley Lane Reservoir (HDR11).
2. In PD12, the available storage (provided by Dundas Elevated Tank HDT12) is slightly below the theoretical storage need (fire, emergency, and equalization) for the pressure district.
3. PD17 does not have sufficient pumping capacity to cover maximum day plus fire flow demands. However, there is an ongoing Class EA related to the HD17A PS which is going to identify the preferred location for a pump station replacement / upgrade, which would support the short- and long-term needs.
4. PD22 is currently supported by a single back feed (from PD18 and the HDR00 – Lee Smith Reservoir). The watermain that provides this back feed is a single main along Sulphur Springs Road, which, in the event of watermain break, would result in lost of service. The resiliency in PD22 is limited currently, so an alternative supply route is envisioned to support the system needs, while improving resiliency.

The following summarizes key opportunities identified based on a combination of the outcomes of the risk assessment, desktop analysis (pumping and storage assessment), and modelling of future growth conditions:

- Opportunity to increase pumping capacity required along with linear improvements in PD11 via Osler PS or by adding a second pumping station drawing from PD2.
- Opportunity to increase capacity at HD12A pump station (planned Governor's Road PS upgrades) to enable additional pumped storage in PD12.
- Opportunity to replace HD17A PS (ongoing Class EA) to enable both state-of-good-repair upgrades while improving levels of service in PD17 to meet existing and future needs.
- Opportunity to provide improvements in levels of service and improved resiliency with PD22 upgrades. Previous assessments related to the Governor's Road PS have identified the addition of PD22 pumps at the Governor's Road pumping station, which will support normal operations. The PRV backfeed from PD18 to PD22 will continue to be maintained as secondary supply to support fires and resiliency.

7.2.4 Waterdown (PD16, PD19, PD20, PD24)

The following section summarizes any outstanding opportunities and constraints for the various components of the water system that support PD16, PD19, PD20 and PD24, including pumping, storage, and transmission / distribution. The key existing / future issues and constraints identified include the following:

1. PD16 pumping capacity is insufficient to accommodate existing and future growth. There are planned upgrades at the HD016 PS (firm capacity increasing from approximately 18 ML/d to 28ML/d) that will satisfy future growth projections, while providing a degree of pumped storage. There is also high reliance on the single HD016 PS, however due to topography / route limitations, there are minimal opportunities to address this.
2. In PD16, the available storage (provided by Waterdown North Elevated Tank HDT16) is slightly below the future storage requirements as per MECP guidelines (fire, emergency, and equalization storage). So, either pumped storage, repurposing of existing offline storage sites (HDT01 / HDR1A) or new storage will be needed.
3. PD16 relies heavily on a single 600 mm feed that connects PD2 to HD016 pump station along York Road, and a single 600 mm discharge feed leaving HD016 PS. This is currently the only supply route to the PD16 system, which also supplies PD19, PD20 and PD24. There is a planned twin discharge watermain (ongoing Class EA) that will reduce the risk associated with reliance on this single pipe.

The following summarizes key opportunities identified based on a combination of the outcomes of the risk assessment, desktop analysis (pumping and storage assessment), and modelling of future growth conditions:

- Planned upgrades at HD016 PS (firm capacity increasing from approximately 18 ML/d to 28 ML/d) should continue to be carried forward and confirmed for viability to satisfy the future growth projections,
- In terms of storage, it is important to either maintain HDT01 (currently offline facility) to support sufficient capacity in PD16 or consider other ways to manage the storage deficit, such as providing pumped storage from HD016, or / and installing PRVs that enable backfeed from PD24 to PD16.
- Opportunity near the suction side (PD2) at York / Olympic / Cootes Drive for twinning watermains to enhance resiliency, low net positive suction head (NPSH) and suction capacity at HD016 pumping station.

7.2.5 Hamilton Mountain (PD5, PD6, PD7, PD25)

The following section summarizes any outstanding opportunities and constraints for the various components of the water system that support PD5, PD6, PD7 and PD25, including pumping, storage, and transmission / distribution. The key existing / future issues and constraints identified include the following:

1. PD5 pumping capacity is insufficient to accommodate future growth, and, without upgrades, there would be future transmission limitations restricting the ability of Greenhill pumping station (HD05A) to operate at full capacity within the PD5 system and towards Stone Church pumping station (HD06B).
2. In PD6, there is no assigned storage, resulting in a high reliance on continued supply from Stone Church and Garth pumping station (HD06A) and Stone Church and Tunbridge PS (HD06B) when needed. There are also some transmission limitations in PD6 system, with low resiliency in the linkage between the two PD6 pump station facilities and the supply to growth areas of the Airport Employment Growth District (AEGD).
3. PD7 does not have any dedicated floating storage and currently relies on pumped storage at Highland Reservoir (HDR07), which is slightly below the future storage requirements, as per MECP guidelines. It is noted that HDR07 storage site is physically constrained for expansion; therefore, a new storage location is likely required in combination with new pumping capacity to support PD7 growth and increase resiliency.
4. PD7 pumping capacity is insufficient to accommodate future growth, and there are some transmission limitations impacting PD7, including limited suction piping towards the Highland pump station and Reservoir site (HD007).

The following summarizes key opportunities identified based on a combination of the outcomes of the risk assessment, desktop analysis (pumping and storage assessment), and modelling of future growth conditions:

- There is an opportunity for HD05A pump station upgrades (in design currently) and associated transmission main extensions (PD5 to HD06B in design currently) to support capacity increases in PD5.
- Although there are limited opportunities for floating storage in PD6, there is an opportunity to provide a more significant transmission main extension along Rymal Road (Upper Wentworth to Garth) to strengthen PD6 resiliency. Similarly, there is an opportunity related to Ancaster system resiliency (PD6 to PD18 feed) by adding a twinned suction feed towards HDR18 / HD018 pump station. Linear upgrades in PD6 also help support AEGD expansion.
- Opportunity exists to add a potential new elevated tank in PD7 to address the long-term storage deficits in PD7 and PD23.
- Opportunity exists to consider a second pumping station site for PD7. An existing large diameter PD5 watermain has been built on Mud Street, which is a good start to a PD5 feed towards a potential second pumping station site for PD7 along Upper Centennial. This could help reduce the challenges with the existing suction feeds towards Highland pump station and reservoir, while also adding resiliency to the PD7 system.

7.2.6 Binbrook (PD23)

The following section summarizes any outstanding opportunities and constraints for the various components of the water system that support PD23, including pumping, storage, and transmission / distribution. The key existing / future issues and constraints identified include the following:

1. Pumping capacity is insufficient to meet future pumping needs in Binbrook, so pumping upgrades at Binbrook (HD019) may be required to accommodate growth.
2. PD23 has a single elevated tank (HDT23), which is slightly below the future storage requirements, as per MECP guidelines.
3. There are existing transmission limitations towards the PD23 system, with a high reliance on the single 400 mm transmission connection between PD7 and HD019 on Hwy 56.

The following summarizes key opportunities identified based on a combination of the outcomes of the risk assessment, desktop analysis (pumping and storage assessment), and modelling of future growth conditions:

- Pumping capacity upgrades have already been considered at the HD019 pumping station with a pre-design concept developed. The existing pumping station facility has been identified as being reasonably expandable up to ~200 L/s with select modifications / upgrades.
- Lack of storage can be resolved by either constructing a second elevated tank within PD23 or providing additional pumped storage (and adding the storage in PD7 with the previously flagged opportunity of a new PD7 elevated tank).
- There is an opportunity of a second suction feed from PD7 towards HD019 pump station by either installing a new 400 mm watermain along Fletcher Road to HD019 pump station or twinning the existing 400 mm watermain along Hwy 56.

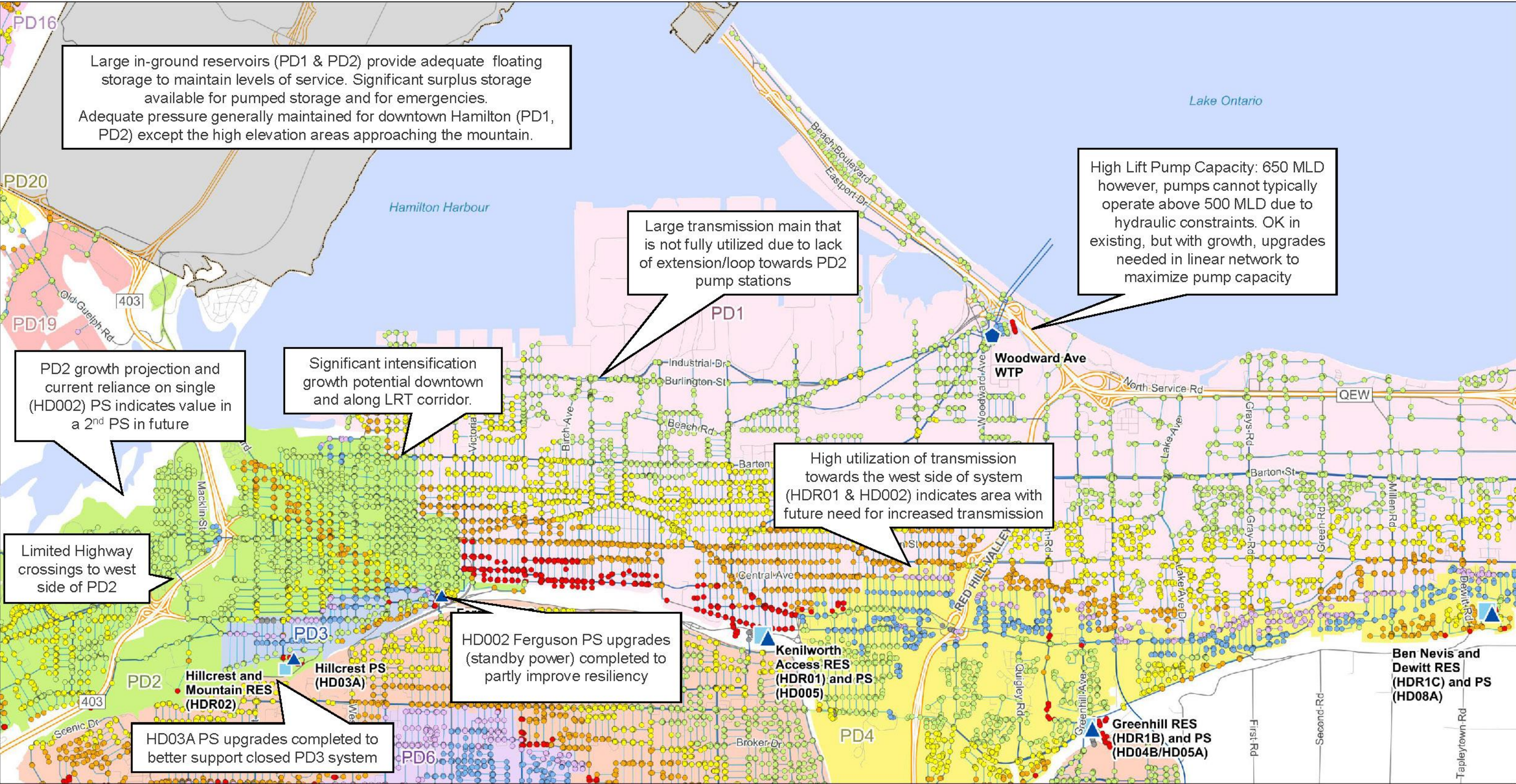
7.2.7 Ancaster (PD13, PD14, PD15, PD18)

The following section summarizes any outstanding opportunities and constraints for the various components of the water system that support PD13, PD14, PD15 and PD18, including pumping, storage, and transmission / distribution. The key existing / future issues and constraints identified include the following:

1. PD18 does not have any dedicated floating storage and relies on pumped storage at the Garner Reservoir (HDR18), which is slightly below the future storage requirements, as per MECP guidelines.
2. Furthermore, there is limited pumping capacity (unable to meet maximum day demand plus fire) in the existing and future PD18 due to the single source of pumped supply - Garner PS (HD018). The district is also highly reliant on a single pumping station and single feed currently.
3. There are transmission limitations in the existing and future PD18, with a high reliance on the primary suction and discharge transmission mains at HD018 PS.

The following summarizes key opportunities identified based on a combination of the outcomes of the risk assessment, desktop analysis (pumping and storage assessment), and modelling of future growth conditions:

- All of the issues / constraints for Ancaster are related to the overall supply and storage strategy to PD18. As such, they are all interrelated and considered as one servicing strategy.
- The opportunities considered involve either adding partial floating storage (new elevated tank) while simultaneously upgrading the existing pump station (under construction) and the linear resiliency risks. Alternatively, there is also an opportunity to add an additional (second) pumping station site that can help to provide further resiliency of supply into PD18.



Water Infrastructure

Water Treatment Plant (WTP)

Pumping Station (PS)

Reservoir (RES)

Watermain Trunk

Watermain Distribution

Minimum Pressure (psi)

< 40

40 - 50

50 - 60

60 - 80

80 - 90

90 - 100

> 100

Pressure District

PD1

PD2

PD3

PD4

General Feature

Municipal Boundary

Reference(s)

1. Projection EPSG:26917

2. Base Data: City of Hamilton, 2024

1

2 km

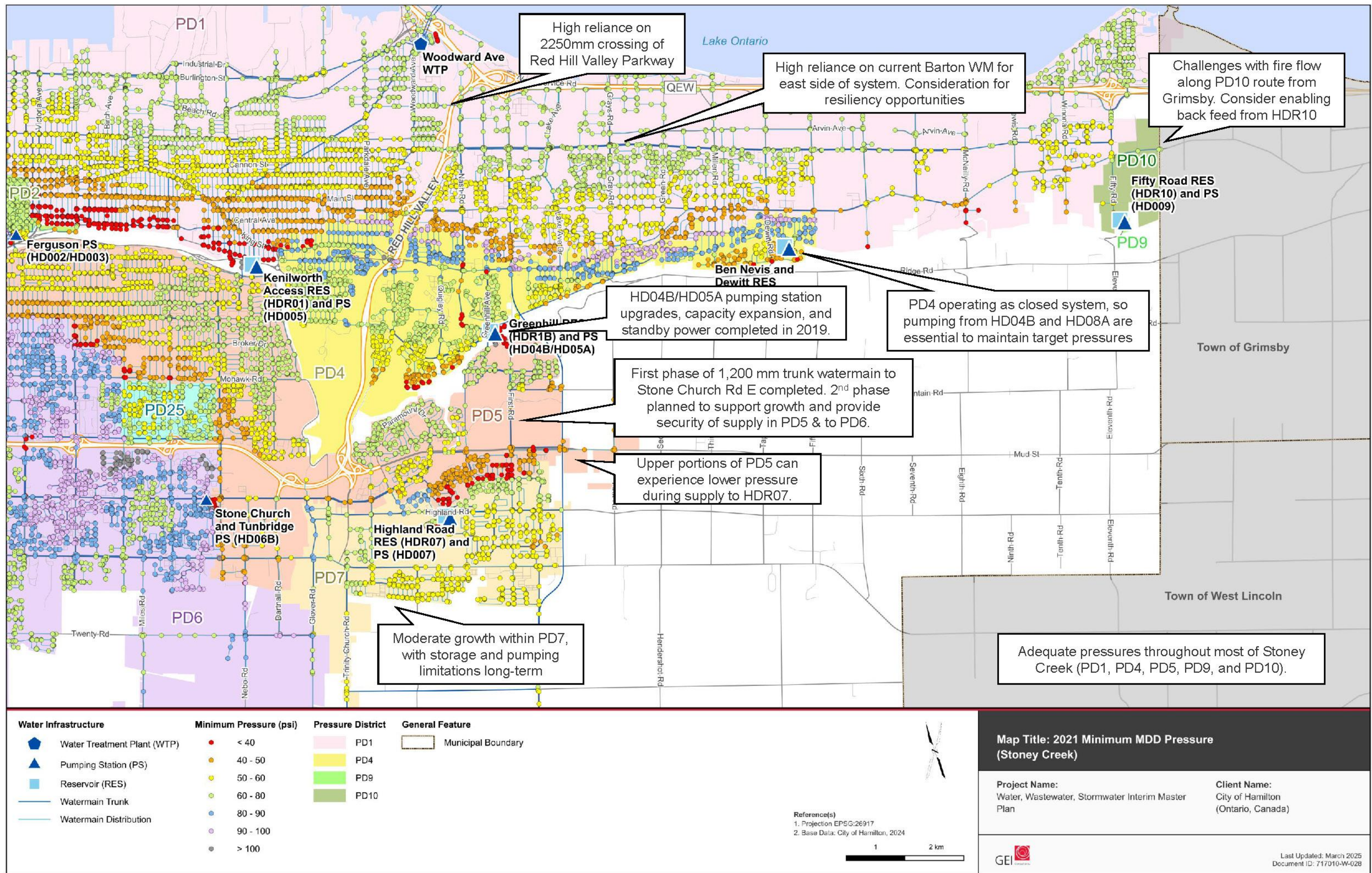
Map Title: 2021 Minimum MDD Pressure (Downtown Hamilton)

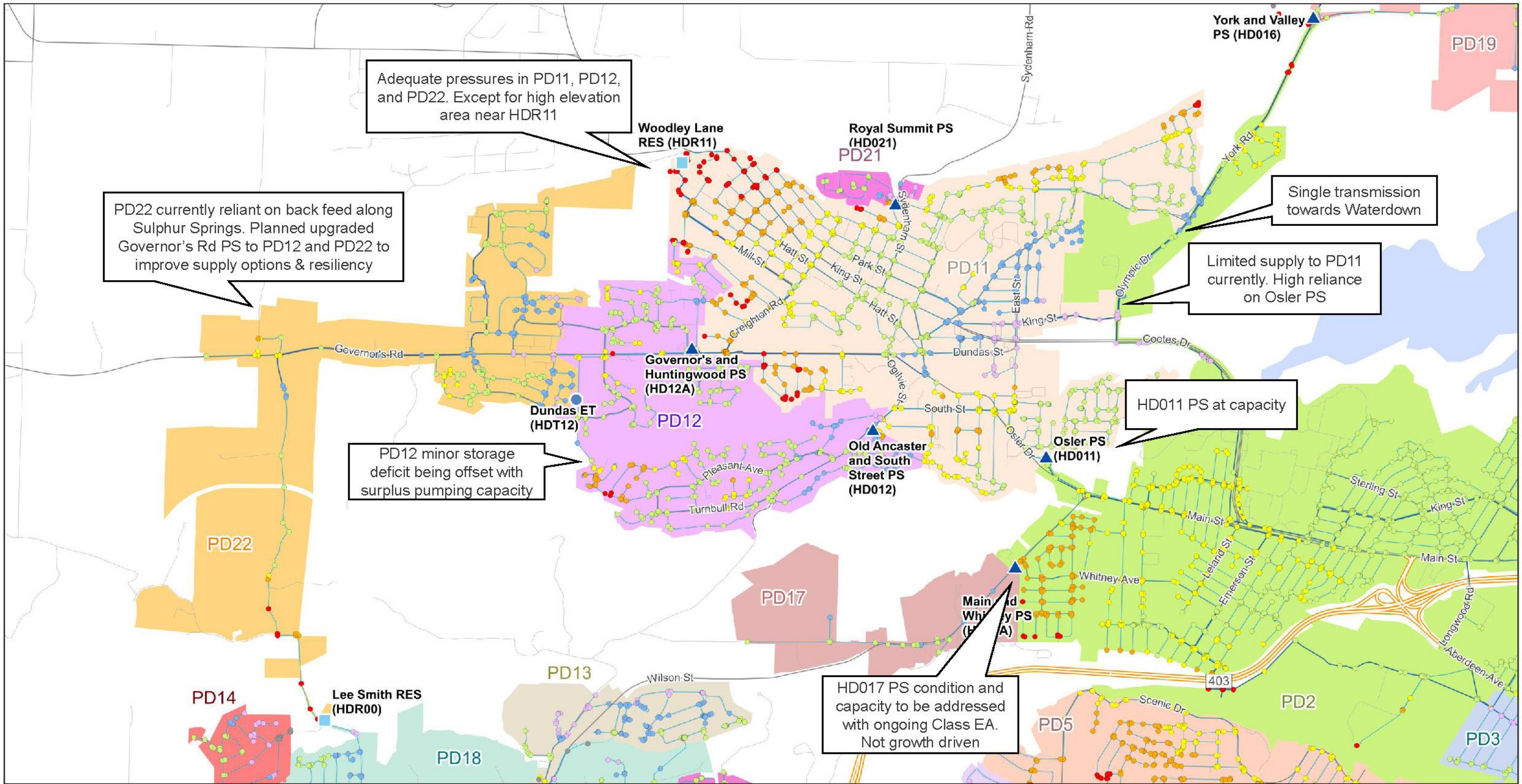
Project Name:
Water, Wastewater, Stormwater Interim Master Plan

Client Name:
City of Hamilton (Ontario, Canada)

GEI

Last Updated: March 2025
Document ID: 717010-W-028





Water Infrastructure	Minimum Pressure (psi)	Pressure District	General Feature
Water Treatment Plant (WTP)	< 40	PD2	Municipal Boundary
Pumping Station (PS)	40 - 50	PD11	
Reservoir (RES)	50 - 60	PD12	
Watermain Trunk	60 - 80	PD17	
Watermain Distribution	80 - 90	PD21	
	90 - 100	PD22	
	> 100		

Map Title: 2021 Minimum MDD Pressure (Dundas)

Project Name: Water, Wastewater, Stormwater Interim Master Plan

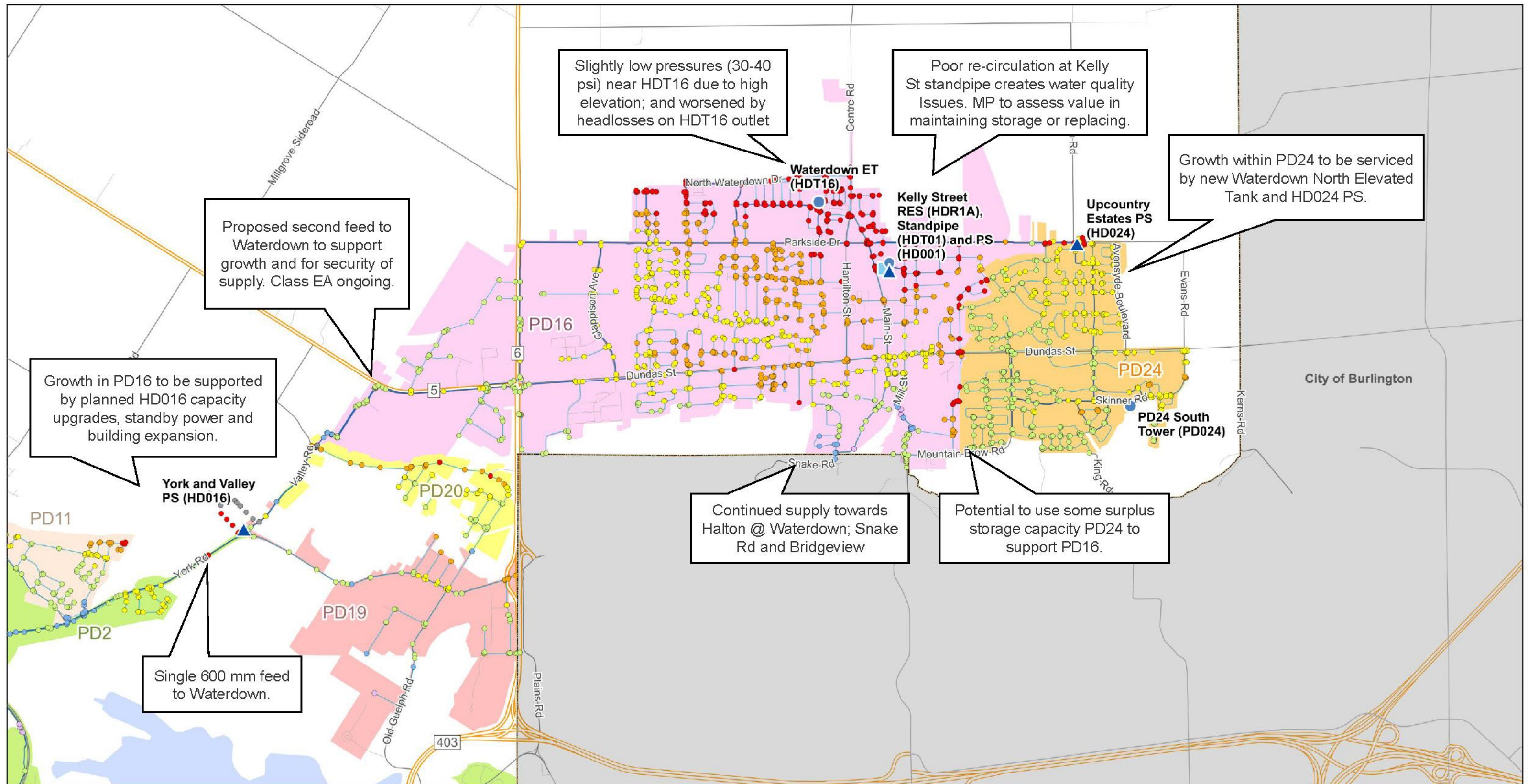
Client Name: City of Hamilton (Ontario, Canada)

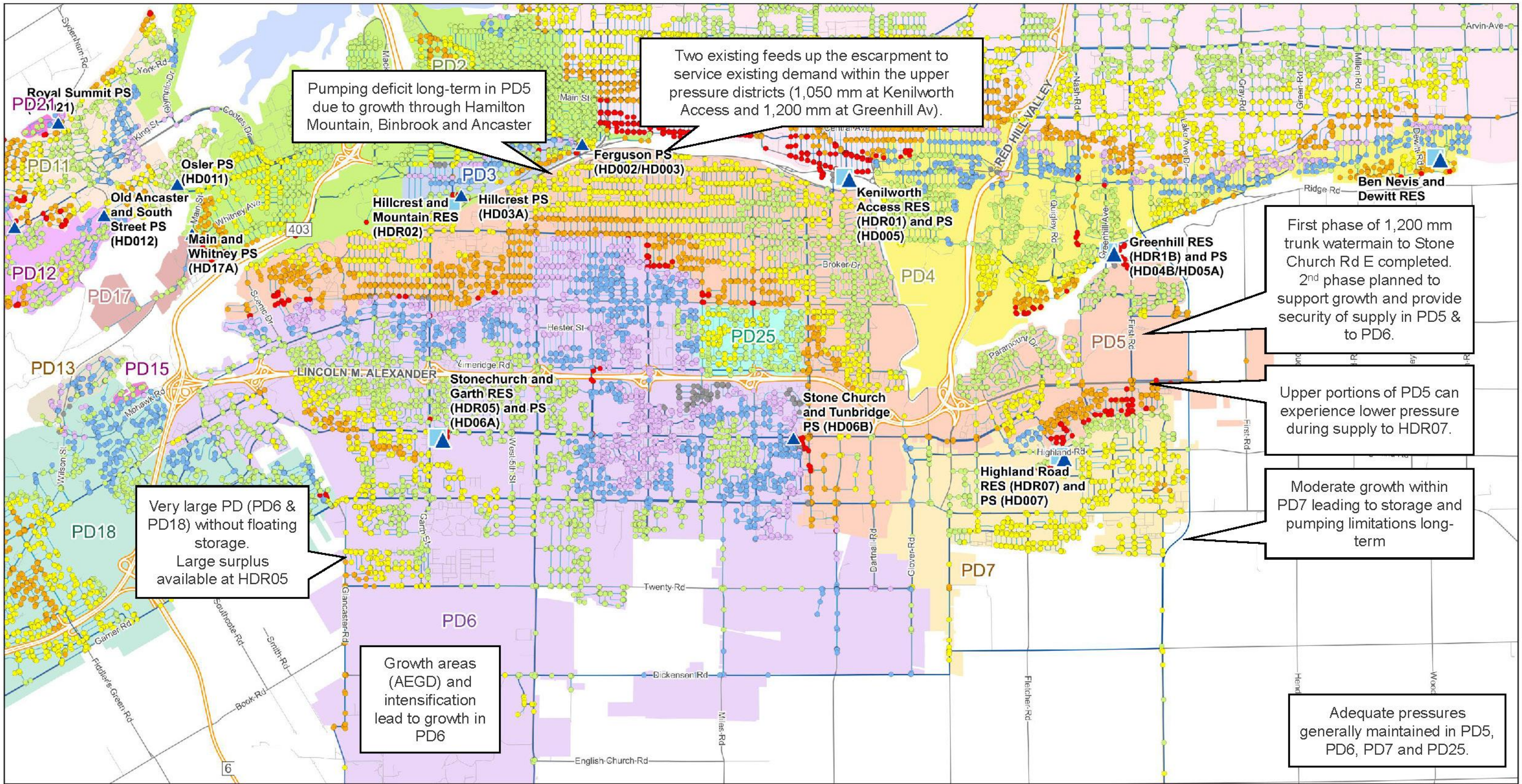
Reference(s): 1. Projection EPSG:26917 2. Base Data: City of Hamilton, 2024

Scale: 0.6 1.2 km

GEI

Last Updated: April 2025
Document ID: 717010-W-028





Water Infrastructure	Minimum Pressure (psi)	Pressure District	General Feature
▲ Pumping Station (PS)	● < 40	PD5	▭ Municipal Boundary
■ Reservoir (RES)	● 40 - 50	PD6	
— Watermain Trunk	● 50 - 60	PD7	
— Watermain Distribution	● 60 - 80	PD25	
	● 80 - 90		
	● 90 - 100		
	● > 100		

Reference(s)

1. Projection EPSG:26917

2. Base Data: City of Hamilton, 2024

1 2 km

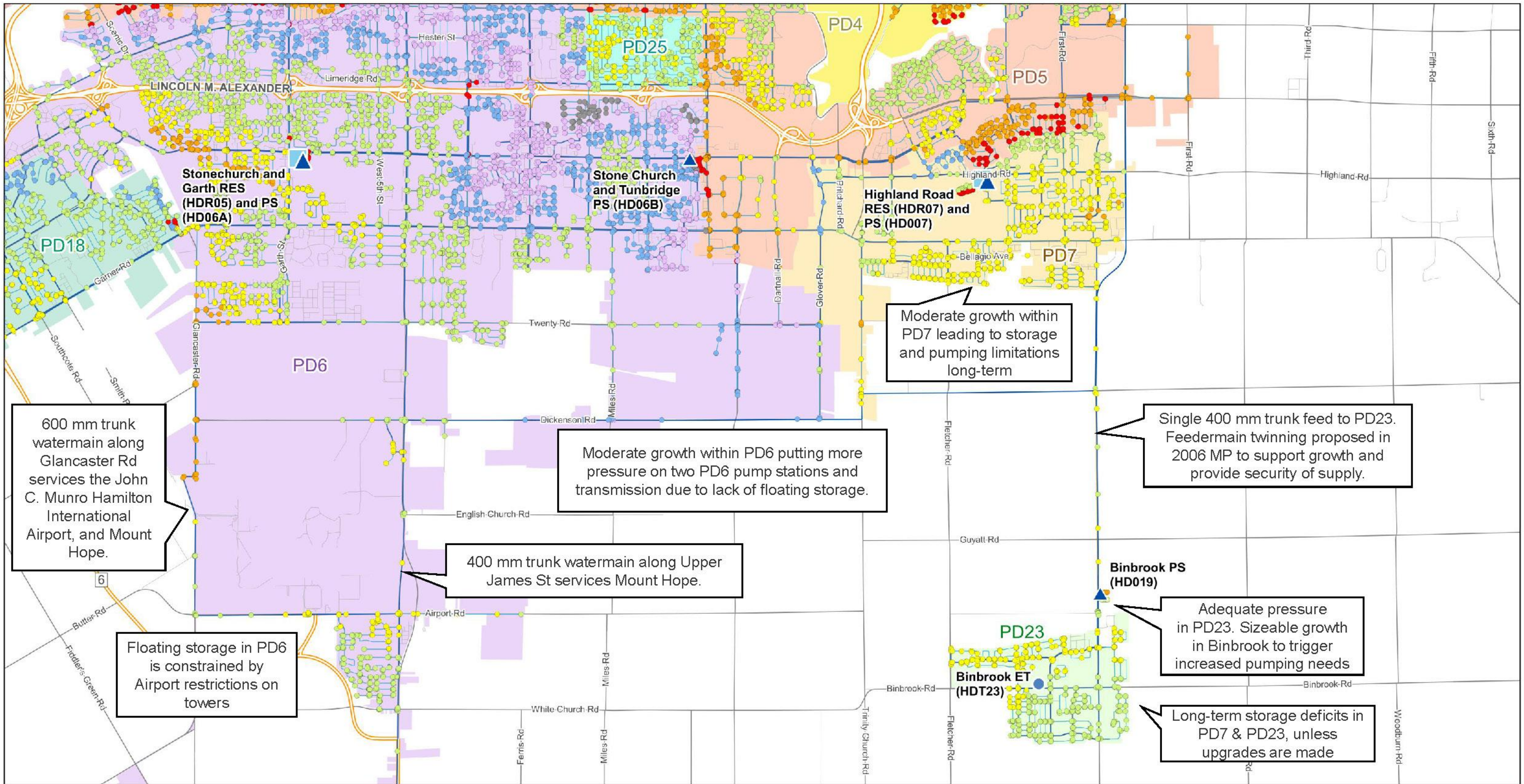
Map Title: 2021 Minimum MDD Pressure (Hamilton Mountain)

Project Name: Water, Wastewater, Stormwater Interim Master Plan

Client Name: City of Hamilton (Ontario, Canada)

GEI

Last Updated: April 2025
Document ID: 717010-W-028



Water Infrastructure

Pumping Station (PS)

Reservoir (RES)

Watermain Trunk

Watermain Distribution

Minimum Pressure (psi)

< 40

40 - 50

50 - 60

60 - 80

80 - 90

90 - 100

> 100

Pressure District

PD5

PD6

PD7

PD23

General Feature

Municipal Boundary

Reference(s)

1. Projection EPSG:26917

2. Base Data: City of Hamilton, 2024

1

2 km

Map Title: 2021 Minimum MDD Pressure (Mount Hope and Binbrook)

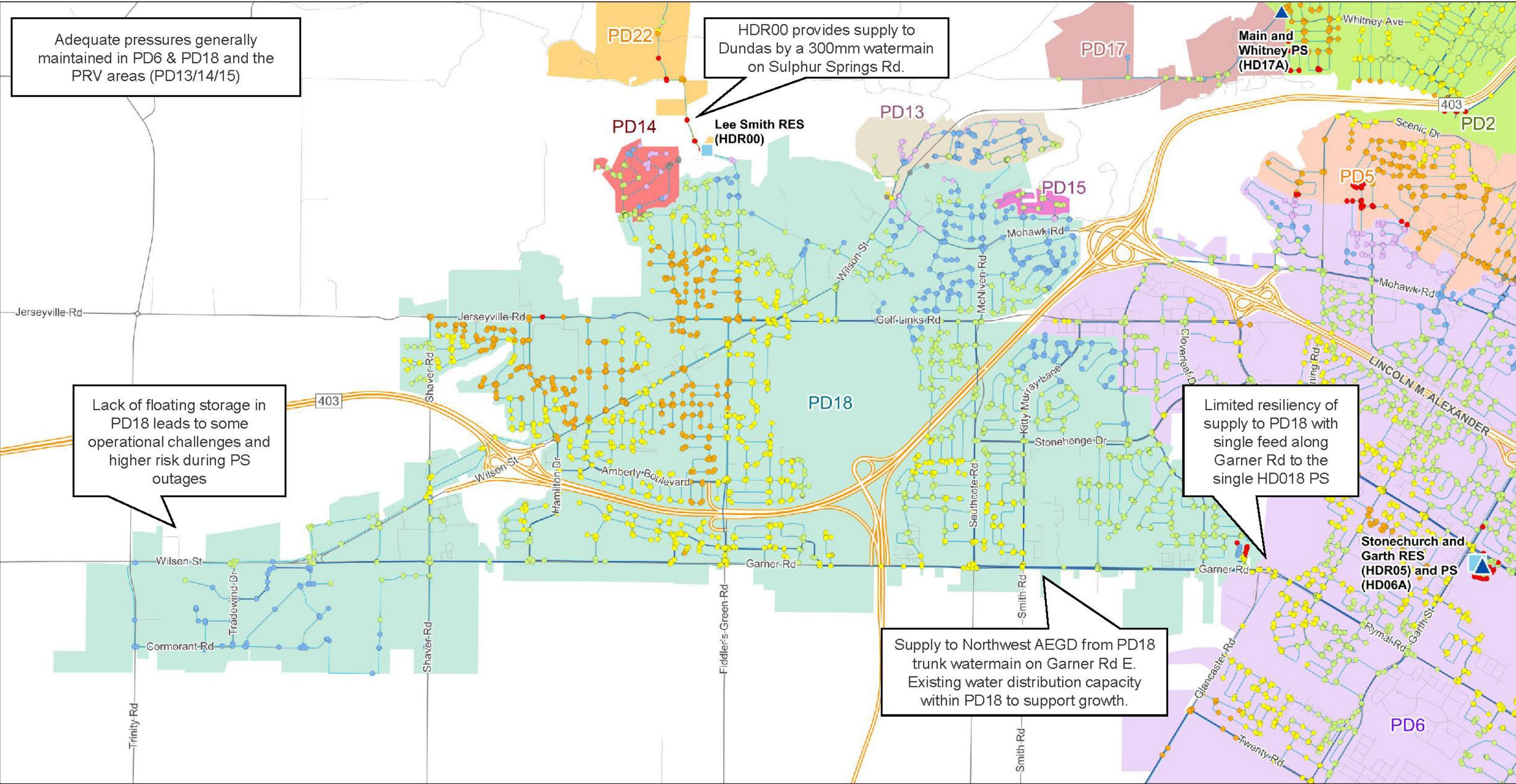
Project Name: Water, Wastewater, Stormwater Interim Master Plan

Client Name: City of Hamilton (Ontario, Canada)

GEI

Last Updated: April 2025
Document ID: 717010-W-028

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Water Infrastructure

- Pumping Station (PS)
- Reservoir (RES)
- Watermain Trunk
- Watermain Distribution

Minimum Pressure (psi)

- < 40
- 40 - 50
- 50 - 60
- 60 - 80
- 80 - 90
- 90 - 100
- > 100

Pressure District

- PD13
- PD14
- PD15
- PD18

General Feature

- Municipal Boundary

Reference(s)

- 1. Projection EPSG:26917
- 2. Base Data: City of Hamilton, 2024

Figure 3-9
Map Title: 2021 Minimum MDD Pressure (Ancaster)

Project Name:
Water, Wastewater, Stormwater Interim Master Plan

Client Name:
City of Hamilton
(Ontario, Canada)

Last Updated: April 2025
Document ID: 717010-W-028

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User: J. Smith
Date: 2025-04-02 14:28:16
Title: 2021 Minimum MDD Pressure (Ancaster)
Project: Water, Wastewater, Stormwater Interim Master Plan
Client: City of Hamilton
Last Updated: April 2025
Document ID: 717010-W-028

8.0 Water Servicing Strategy Development

The identification and evaluation of water servicing alternatives are a fundamental component of the Interim Master Servicing Strategy (IMSS) process. The servicing strategy development process allows for a comprehensive review of various servicing solutions and is completed through a transparent process that demonstrates decision-making and provides recommended strategies.

The IMSS is an update to the 2006 Master Plan. As such, the servicing strategies in the 2006 Master Plan were reviewed to validate their continued need to service growth. Additionally, new / updated strategies were developed to meet growth to the 2051 planning horizon. The water servicing strategy alternatives were developed to address the problem / opportunity statement identified in Phase 1 of the Municipal Class EA process.

8.1 Objectives

The objective of the water servicing strategy development process was to validate current water servicing strategies, develop new water strategies where new system constraints have been triggered by growth or resiliency concerns, and ensure that suitable alternatives were considered while clearly outlining the rationale for the recommended water servicing solutions.

As noted in **Section 7.1**, this IMSS does not include a detailed assessment of potential transmission main alignments or facility locations, as this level of analysis is beyond the scope of the study. Instead, conceptual corridors and representative facility sites have been identified to support costing and mapping at the IMSS level. These will be refined through future Class EA or design studies once more detailed environmental, technical, and financial information becomes available.

The strategy development approach described herein was designed to ensure a logical and defensible process that documents evaluation and decision-making while integrating sustainability, resiliency, and long-term planning principles.

Key guiding considerations included:

1. Optimizing use of existing infrastructure and maximizing system efficiency before constructing new facilities.
2. Supporting financially sustainable solutions that balance capital investment with lifecycle operating costs.
3. Enhancing system resiliency and reliability to accommodate growth and respond to future uncertainties.
4. Minimizing environmental impacts and supporting climate change mitigation and adaptation objectives.
5. Promoting coordinated planning with other infrastructure programs and the efficient use of City-owned lands and corridors.
6. Ensuring flexibility and adaptability of the system to meet service needs to 2051 and beyond.

8.2 Evaluation Criteria

The water servicing strategies were evaluated using five (5) criteria: environmental, social / cultural, technical, financial, and legal / jurisdictional considerations. Each criterion consists of specific factors used to identify the best overall servicing strategy subject to refinement prior to implementation (**Table 8-1**).

Table 8-1- Water Servicing Evaluation Criteria

Criteria	Potential Impacts
Environmental Impacts	- Minimizes major environmental crossings to help protect environmental features, wildlife and species at risk. - Minimizes proximity (and subsequent impacts) to environmentally sensitive features (e.g., wetlands, ESAs, ANSIs, woodlots, other natural areas, etc.). - Minimize impacts to climate change and consider climate change adaptation measures. - Supports Ministry of the Environment, Conservation and Parks (MECP) environmental protection goals.
Social / Cultural Impacts	- Minimize resident / business impacts long-term. - Minimize potential noise, odour, dust, vibration and traffic disruptions to residents and businesses during construction and / or facility operation. - Considers public interest and level of community support for the servicing strategy.
Technical Feasibility	- Maximize use of existing infrastructure. - Improves system resiliency / security, supporting reliable service. - Optimizes operational flexibility and minimizes operational complexity. - Supports phased expansion of the system. - Minimizes construction risk (use of rights-of-way; limits conflict with light rail transit (LRT) and other major crossings; etc.) - Supports constructability of the servicing strategy. - Achieves capacity for growth, including both local and trunk servicing needs. - Considers implementation of timing and phasing constraints and opportunities.
Financial Viability	- Supports a cost effective and financially sustainable solution. - Consider impact of lifecycle costs (capital costs plus operation and maintenance costs).
Legal / Jurisdictional Requirements	- Maximize the use of City-owned lands and road right of ways (ROWS). - Minimizes land requirement issues and agency concerns. - Minimize expected approvals and permitting needs.

8.3 Servicing Strategies Development

Water servicing strategies were identified and reviewed in detail for existing and future growth areas within Downtown Hamilton, Stoney Creek, Dundas, Waterdown, Hamilton Mountain, Mount Hope, Binbrook, and Ancaster. Collectively, all these area-specific servicing solutions together form the overall water servicing strategy for the City of Hamilton. The following section summarizes the development of the alternative servicing strategies for the City's water system.

8.3.1 Downtown Hamilton Strategies

Key challenges and opportunities were identified within the Downtown Hamilton water system (PD1, PD2, and PD3) as summarized in **Section 7.2.1**. These issues relate to transmission capacity limitations, pumping constraints, and system resiliency in the west and central portions of the network. Collectively, they represent the primary focus areas for long-term servicing improvements in the Downtown Hamilton areas.

The following subsections outline the water servicing strategies developed to address each of these challenges. The three (3) key strategies for Downtown Hamilton include:

- Strategy DH-1: PD1 (West Side) Transmission Limitation
- Strategy DH-2: PD2 Pumping Constraint
- Strategy DH-3: PD2 Transmission Limitation

8.3.1.1 Strategy DH-1: PD1 (West Side) Transmission Limitation

As previously discussed, there are transmission limitations that restrict the ability of Woodward WTP to achieve its full flow capacity into the PD1 system. These limitations are also contributing factors to the current challenges experienced with low suction pressures at times at the Ferguson pump station (HD002).

Strategy DH-1 explored opportunities to improve transmission capacity on the west side of PD1 to increase supply capacity and system resilience both towards HDR01 and towards the PD2 pumping station(s).

As part of this strategy, the following alternatives were considered:

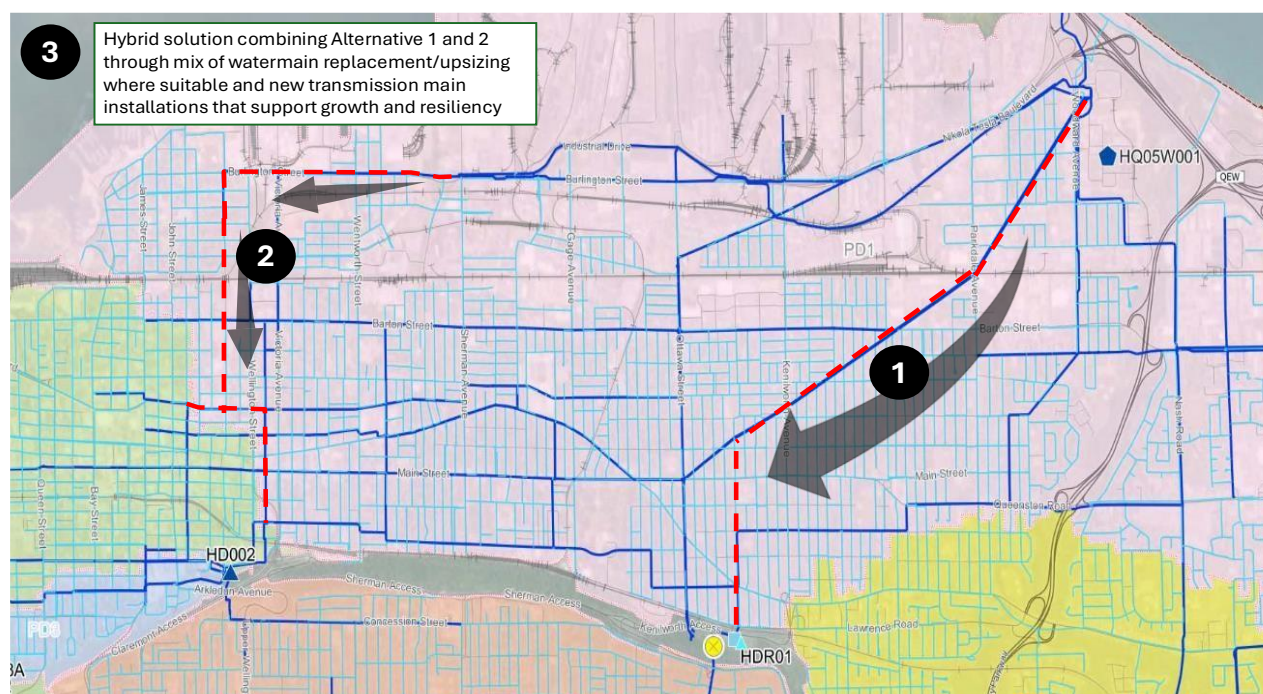
- **Do-Nothing:** Not viable, since increased demands in the system would not be able to be supported. As such, this alternative does not allow for planned growth.
- **Alternative 1:** Replace and upsize feeder mains along existing alignments from Woodward WTP to HDR01.
- **Alternative 2:** Add new transmission main along new alignment from the WTP to the PD2 pumping stations (proposed second and existing HD002) by extending the 1200 mm transmission main that currently terminates at Burlington Street and Sherman Avenue.
- **Alternative 3:** Hybrid solution combining Alternative 1 and 2 through a mix of watermain replacements / upsizing where suitable and new transmission main installations that support both growth and improved system resiliency.

Figure 8-1 presents the proposed water servicing alternatives for the Downtown Hamilton PD1 area. **Table 8-2** summarizes the high-level pros and cons for each alternative.

Based on the pros and cons of each alternative, Alternative 3 has been identified as the most suitable option to resolve transmission limitations in PD1. The primary rationale for selecting the hybrid option is that there are clear benefits of both Alternative 1 and Alternative 2 for different areas of the PD1 west system, which support filling of HDR01 and supply towards the PD2 pump station(s), respectively.

An extension of the existing 1050 mm transmission main, which currently terminates at Burlington and Sherman Avenue, is advantageous as it maximizes the use of existing infrastructure and improve resilience with a secondary feed toward the PD2 area. Conversely, the three (3) existing cast iron transmission mains within the pipeline trail corridor are aging, have frequent breaks and have limited hydraulic capacity. Therefore, replacing and upsizing along this route is viewed as a secondary way to improve supply capacity to the PD1 west areas.

Additionally, it is recommended that the City undertake a future alignment assessment study to determine the ideal location, considering potential construction impact on the community and environment, constructability challenges (e.g., LRT crossings, etc.), utility conflicts, and financial viability.

Figure 8-1- Downtown Hamilton PD1 Transmission Alternatives

Table 8-2- Downtown Hamilton PD1 Transmission Alternatives Assessment

Alternatives	Pros ¹	Cons ¹
Do Nothing Screened Out	No new infrastructure / costs.	Does not support meeting the growth targets. Limits growth potential and resiliency.
Alternative 1 Screened Out	- Supports a cost-effective and financially sustainable solution (works well with state-of-good-repair needs). - Increases transmission capacity, particularly along the route towards HDR01.	- Limited operational flexibility and resiliency. - Potential challenges with phased expansion and constructability within congested ROWs. All linear options will need to cross the LRT alignment, so exact alignment should be assessed and refined to limit impacts. - Limited existing capacity that could support the increased supply toward PD2.
Alternative 2 Screened Out	- Increases transmission capacity by maximizing use of existing infrastructure and identifying new routes to improve looping and resiliency. - Routes and construction methods can be selected to maximize use of City ROWs and minimize social and environmental impacts.	- High capital costs for installing new feedermain(s). - All linear options will need to cross the LRT alignment, so exact alignment should be assessed and refined to limit impacts. - Some imbalance remains with difficulty filling HDR01 long-term.
Alternative 3 Carried Forward	- Maximizes use and capacity of existing infrastructure and replaces / upsizes aging transmission mains nearing end of service life. - Optimizes operational flexibility and resiliency. - Achieves the increased capacity required to PD1 and PD2 while adding flexibility.	- High cost for installing new and replacement feedermain(s) - All linear options will need to cross LRT alignment, so exact alignment should be assessed and refined to limit impacts.

Note 1: The evaluation criteria from Section 8.2 were reviewed and applied to each alternative. However, only the main differentiating criteria are identified to distinguish to find the preferred strategy

8.3.1.2 Strategy DH-2: PD2 Pumping Constraint

The existing PD2 pumping capacity is insufficient to meet future demands due to significant growth expected both within PD2 itself and in areas including future PD22 demands that are supported through transferred supply from PD2 (Waterdown and Dundas). Furthermore, there is currently a high reliance on the single PD2 pumping station (Ferguson PS HD002), which is the single source of pumped supply into PD2 and the upstream areas.

Strategy DH-2 explored opportunities to improve pumping capacity in PD2. It is noted that the preferred decision for PD2 pumping will have implications for the previously discussed PD1 transmission needs, since any selected PD2 pumping station site, or increases from the existing site would need to have suitable suction (PD1) piping connections.

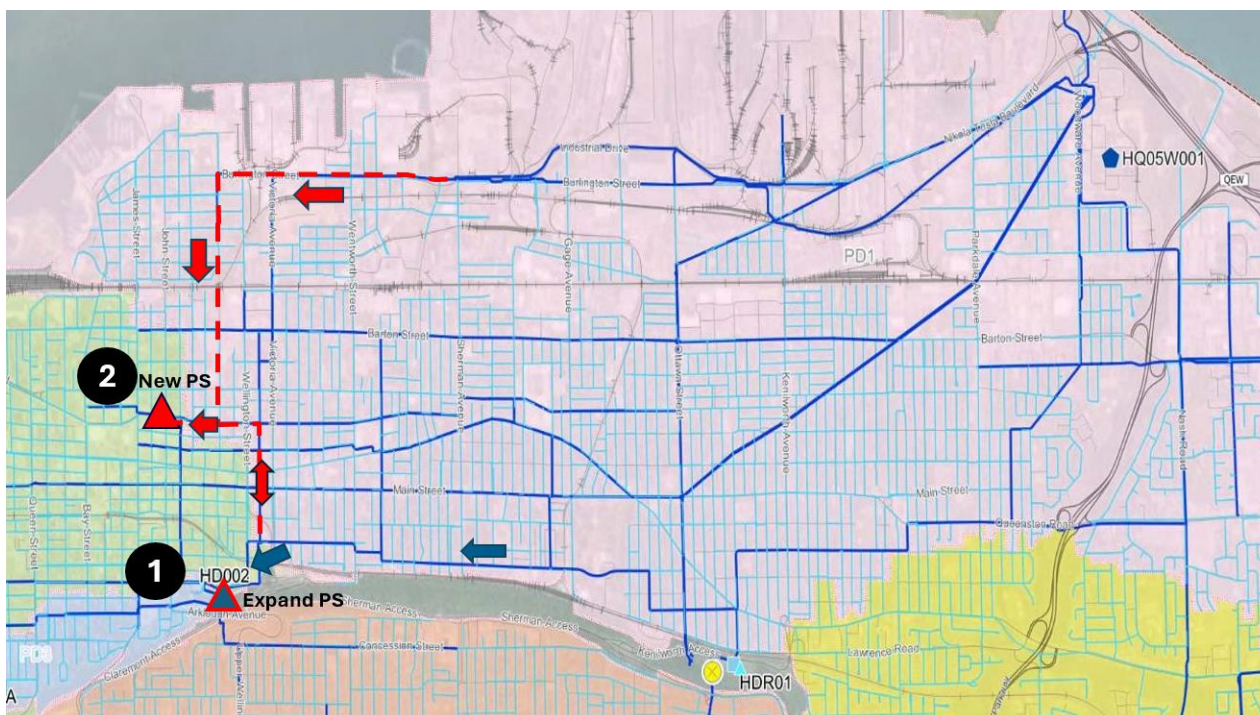
The following alternatives were considered as part of Strategy DH-2:

- **Do-Nothing:** Maintain Ferguson pump station (HD002) as the only PD2 pumping station and do not upsize. Not viable, since increased demands in the system would not be able to be supported. As such, this alternative does not support planned growth.
- **Alternative 1:** Expand HD002 pump station such that it can support the 2051 maximum day demand (MDD) needs of approximately 145 ML/d.
- **Alternative 2:** Add a second pumping station to help accommodate growth, while sizing the facility large enough to provide moderate resiliency in the PD2 (and Dundas and Waterdown) system.

Figure 8-2 presents the proposed water servicing alternatives for the Downtown Hamilton PD2 area. **Table 8-3** summarizes the high-level pros and cons for each alternative.

Based on the pros and cons of each alternative, Alternative 2 (adding a second PD2 pumping station) has been identified as the most suitable option to help resolve the pumping deficiency long-term. The primary rationale for selecting Alternative 2 is that there are clear benefits in terms of resiliency of supply being provided in this option. Currently, there is a moderately high level of risk associated with the Ferguson PD2 pumping station and the transmission mains that feed it. There are already challenges with suction pressure at Ferguson pumping station and further expansion will only exacerbate those challenges unless sizeable PD1 transmission main upgrades are incorporated towards Ferguson pumping station.

Although Alternative 2 is recommended as the preferred solution, it will be necessary for the City to conduct further assessment (Class EA) to find a suitable site for the PD2 pumping station. The location shown in **Figure 8-2** is only a conceptual example of a potential site along the PD1 PD2 boundary. Additionally, the PD1 and PD2 linear upgrades will need to be coordinated with the proposed PD2 pumping station site and should be considered as part of the same Class EA for improved coordination.

Figure 8-2- Downtown Hamilton PD2 Pumping Alternatives

Table 8-3- Downtown Hamilton PD2 Pumping Alternatives Assessment

Alternatives	Pros ¹	Cons ¹
Do Nothing Screened Out	No new infrastructure / costs.	Does not support meeting the growth targets. Limits growth potential and resiliency.
Alternative 1 Screened Out	- Lower cost alternative with only a moderate upsizing required from current capacity (current theoretical firm capacity ~136 ML/d to at least ~145 ML/d). - Maximizes use of existing infrastructure.	- Less flexibility and resiliency in operation. - Requires PD1 infrastructure to support improvements in the suction pressure at the pumping station. - Site challenges related to expansion and new linear improvements (discharge/suction upgrades).
Alternative 2 Carried Forward	- Supports improved operational flexibility. - Helps to improve resiliency in supply to PD2 (and Dundas and Waterdown). - Pairs well with proposed PD1 transmission upgrades. - Could pair well with additional PD2 transmission upgrades for resiliency across Hwy 403 towards Waterdown and Dundas.	- Higher costs due to need for land and the construction of a full PS with sufficient capacity to support resiliency (ADD sizing ~80 ML/d). - Requires PD1 infrastructure to help support improvements in the suction pressure at the PS. - Potential difficulty in finding suitable land/site. - Also requires linear upgrades to/from site.

Note 1: The evaluation criteria from Section 8.2 were reviewed and applied to each alternative. However, only the main differentiating criteria are identified to distinguish to find the preferred strategy

8.3.1.3 Strategy DH-3: PD2 Transmission Limitation

There are existing transmission limitations in the Pressure District 2 (PD2) system, primarily reflected in the resiliency assessment, which shows a high reliance on the primary transmission between the pumping station (HD002) and HDR2A. Subsequently, the Hwy 403 crossing next to HDR2A towards the west side of the PD2 system is also shown to be a highly critical main. This route from HDR2A to the various suction feeds towards Waterdown (HD016 PS) and towards Dundas (HD011 PS and HD017 PS) has shown to have limitations, which has contributed to some low suction pressure concerns.

Strategy DH-3 explored opportunities to improve transmission capacity in PD2, with a particular focus of improving the transmission capacity and resiliency of supply across Hwy 403. The preferred decision for PD2 transmission is related to strategy DH-2 (second PD2 pumping station), as such, the considerations should likely be combined into a single Class EA for future detailed assessment of opportunities / alignments. Improving the suction feeds towards PD16 and PD11 is considered separately in the Waterdown and Dundas sections of this report, respectively.

The following alternatives were considered as part of Strategy DH-3:

- **Do-Nothing:** Maintain existing PD2 transmission system. Based on hydraulic modelling, the existing PD2 transmission system can be sufficient to maintain service levels in PD2. However, this is reliant on continued availability of supply from the PD2 pumping stations and the transmission network. This option has limited resiliency, where an outage of the highway crossing could limit supply towards Dundas / Waterdown.
- **Alternative 1:** Add a new transmission main that is focused on bringing increased supply from a future PD2 PS (Potentially on Main / King Street going east-west and Dundurn Street) through the downtown core and across Hwy 403 before connecting with the existing transmission network around Main Street / Cootes Drive.
- **Alternative 2:** Add a new transmission main that is focused on improving the link between the existing PD2 transmission mains (potentially on Studholme Road and Bowman Street) over towards the HDR2A site. There is currently a reliance on the single main (1050 mm across Chedoke Park) to HDR2A, which subsequently continues as a 750 mm crossing of Hwy 403.

Figure 8-3 presents a water servicing strategy for the Downtown Hamilton PD2 area. **Table 8-4** lists the pros and cons for each alternative.

Based on the pros and cons of each alternative, Alternative 1 (new transmission main from the new PD2 pump station across Hwy 403 and towards Main / Cootes) has been identified as the preliminary preferred alternative to resolve the transmission limitations in PD2. Alternative 1 was selected for its clear benefits in terms of improving hydraulic connectivity of the proposed new PD2 PS through the downtown core and across Hwy 403 (before Main / Cootes). The new PD2 PS and associated transmission main will be able to convey supply to the west, even during potential facility / transmission outages elsewhere in PD2. Additionally, this route avoids the addition of a new main through the Greenbelt / natural heritage systems.

It is anticipated that the final route will be complex through downtown areas. As such, it is noted that the IMSS has not completed a fulsome alignment assessment, but rather a high-level identification of some of the most apparent opportunities. It is recommended for the City to consider an alignment assessment study that determines the ideal route, with consideration of the potential construction impact on the community and environment, constructability challenges and utility conflicts. It is suggested that the alignment study be combined with the future Class EA for identifying the preferred site for the proposed second PD2 PS. Alternatively, when conducting the recommended detailed alignment assessment study, a different alignment could also be considered which acts like a hybrid between Alternatives 1 and 2.

Figure 8-3- Downtown Hamilton PD2 Transmission Strategy

Table 8-4- Downtown Hamilton PD2 Transmission Strategy Assessment

Alternatives	Pros ¹	Cons ¹
Do Nothing Screened Out	No new infrastructure / costs.	Does not support meeting the growth targets. Limits growth potential and resiliency.
Alternative 1 Carried Forward	- Improves the hydraulic connectivity of the proposed new PD2 pumping station and adds an additional Hwy 403 crossing more directly from the pumping stations. - Pairs well with proposed new PD2 PS - Improves resiliency in the PD2 system and the Dundas and Waterdown areas. - Limited impacts to natural heritage system and to conservation authority regulated areas (avoids Greenbelt / Natural Heritage System).	- Moderately high cost due to downtown route and crossing cost. - Also requires a stronger transmission link between the existing PD2 reservoirs and the proposed transmission main across Hwy 403 to ensure functionality even when PD2 pumping stations are briefly off.
Alternative 2 Screened Out	- Improves the hydraulic connectivity to and from the HDR2A facility, which can help with reservoir turnover challenges. - Moderately improves resiliency	- Moderately high cost due to topography of route and crossing cost. - Does not significantly benefit the connectivity between the new PD2 PS. Relies on majority of flow heading towards HDR2A. - Potential impacts to natural heritage systems (i.e. Greenbelt) and to conservation authority regulated areas.

Note 1: The evaluation criteria from Section 8.2 were reviewed and applied to each alternative. However, only the main differentiating criteria are identified to distinguish to find the preferred strategy

8.3.2 Stoney Creek

Key challenges and opportunities were identified within the Stoney Creek water system (PD1, PD4, PD9, and PD10) as summarized in **Section 7.2.2**. These issues relate to transmission resiliency across Red Hill Valley Parkway (RHVP), reliance on Barton Street East transmission mains, and fire flow limitations in PD10. Collectively, they represent the primary focus areas for long-term servicing improvements in the Stoney Creek system.

The following subsections outline the water servicing strategies developed to address each of these challenges. The three (3) key strategies for Stoney Creek include:

- Strategy SC-1: PD1 East Crossing to Stoney Creek and Greenhill Avenue / Dewitt Road
- Strategy SC-2: PD1 East Reliance on Barton Street Transmission
- Strategy SC-3: PD10 Fire Flow Limitation

8.3.2.1 Strategy SC-1: PD1 East Crossing to Stoney Creek and Greenhill / Dewitt

There is a high reliance currently on the existing 2250 mm crossing of RHVP from Rennie Street to Nash Road North. This is currently the primary supply across to the east side of Hamilton towards Stoney Creek and Greenhill and Dewitt PD1 reservoirs. Without the 2250 mm crossing, the only remaining crossings are a 600 mm crossing at Melvin Avenue and a 900 mm crossing at Queenston Road.

Strategy SC-1 explored opportunities to accommodate growth and improve resiliency in transmission in PD1 East with a focus on potential options to improve crossing reliability towards Stoney Creek and the Greenhill / Dewitt facilities. Adding resiliency along this route is critical long-term as there is continued growth in the east side of PD1, as well as significant increases in the planned pumped supply leaving the Greenhill PS facility towards the Upper Mountain areas.

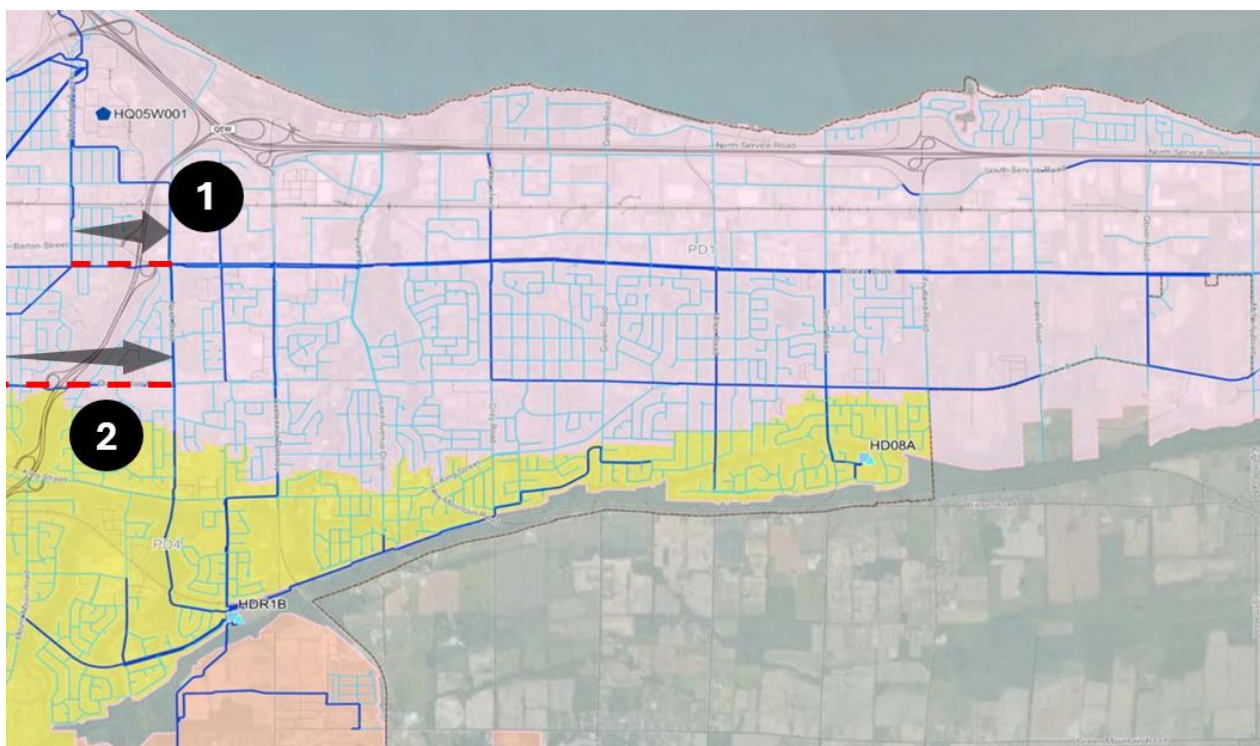
The following alternatives were considered as part of Strategy SC-1:

- **Do-Nothing:** Maintain existing PD1 transmission system with no additional crossings. This can function under normal operating conditions; however, it is noted that there is huge reliance on the existing 2250 mm, whose use is only increasing over time with increased supply needs towards Greenhill pumping station
- **Alternative 1:** New watermain (RHVP crossing) at Melvin Avenue
- **Alternative 2:** New watermain (RHVP crossing) at Queenston Road

Figure 8-4 presents the water servicing strategy options considered for the PD1 East crossings of the RHVP. **Table 8-5** lists the pros and cons for each alternative.

Based on the pros and cons of each alternative, Alternative 1 (new RHVP crossing at Melvin to Barton) has been identified as the most suitable option to resolve transmission resiliency limitations in PD1 East. The primary rationale for selecting Alternative 1 is that it provides a shorter crossing with potentially lesser impacts than a Queenston crossing due to less interference with LRT work and the environment, whilst still providing the future resiliency that the system needs.

Although Alternative 1 is recommended as the preferred solution, it is noted that this is not a comprehensive alignment assessment, but rather a high-level identification of the most apparent opportunities. It is recommended that the City undertake a future Class EA to determine the ideal alignment, considering potential construction impacts on the community and environment, constructability challenges (e.g., RHVP corridor constraints), utility conflicts, and financial viability. As part of the future Class EA to select preferred alignment, the City could also consider both crossings, but this would likely lead to more significant environmental challenges.

Figure 8-4- Stoney Creek PD1 East Crossing to Stoney Creek Servicing Strategy

Table 8-5- Stoney Creek PD1 Servicing Strategy Assessment

Alternatives	Pros ¹	Cons ¹
Do Nothing Screened Out	- No new infrastructure / costs - System can maintain sufficient supply to the east side of the system, when the existing infrastructure (in particular the 2250 mm transmission) is in service.	- Does not improve the resiliency of the PD1 system, or the supply towards Greenhill / Dewitt. - High reliance on the existing 2250 mm crossing
Alternative 1 Carried Forward	- Increased resiliency of transmission across to PD1 East / Greenhill, which could link existing north-south transmission mains on Woodward Avenue and on Nash Road - Links well with existing east-west feeds further east along Barton - Shorter crossing than Alternative 2	- Potential environmental/social impacts related to the RHVP crossing. Will need consultation and detailed EA to assess preferred alignment. - Environmental Impact Study may be needed to verify how to limit any impacts across RHVP.
Alternative 2 Screened Out	- Increased resiliency of transmission across to PD1 East / Greenhill, which could link existing north-south transmission mains on Delena Avenue and on Nash Road - Could link well with potential future east-west transmission further east along Queenston	- Longer length of crossing than Alternative 1 - Potential environmental/social impacts related to the RHVP crossing. Will need consultation and detailed EA to assess preferred alignment. - Environmental Impact Study may be needed to verify how to limit any impacts across RHVP. - Future LRT project that has a conflict from Nash Road to Eastgate. Will need consultation and detailed EA to access preferred alignment.

Note 1: The evaluation criteria from Section 8.2 were reviewed and applied to each alternative. However, only the main differentiating criteria are identified to distinguish to find the preferred strategy

8.3.2.2 Strategy SC-2: PD1 East Reliance on Barton Transmission

There is a high reliance on the existing Barton Street East (1200 mm / 1050 mm) transmission main, in particular, the 1200 mm segment along Barton Street between Nash Road and Gray Road. Without the 1200 mm feed, the only remaining east-west feeds in PD1 (across Battlefield Creek) are a 500 mm watermain (aging cast iron) along Barton Street, a 300 mm on Huckleberry Drive; a 250 mm along Queenston Road; and a 200 mm along Randall Avenue. Overall, these remaining feeds have limited capacity to support the east side of Hamilton, thus additional east-west resiliency should be considered.

Strategy SC-2 explored opportunities to improve resiliency in transmission in PD1 East with a focus on potential options to improve the east-west feeds in PD1 across Battlefield Creek. Adding resiliency along this route is critical long-term as there is continued growth in the east side of PD1.

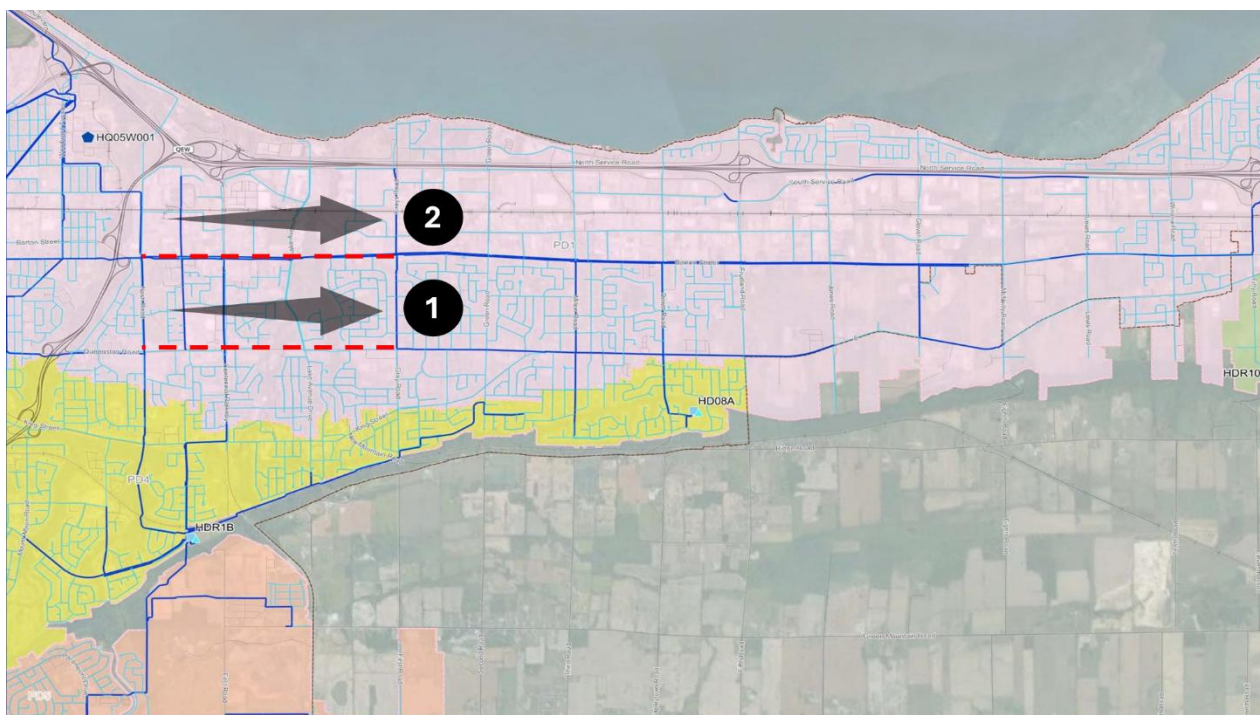
The following alternatives were considered as part of Strategy SC-2:

- **Do-Nothing:** Maintain existing PD1 east transmission system. This can function under normal operating conditions. However, it is noted that there is significant reliance on the current existing Barton watermain to support transfer east
- **Alternative 1:** Add new sub-transmission watermain at Queenston Road
- **Alternative 2:** Twin sub-transmission watermain at Barton Street

Figure 8-5 presents a water servicing strategy for the Stoney Creek PD1 area. **Table 8-6** lists the pros and cons for each alternative.

Based on the advantages and disadvantages, Alternative 1 is being selected as the preliminary preferred since it provides more operational flexibility and better east-west transmission resiliency. However, it is noted that Alternative 2 could also end up being preferred under a more detailed assessment, since it may have lower environmental impacts and less conflict with LRT work.

Although Alternative 1 is recommended as the preferred solution, it is important for the City to conduct a Class EA to confirm the alignment and assess environmental impacts, particularly in relation to the Greenbelt areas / environmental crossings and potential LRT conflicts. As part of a future Class EA to select preferred alignment, the City could also consider both crossings, but this may lead to more significant environmental / social impacts.

Figure 8-5- Stoney Creek PD2 East Reliance on Barton Servicing Strategy

Table 8-6- Stoney Creek PD1 East Reliance on Barton Servicing Strategy Assessment

Alternatives	Pros ¹	Cons ¹
Do Nothing Screened Out	- No new infrastructure / costs - Lower environmental impacts by avoiding construction. - Under normal operating conditions, the system is able to maintain supply to the east side of the system	Does not improve the resiliency of the PD1 system, or the supply towards Dewitt / Stoney Creek
Alternative 1 Carried Forward	- Increased resiliency of transmission across to PD1 East / Stoney Creek. - Proposed route would link well with existing east-west feeds further east along Queenston / Hwy 8 - Supports improved operational flexibility	- Potential environmental/social impacts related to the Greenbelt Plan. Will need consultation and detailed EA to assess preferred alignment. - Requires two crossings (two separate branches of the Battlefield Creek) compared to Alternative 1 which has the one segment to cross. - Part of the route (Nash Road to Centennial Parkway) is within the planned Hamilton LRT route, which can add construction complexity - Not required for growth; resiliency driven project
Alternative 2 Screened Out	- Increased resiliency of transmission across to PD1 East / Stoney Creek which could link well with existing east-west feeds further east along Barton. - Requires one crossing (single longer branch of the Battlefield Creek) and avoids the LRT route along Queenston.	- Less operational flexibility and resiliency since it is at risk of any issues / major construction impacts along Barton (both the existing and proposed major east-west feeds would be along the same route). - Not required for growth; resiliency driven project

Note 1: The evaluation criteria from Section 8.2 were reviewed and applied to each alternative. However, only the main differentiating criteria are identified to distinguish to find the preferred strategy

8.3.2.3 Strategy SC-3: PD10 Fire Flow Limitation

Currently, there are limitations in the available fire flow (FF) provided to the PD10 service area. The PD10 area currently only receives supply directly from the connection with Grimsby, and there is no backfeed currently from HDR10. The limitations in fire flow in PD10 are driven by a combination of the limited watermain size and the lack of a backfeed from the storage (HDR10)

Strategy SC-3 explored a range of opportunities that either maintain the system as it currently exists (with rural FF support needed, due to low FF availability) or to consider upgrades that can physically increase the fire flow availability in PD10.

The following alternatives were considered as part of Strategy SC-3:

- **Do-nothing:** Maintain the existing PD10 storage with no additional storage and without a backfeed from HDR10 back to PD10. This would involve augmenting through creating a rural FF designation for the area, whereby the hydrants alone do not fully support Hamilton's typical residential FF goal.
- **Alternative 1:** Add backfeed ability from HDR10 such that, during a fire, flows can both be returning from HDR10 and being simultaneously supplied by Grimsby to increase fire flow availability. This would require some rechloramination type treatment upgrades at the HDR10 site and some valving at the Grimsby-Hamilton boundary to ensure reverse flow does not occur.
- **Alternative 2:** Replace and upsize watermain along existing alignments from Grimsby supply connection to PD10 system. By upsizing (or twinning), less headloss could potentially occur, thereby increasing the instantaneous available flow from Grimsby.

Figure 8-6 presents a water fire flow strategy for the Stoney Creek PD10 area. **Table 8-7** lists the pros and cons for each alternative.

Based on the pros and cons of each alternative, Alternative 1 has been identified as the initial preferred option for this servicing strategy. The rationale for selecting Alternative 1 is that ability to backfeed from HDR10 will improve fire flow availability during a fire in PD10 and maximizes capacity of the existing storage. A separate feasibility study should be undertaken to assess the viability of adding rechloramination on the backfeed flow from HDR10. In the interim before the alternative is implemented, City should maintain a good communication between Water Services and the City's Fire Department to support the system with rural firefighting since fire flows are below the preferred goals.

Figure 8-6- Stoney Creek PD10 Fire Flow Servicing Strategy

Table 8-7- Stoney Creek PD10 Fire Flow Servicing Strategy Assessment

Alternatives	Pros ¹	Cons ¹
Do Nothing Screened Out	- No new infrastructure / costs - No changes to existing Grimsby-Hamilton agreement	- Does not provide full fire flow targets for residential and ICI customers along Fifty Road and Hwy 8. - Would require support from rural fire fighting during fire conditions. (tanker / pumper trucks)
Alternative 1 Carried Forward	- Increases useable storage capacity, (maximizing capacity of existing infrastructure) with backfeed ability during a fire in PD10. - Could support partly improved fire flow availability due to dual flow path	- Potential complexity at HD009 / HDR10 site and at Grimsby-Hamilton boundary. Likely need for rechloramination (improve water quality) to ensure suitable residual during back feed. - Fire flows are still below the targeted fire flow goal at select locations within PD10. - Limited growth in PD10 to justify upgrades.
Alternative 2 Screened Out	Could support partly improved fire flow availability, with higher direct supply from Grimsby.	- Moderately high cost for replacing/twinning watermain. - Could worsen water quality due to longer turnover time caused by added volume in pipes. - Limited growth in PD10 to justify upgrades. - Fire flow could still be limited by infrastructure on the Grimsby side.

Note 1: The evaluation criteria from Section 8.2 were reviewed and applied to each alternative. However, only the main differentiating criteria are identified to distinguish to find the preferred strategy

8.3.3 Dundas

Key challenges and opportunities were identified within the Dundas water system (PD11, PD12, PD17, PD21, and PD22) As summarized in **Section 7.2.3**. These issues relate to pumping constraints in PD11, PD17 and PD22, transmission limitations, and storage deficits in PD12 and PD22. Collectively, they represent the primary focus areas for long-term servicing improvements in the Dundas system.

The following subsections outline the water servicing strategies developed to address each of these challenges. The four (4) key strategies for Dundas include:

- Strategy D-1: PD11 Pumping and Transmission Constraint
- Strategy D-2: PD12 Storage Constraint
- Strategy D-3: PD17 Pumping Constraint
- Strategy D-4: PD22 Pumping and Storage Constraints

8.3.3.1 Strategy D-1: PD11 Pumping and Transmission Constraint

As previously discussed, the existing PD11 pumping capacity is insufficient to accommodate existing and future demand. The pumping capacity limitation is partly also exacerbated by limitations in the linear capacity from transmission mains between HD011 PS and the HDR11 reservoir. Furthermore, currently the PD11 area has a high reliance on the PD11 pumping station, which is the single source of pumped supply into PD11 and the subsequent areas (PD12 & PD21).

Strategy D-1 explored opportunities to improve pumping capacity in PD11, while improving transmission capacity in PD11 and adding resiliency of supply. This is critical long-term as there is continued growth in PD11 system, as well as continued increases in supply towards PD12 and PD22.

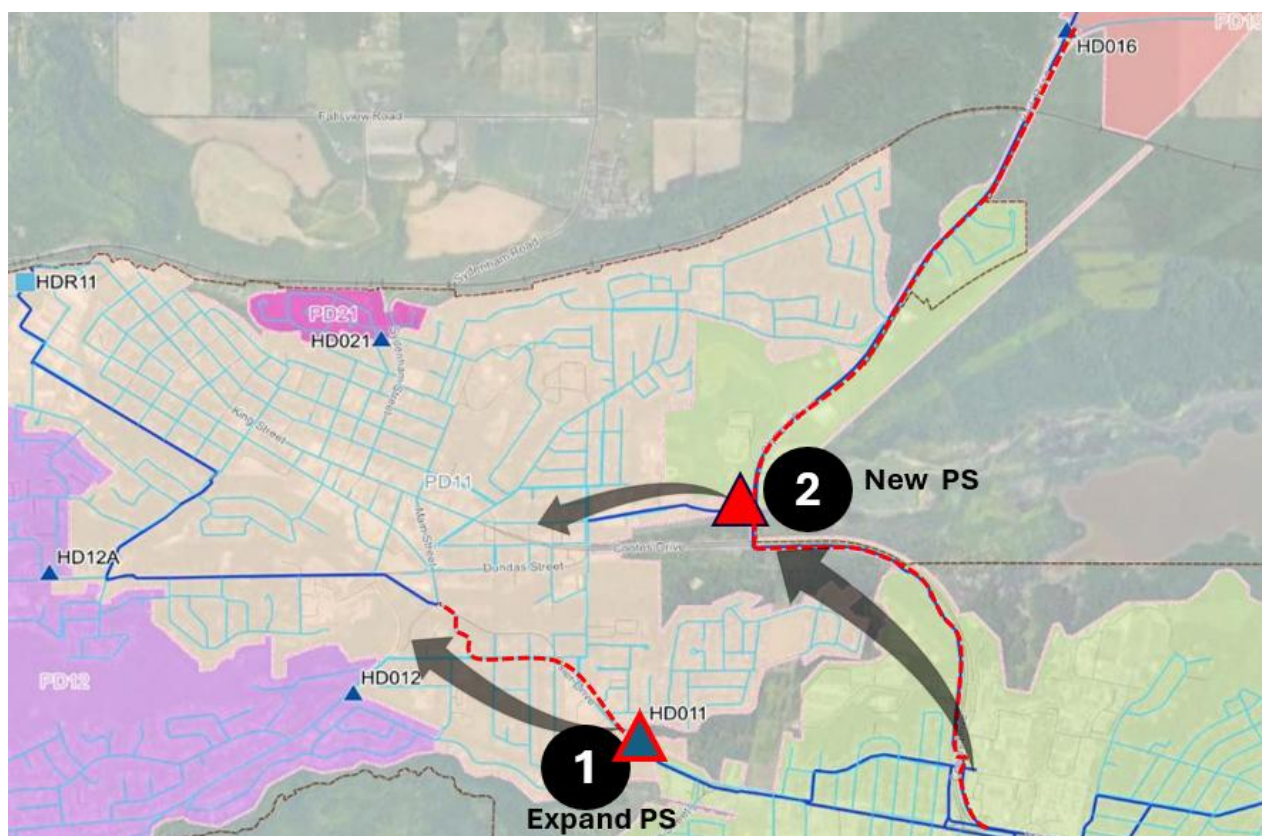
The following alternatives were considered as part of Strategy D-1:

- **Do-Nothing:** Maintain Osler Drive pumping station (HD011) as the only PD11 pumping station and do not upsize. Not viable, since the existing demands in the system would not be able to be supported. As such, this alternative does not support the planned growth.
- **Alternative 1:** Expand HD011 PS such that it can support the 2051 MDD / transfer needs of ~23 ML/d, while improving the transmission near HD011 pumping station (along Osler Drive and South Street) to provide sufficient resiliency.
- **Alternative 2:** Add second pumping station (Olympic / King) to support existing and future growth, while improving transmission from PD2 to new PD11 pumping station (Cootes / York) to provide sufficient resiliency towards both Dundas and Waterdown systems.

Figure 8-7 presents a water servicing strategy for the Dundas area. **Table 8-8** lists the pros and cons for each alternative.

Based on the pros and cons of each alternative, Alternative 2 (Adding a second PD11 PS) has been identified as the most suitable option to help resolve the pumping deficiency long-term. The primary rationale for selecting Alternative 2 is that there are clear benefits in terms of resiliency of supply being provided with this option. Currently, there is a moderately high level of risk and low resiliency associated with the Osler PD11 PS and the PD2 suction feeds. So, Alternative 2 helps increase resiliency of supply towards Dundas.

Although Alternative 2 is recommended as the preferred solution, it will be necessary for the City to conduct further assessment (Class EA) to find a suitable site for the PD11 pumping station. The location shown currently is only an example of a potential site along the PD2-PD11 boundary. Additionally, the PD2 linear upgrades (Cootes / York) should be coordinated with the proposed PD11 PS site.

Figure 8-7- Dundas PD11 Servicing Strategy Alternatives

Table 8-8- Dundas PD11 Servicing Strategy Alternatives Assessment

Alternatives	Pros ¹	Cons ¹
Do Nothing Screened Out	No new infrastructure / costs	Does not support meeting growth targets. Limits growth potential.
Alternative 1 Screened Out	- Lower cost alternative with moderate upsizing required (Current firm ~16 ML/d - > future firm need ~23 ML/d) - Maximize use of existing infrastructure committed at Osler PS - No new facility required	- Less flexibility and resiliency in operation - Relies on some PD2 infrastructure upgrades to help support improvements in the suction pressure at HD011 PS - Requires linear upgrades at the discharge side of Osler PS to achieve sufficient flow increases from Osler PS into PD11.
Alternative 2 Carried Forward	- Provides operational flexibility and resiliency through the benefits of two pumping stations that can support PD11. - Linear upgrades along Cootes / York help to improve resiliency in supply from PD2 towards this new PS and Waterdown. Pairs well with other system needs because this main would be required for Waterdown anyway. - Improves the hydraulic connectivity from new PD11 pumping station to HDR11, by maximizing use of existing 400 mm on King Street	- Moderate costs due to need for land and the construction of a new pumping station. - Requires PD2 infrastructure to help support improvements in the suction pressure at the pumping station. PD2 linear works are along a complex alignment. - New pump station (firm capacity ~14 ML/d) is a larger increase in capacity. Such that it intentionally can support at least 2051 average day demand / transfer needs. - Potential impacts with site near Desjardins Canal and environmentally sensitive areas

Note 1: The evaluation criteria from Section 8.2 were reviewed and applied to each alternative. However, only the main differentiating criteria are identified to distinguish to find the preferred strategy

8.3.3.2 Strategy D-2: PD12 Storage Constraint

As previously discussed, existing PD12 available storage (provided by Dundas Elevated Tank HDT12) is slightly below the theoretical direct storage requirement in 2051 (as per MECP guidelines of fire, emergency and equalization needs and MECP Secondary Disinfection Regulations).

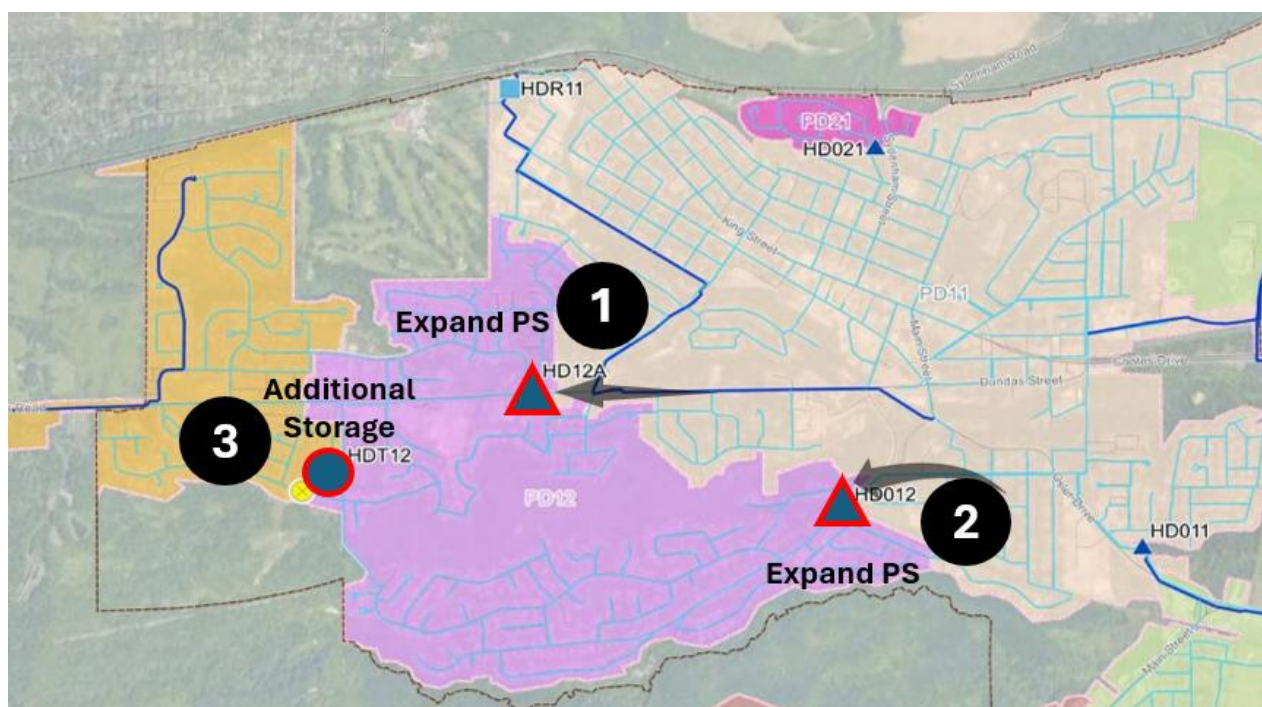
As such, Strategy D-2 explored opportunities meet the storage requirements in the PD12 system through either additional storage, or through increased pumped storage (transferring spare storage from one PD to another). The following alternatives were considered for Strategy D-2:

- **Do-Nothing:** Maintain Governors PS (HD12A) and Old Ancaster PS (HD012) and do not upsize any facility or provide any additional PD12 storage.
- **Alternative 1:** Expand HD12A PS such that it can help offset the storage deficit in PD12, by providing additional pumping capacity from PD11 to PD12, with surplus PD11 storage.
- **Alternative 2:** Expand HD012 PS such that it can help offset the storage deficit in PD12, by providing additional pumping capacity from PD11 to PD12, with surplus PD11 storage.
- **Alternative 3:** Add storage capacity to PD12 such that it can help offset the storage deficit in PD12.

Figure 8-8 presents a water servicing strategy for the Dundas area. **Table 8-8** lists the pros and cons for each alternative.

Based on the pros and cons of each alternative, Alternative 1 (Expanding HD12A PS) has been identified as the most suitable option to help resolve the storage deficiency long-term. The primary rationale for selecting Alternative 1 is that it helps meet the storage goals in PD12 (via partial pumped storage) and there is an improvement in resiliency of supply by reducing heavy reliance on HD012 PS. This alternative also pairs well with the PD22 system needs.

Although Alternative 1 is recommended as the preferred solution, it will be necessary for the City to conduct further assessment (Class EA) to confirm the preferred site and plans for the HD12A PS site, which has historically been considered as a “New Governor’s Road PS” nearby to the existing site.

Figure 8-8- Dundas PD12 Storage Alternatives

Table 8-9- Dundas PD12 Storage Alternatives Assessment

Alternatives	Pros ¹	Cons ¹
Do Nothing Screened Out	- No new infrastructure/costs - Pumped storage would need to be provided via PD11 from the HD012 PS, which does have sizeable capacity.	Does not help address some resiliency concerns in the PD12 system. HD12A is limited currently, so any issues at HD012 PS would be challenging to maintain service levels.
Alternative 1 Carried Forward	- Supports PD12 storage needs (partial pumped storage) - Helps to improve system resiliency, supporting reliable service by reducing heavily reliance on HD012 PS - Aligns with long-term vision of having a new Governor's Road PS site with more wholesome pumping capacity to PD12 and separate pumps to PD22.	Does rely on capacity in the PD11 system (partial storage transfer from external to the district)
Alternative 2 Screened Out	Supports PD12 storage needs (partial pumped storage)	- Does rely on capacity in the PD11 system (partial storage being borrowed) - Does not improve operational flexibility and resiliency in operation since system would continue to be highly reliant on HD012 PS - Does not pair well with a new PD22 PS site
Alternative 3 Screened Out	- Increases storage capacity and achieves storage needs for future growth. - Supports improved operational flexibility with multiple tanks	- Operational complexity with water quality and turnover challenges - Higher social impacts (aesthetics) from a second elevated storage - Does not pair well with a new PD22 PS site

Note 1: The evaluation criteria from Section 8.2 were reviewed and applied to each alternative. However, only the main differentiating criteria are identified to distinguish to find the preferred strategy

8.3.3.3 Strategy D-3: PD17 Pumping / Fire Flow Constraint

The current PD17 pump station (HD17A) does not have sufficient pumping capacity to cover maximum day plus fire flows, so current fire flows are supported by a check valve arrangement that allows for PD2 flow to bypass the station and travel direct into PD17 to support a fire. This provides moderate fire flows (ranging ~75 L/s to 140 L/s), but below some of the targeted levels for the area. Furthermore, there are age / condition concerns with the existing pump station due to poor age/condition of the facility.

There is negligible growth projected in the PD17 area, so the project needs are not growth driven, but rather upgrades to existing service levels. Furthermore, there is an ongoing Class EA related to identifying a new (replaced / upgraded) HD17A PS site. As such, this new HD17A PS site is being carried forward as a Class EA solution to support existing needs, rather than a Master Servicing Strategy driven project.

8.3.3.4 Strategy D-4: PD22 Pumping and Storage Constraints

PD22 is currently supported by a single back feed (from PD18 and the HDR00 – Lee Smith Reservoir). The watermain that provides this back feed is a single main along Sulphur Springs Road, which is at high risk of a watermain break. As such, the resiliency in PD22 is currently limited, so an alternative supply route is envisioned to support the system needs, while improving resiliency. The storage facility is not large enough to provide the full storage volume, so it inherently still transfers currently from PD18.

Strategy D-4 explores opportunities to improve the overall supply strategy towards the PD22 area with a focus on improving the resiliency of supply. It is noted that the PD22 servicing strategies and analysis have been assessed and reported on under a separate project.

As such, the following provides a summary of the alternatives considered as part of that prior work, which is still valid and applicable for the purposes of the Master Servicing Study:

- **Do-Nothing:** Maintain status quo of single backfeed from PD18 / HDR00.
- **Alternative 1:** Add new PD22 pumping station near HD12A PS to help meet the growth, while sizing the facility large enough to provide sufficient pumping (and pumped storage needs) in the PD22 system.
- **Alternative 2:** Expand Lee Smith Reservoir (HDR00) such that it can support sufficient full PD22 storage needs.

Figure 8-9 presents a water servicing strategy for the Dundas area. **Table 8-10** lists the pros and cons for each alternative.

Based on the pros and cons of each alternative, Alternative 1 (Add new PD22 pumping station) has been identified as the most suitable option to help resolve the pumping and storage deficiency long-term. The primary rationale for selecting Alternative 1 is that there are clear benefits in terms of improved operational flexibility / resiliency, whereby the single feed risk is mitigated. There are still operational challenges with water quality that need to be managed by creating a way to create turnover along the long dead-end feed on Sulphur Springs, however it can be managed. Details on this strategy can be seen in prior reports specific to the PD22 analysis and the pre-design work for a new Governor's Road pump station site.

Although Alternative 1 is recommended as the preferred solution, the City is planning to conduct further assessment (Class EA) to confirm the suitable site for the new PD12 and PD22 pumping station. The location shown currently is the theorized "New Governor's Road PS".

Figure 8-9- Dundas PD22 Servicing Strategy Alternatives

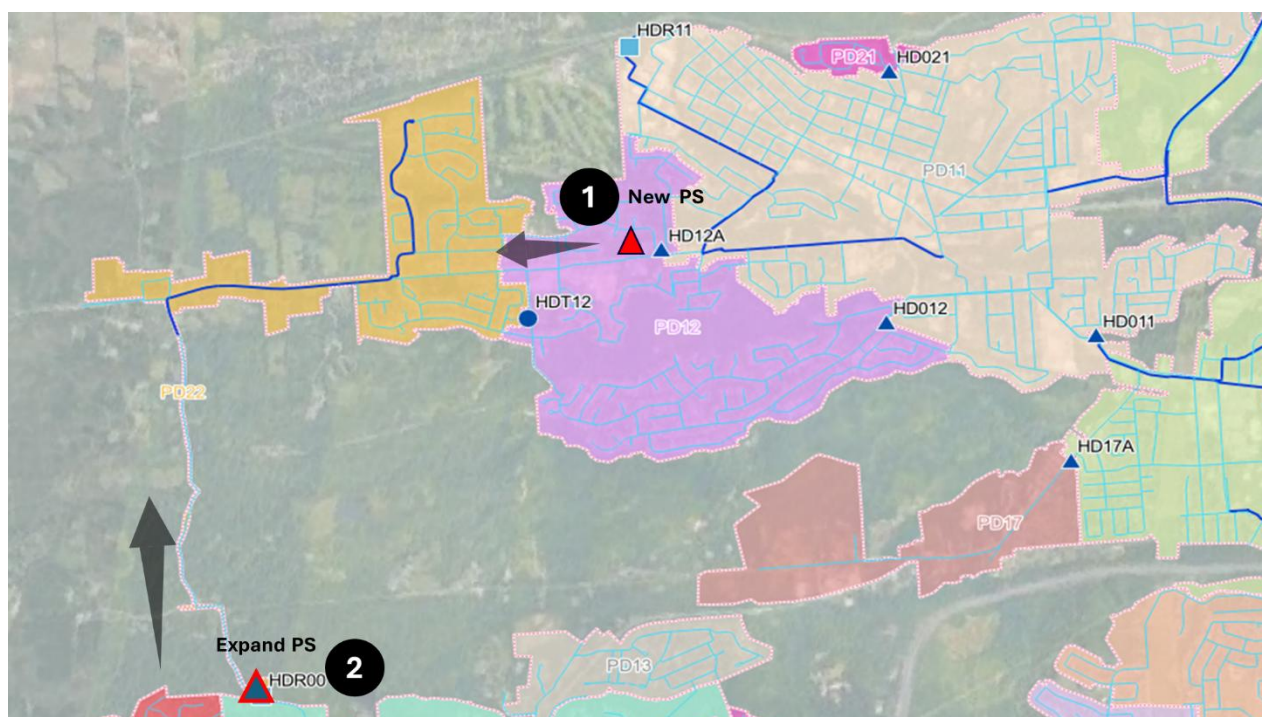


Table 8-10- Dundas PD22 Servicing Strategy Alternatives Assessment

Alternatives	Pros ¹	Cons ¹
Do Nothing Screened Out	No new infrastructure / costs	- Does not support storage needs for existing and future growth targets. - Does not support resiliency needs for PD22 long-term, since the area relies on the operation of the Sulphur Springs back feed. - Does not improve current water quality challenges, where water age is particularly high due to the long travel time towards HDR00 and PD22.
Alternative 1 Carried Forward	- Supports improved operational flexibility with primary supply from new PS and backup / secondary supply from the existing back feed. Check valves from PD12 become tertiary ("last resort" option) - Water quality / turnover challenges can be improved and managed with PS helping to bring fresher supply into the area and small PS (PD22 to PD18) to help create turnover along Sulphur Springs feed.	- Higher costs due to need for the construction of a full pumping station - Some operational challenges remain due to unique topography and long single feed supply up Sulphur Springs.
Alternative 2 Screened Out	Additional storage helps to ensure enough floating storage exists in PD22.	- Does not address resiliency risk. Operational challenges remain due to unique topography and long single feed supply up Sulphur Springs - Worsens water quality (age) challenges.

Note 1: The evaluation criteria from Section 8.2 were reviewed and applied to each alternative. However, only the main differentiating criteria are identified to distinguish to find the preferred strategy

8.3.4 Waterdown

Key challenges and opportunities were identified within the Waterdown water system (PD16, PD19, PD20, and PD24) as summarized in **Section 7.2.4**. These issues relate to pumping capacity limitations, storage constraints, and transmission resiliency in PD16. Collectively, they represent the primary focus areas for long-term servicing improvements in the Waterdown system. The following subsections outline the water servicing strategies developed to address each of these challenges.

The three (3) key strategies for Waterdown include:

- Strategy WD-1: PD16 Pumping Constraint
- Strategy WD-2: PD16 Storage Constraint
- Strategy WD-3: PD16 Transmission Limitations

8.3.4.1 Strategy WD-1: PD16 Pumping Constraint

As previously discussed, PD16 does not have sufficient pumping capacity to accommodate existing and future growth. However, there is a design for an upgrade of the York and Valley pump station (HD016), which will provide additional capacity as well as more flexibility in the operations of the pump stations. The previously indicated capacity increase from AECOM's HD016 pumping station report is to increase firm capacity from ~18 ML/d to ~28 ML/d.

Based on a review of the overall projected growth in PD16, PD19, PD20, and PD24, the 28 ML/d capacity does exceed the projected 2051 MDD (~22 ML/d). As such, the pumping station expansion can support the full MDD needs, plus some excess capacity which can either be used to partly offset some storage, or it can be reserved for post-period growth or to support increased Halton flow.

It is noted that there are ongoing discussions between the City of Hamilton and Regional Municipality of Halton about potentially increasing the supply agreement from Waterdown to the North Aldershot lands in Halton. This could also further increase the needs of the pump station expansion. As part of the IMSS, the current transfer agreement values were assumed.

No further expansion beyond 28 ML/d is identified in this IMSS.

8.3.4.2 Strategy WD-2: PD16 Storage Constraint

The available storage (provided by Waterdown North Elevated Tank HDT16 - 8.25 ML) is slightly below the future storage requirements, as per MECP guidelines for fire, emergency, and equalization storage. In addition to the active HDT16, PD16 also includes older facilities HDT01 and HDR1A (Kelly Street Standpipe and Reservoir) that are currently not in service.

Strategy WD-2 explored opportunities to meet the storage needs through a wide range of potential options (pumped or transferred storage; new / repurposed storages). The following alternatives were considered as part of Strategy WD-2:

- **Do-Nothing:** Maintain Waterdown North Elevated Tank (HDT16) and keep HDT01 and HDR1A (Kelly Street Standpipe and Reservoir) offline. Note this version does not meet the storage need long-term and therefore does not support the planned growth.
- **Alternative 1:** Maintain and utilize/repurpose HDT01 (Kelly Street Standpipe) to support 2051 storage needs of ~13.7 ML in PD16. This could be repurposed either as the current standpipe or as a second elevated tank, depending on viability and the significance of rehab works that would be required with the current standpipe. The additional storage would need to remain online, particularly in summers and during planned maintenance of HDT16.
- **Alternative 2:** Add further pumping capacity at HD016 PS to provide partial pumped storage (from PD2), while the majority of storage is still supported by HDT16. HDT01 is maintained offline in this scenario.
- **Alternative 3:** Adding PRVs that can provide a partial back feed from PD24's floating storage. The HDT24 storage facility is projected to have a slight surplus (~1.1 ML in 2051) which could be used as a partial support to PD16, when needed.

Figure 8-10 presents a water servicing strategy for the Waterdown area. **Table 8-11** lists the pros and cons for each alternative.

Based on the pros and cons of each alternative, Alternative 1 is the preferred alternative since it provides clear benefits to maintaining resiliency, while also providing some surplus pumping into PD16.

- Normal operating conditions: Both HDT16 and HDT01 could remain in operation and full floating storage is provided. There would still be operational flexibility, particularly during lower demand conditions (non-summer) to take HDT01 offline to reduce storage and rely on the HDT16 and the slight pumping surplus at HD016 PS.
- When HDT16 needs to be taken offline, HDT01 would be online with HD016 PS operating based on its level.
- There could still be value in considering / installing a PRV (Alternative 3) between PD24 and PD16 so that the HDT24 storage facility supports PD16, in the event of any significant fire flow / emergency scenarios in PD16.

Although Alternative 1 is recommended as the preferred solution, it will be necessary for the City to conduct further assessment to verify the suitability of continued use of the HDT01 standpipe and to ensure it can be used in conjunction with HDT16 in the future.

Independent from the IMSS, the City could also consider undertaking a further study of a potential new storage reservoir being located near the HD016 PS which could act as both floating storage towards PD2 and / or PD11 while also being pumped storage towards PD16.

Figure 8-10- Waterdown PD16 Storage Alternatives

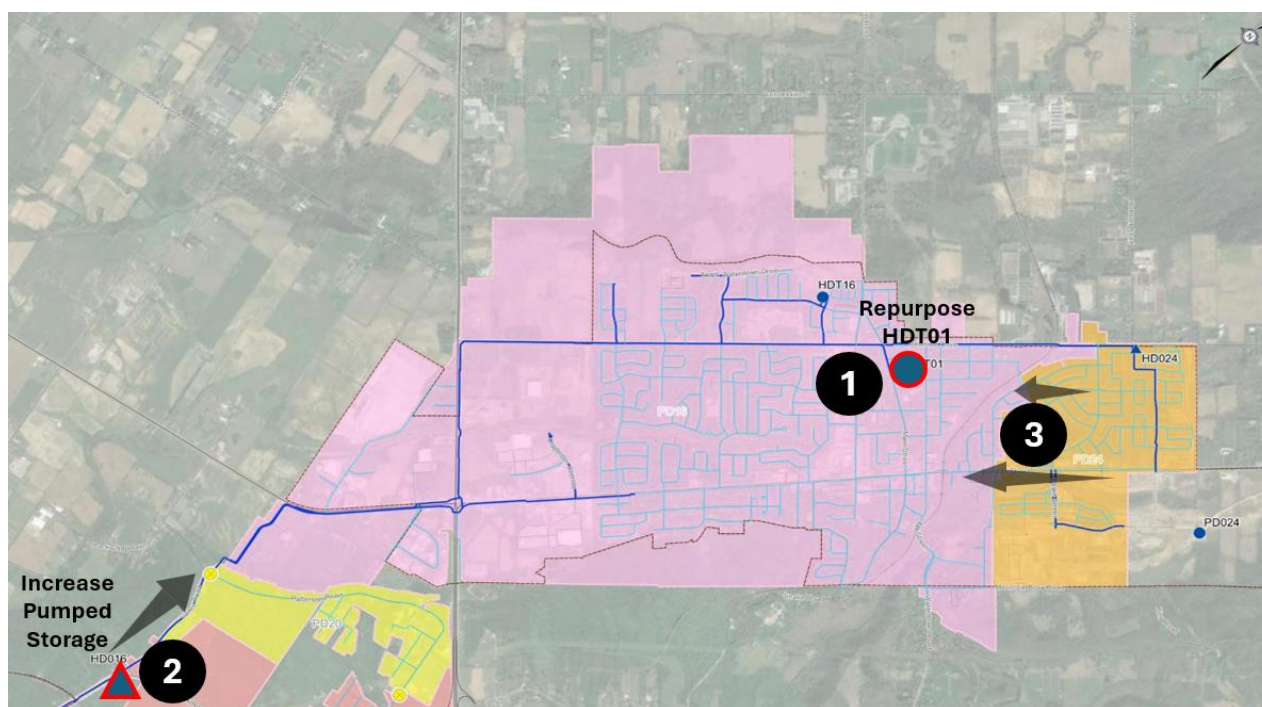


Table 8-11- Waterdown PD16 Storage Alternatives Assessment

Alternatives	Pros ¹	Cons ¹
Do Nothing Screened Out	No new infrastructure / costs.	- Does not support storage needs for future growth targets. Limits growth potential. - Does not provide flexibility in operation when there is a planned storage outage (maintenance) at HDT16.
Alternative 1 Carried Forward	- Maximizes use/capacity of already built infrastructure. - Supports the storage needs in PD16 with continually active storage sites. - Supports improved operational flexibility. - Resiliency in storage.	- Potentially higher costs to maintain and reactivate older facilities. High costs of new tank, if standpipe is repurposed. - Some challenges with operating HDT01 (standpipe) with the existing elevated tank.
Alternative 2 Screened Out	Supports the partial storage deficit via pumped capacity from HD016 PS, which is planning upgrades regardless.	- Not simple to continue increasing pumping capacity due to increasing headloss and the high lift pumps that exist at HD016 PS. - Should still maintain HDT01 in order to be capable of taking HDT16 offline safely.
Alternative 3 Screened Out	- Can help to partly improve supply / capacity to PD16 by back feeding from PD24. - Makes use of the HDT24 capacity. - Supports reduced water age and quality objectives and risks.	- Does not fully support the full deficit in 2051 since there is only a small surplus in HDT24. - Does not provide flexibility in operation when there is a planned storage outage (maintenance) at HDT16.

Note 1: The evaluation criteria from Section 8.2 were reviewed and applied to each alternative. However, only the main differentiating criteria are identified to distinguish to find the preferred strategy

8.3.4.3 Strategy WD-3: PD16 Transmission Limitation

PD16 relies heavily on a single 600mm feed that connects PD2 to HD016 along York Road, and a single 600 mm discharge feed from the HD016 PS. This is currently the only supply route to the PD16 system, which also supplies PD19, PD20 and PD24. There is already a planned twin discharge watermain (ongoing Class EA) to decrease the criticality associated with reliance on a single pipe. The preferred alignment for the discharge watermain has been selected through the Class EA and is being carried forward in this IMSS.

Strategy WD-3 explored opportunities to improve resiliency in transmission towards HD016 PS. Adding resiliency along this route is critical long-term as this is the only watermain that supports PD16. The following alternatives were considered as part of Strategy WD-3:

- **Do-Nothing:** Maintain a single suction watermain towards York and Valley PS (HD016).
- **Alternative 1:** Twinning suction watermain (York Road, Olympic Drive, Cootes Drive) towards HD016 PS and the discharge watermain at HD016 PS

Figure 8-11 presents a water servicing strategy for the Waterdown area. **Table 8-12** lists the pros and cons for each alternative.

Based on the pros and cons of each alternative, Alternative 1 has been identified as the preliminary preferred option to resolve transmission limitations in PD16. The primary rationale for selecting this option is to ensure transmission resiliency from the PD2 system towards the Waterdown and Dundas systems. A new twinning 600 mm watermain along Cootes Drive and York Road helps to maximize linkage from PD2 to PD16, whilst the Class EA proposed twinned 600 mm watermain at discharge of HD016 provides resiliency towards PD16.

As before, it is important for the City to conduct a study that will provide a detailed alignment assessment that considers the potential impacts on the community, the environment, and confirms technical and financial viability.

Figure 8-11- Waterdown PD16 Transmission Alternatives

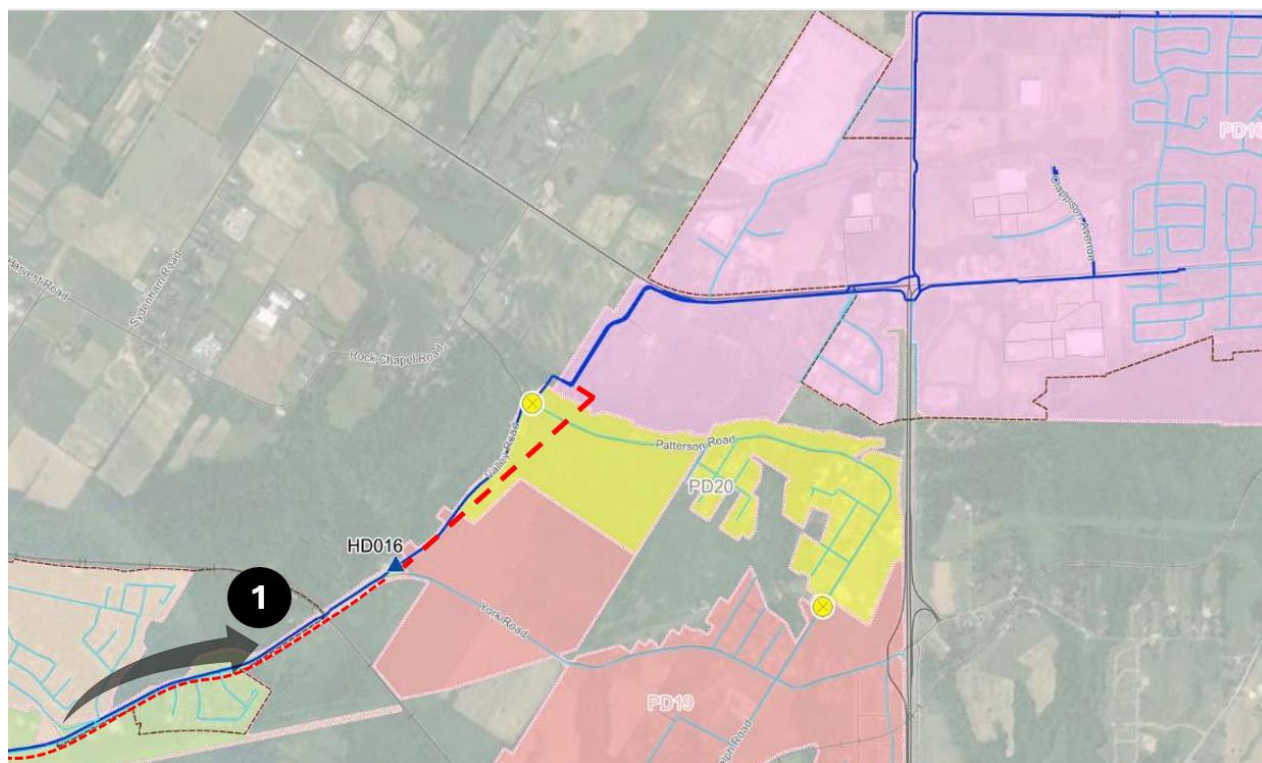


Table 8-12- Waterdown PD16 Transmission Alternatives

Alternatives	Pros ¹	Cons ¹
Do Nothing Screened Out	- Increases transmission capacity after HD016 PS and improves downstream resiliency. - Lower cost alternative due to shorter watermain.	- Does not support transmission resiliency along the suction line from PD2 towards HD016 PS. - High risk still exists along the route.
Alternative 1 Carried Forward	- Improves the hydraulic connectivity to and from the HD016 facility. - Improves transmission resiliency from PD2 to PD16 and discharge feed on HD016 pump station. - Proposed alignment of PD2 suction feed also pairs well with the proposed second PD11 pump station.	- High costs of constructing twinned suction watermain. - Limited alignment options means that proposed alternative is along same alignment as the existing watermain.

Note 1: The evaluation criteria from Section 8.2 were reviewed and applied to each alternative. However, only the main differentiating criteria are identified to distinguish to find the preferred strategy

8.3.5 Hamilton Mountain

Key challenges and opportunities were identified within the Hamilton Mountain water system (PD5, PD6, PD7, and PD25) as summarized in **Section 7.2.5**. These issues relate to pumping and transmission limitations in PD5 and PD7, storage constraints in PD6 and PD7, and overall system resiliency. Collectively, they represent the primary focus areas for long-term servicing improvements in the Hamilton Mountain system.

The following subsections outline the water servicing strategies developed to address each of these challenges. The four (4) key strategies for Hamilton Mountain include:

- Strategy HM-1: PD5 Pumping Constraint and Transmission Limitation
- Strategy HM-2: PD6 Storage Constraint and Transmission Limitation
- Strategy HM-3: PD7 Storage Constraint
- Strategy HM-4: PD7 Pumping Constraint and Transmission Limitation

8.3.5.1 HM-1: PD5 Pumping Constraint and Transmission Limitation

As previously discussed, the existing PD5 pumping capacity is insufficient to accommodate future growth, and there is a transmission limitation that restricts the ability of Greenhill PS (HD05A) to operate at full capacity within the PD5 system and towards Stone Church PS (HD06B).

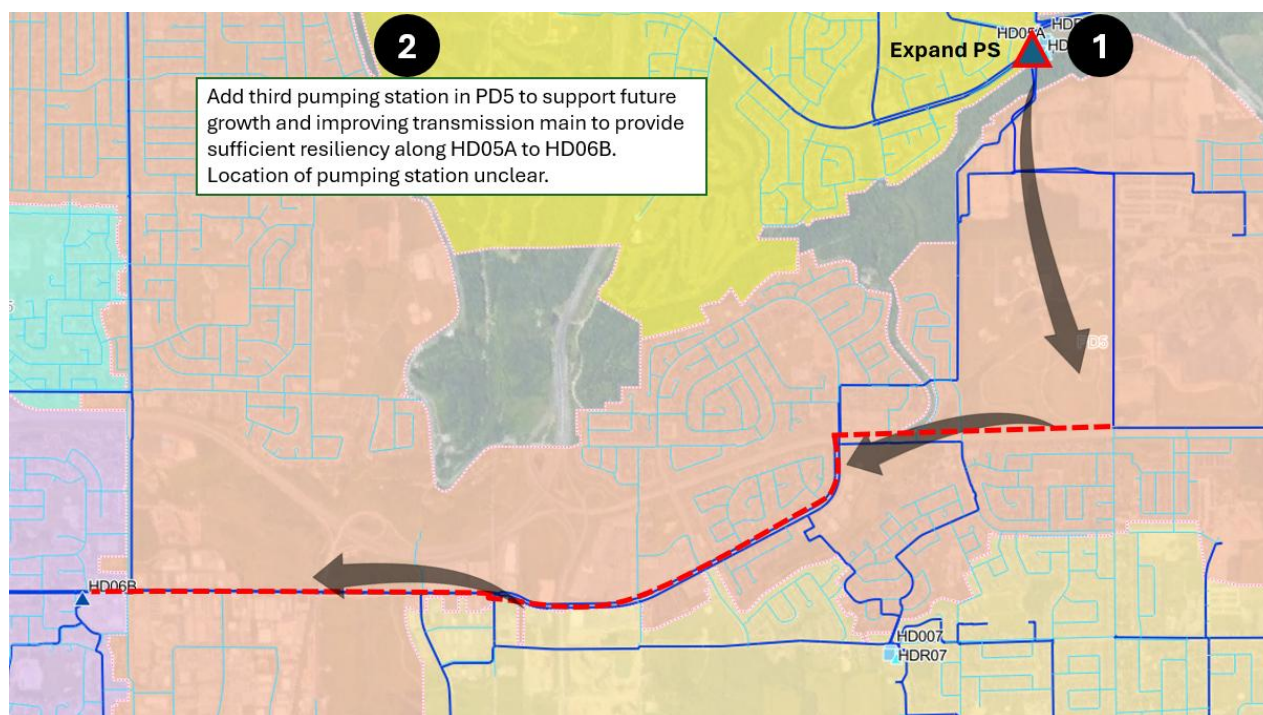
Strategy HM-1 explores opportunities to improve pumping capacity in PD5, through a combination of pumping and transmission upgrades. In addition to the growth driven capacity increase, the concept is also focused on improving resiliency along key routes particularly along the link between HD05A and HD06B since along with growth in PD5, the other impactful growth is the subsequent flow transfer required towards the PD6 system. The following alternatives were considered as part of Strategy HM-1:

- **Do-Nothing:** Maintain Greenhill (HD05A) and do not upsize the pump station or transmission main. Not viable, since increased demands in the system would not be able to be supported. As such, this alternative does not support the planned growth.
- **Alternative 1:** Expand HD05A PS such that it can, in combination with the existing HD005 PS, support the 2051 MDD, while improving transmission to provide sufficient resiliency along HD05A to HD06B
- **Alternative 2:** Add a third pumping station in PD5 to support future growth, while improving transmission to provide sufficient resiliency along HD05A to HD06B

Figure 8-12 presents a water servicing strategy for the Hamilton Mountain area. **Table 8-13** lists the pros and cons for each alternative.

Based on the pros and cons of each alternative, Alternative 1 (expand HD05A pumping station and upgrade transmission) has been identified as the most suitable option to help resolve the pumping deficiency long-term. The primary rationale for the selection of Alternative 1 is that there are clear benefits in terms of maximizing the use of existing/committed infrastructure with a lower cost of upsizing compared to a new pump station site.

It is noted that the City of Hamilton is already engaged in design projects to assess the expansion of HD05A pumping station and the Stone Church Feedermain extension.

Figure 8-12- Hamilton Mountain PD5 Pumping / Transmission Alternatives

Table 8-13- Hamilton Mountain PD5 Pumping / Transmission Alternatives Assessment

Alternatives	Pros ¹	Cons ¹
Do Nothing Screened Out	No new infrastructure / costs.	- Does not support pumping needs for future growth targets in PD5 (and the subsequent transfers to PD6 and beyond). - Does not improve the resiliency in PD5 system.
Alternative 1 Carried Forward	- Lower cost pump upgrade alternative with only a moderate upsizing required from current capacity using a spare pump bay at HD05A PS (Greenhill PS). - Maximizes use of existing infrastructure (Phase 1 of Stone Church main completed already) and the transmission towards Greenhill. - Increases hydraulic connectivity and resiliency of transmission link from HD05A towards HD06B PS / PD6 system.	Still moderately high reliance between use of HD06B PS and operation of HD05A PS. (limited capacity of HD05A PS unless HD06B PS is operating).
Alternative 2 Screened Out	- Improves operational flexibility and resiliency with a theoretical third PD5 PS. - New upgrade / facility could support the PD5 needs.	- Higher costs due to need for land and construction of a full pumping station with sufficient capacity. - Linear upgrades likely significant due to need for strong suction supply and discharge supply. - Limited suitable options for third PS site

Note 1: The evaluation criteria from Section 8.2 were reviewed and applied to each alternative. However, only the main differentiating criteria are identified to distinguish to find the preferred strategy

8.3.5.2 HM-2: PD6 Storage Constraint and Transmission Limitation

PD6 is composed of entirely pumped storage, which is stored in HDR05 (PD5 storage), and has no floating storage, resulting in a high reliance on continued supply from two (2) PD6 pump stations that provide instantaneous supply into PD6 from PD5. This continual need for pumped supply into PD6 means that there is increased importance in having a strong transmission network in PD6 to move flows as and when required. As such, some transmission limitations and resiliency concerns are also considered a challenge in the PD6 system, with limited resiliency in the linkages between Stone Church and Garth PS (HD06A) and Stone Church and Tunbridge PS (HD06B) supplies.

Strategy HM-2 explored opportunities to support the storage / transmission needs in the PD6 area, by either continued pumped storage or the addition of new floating storage.

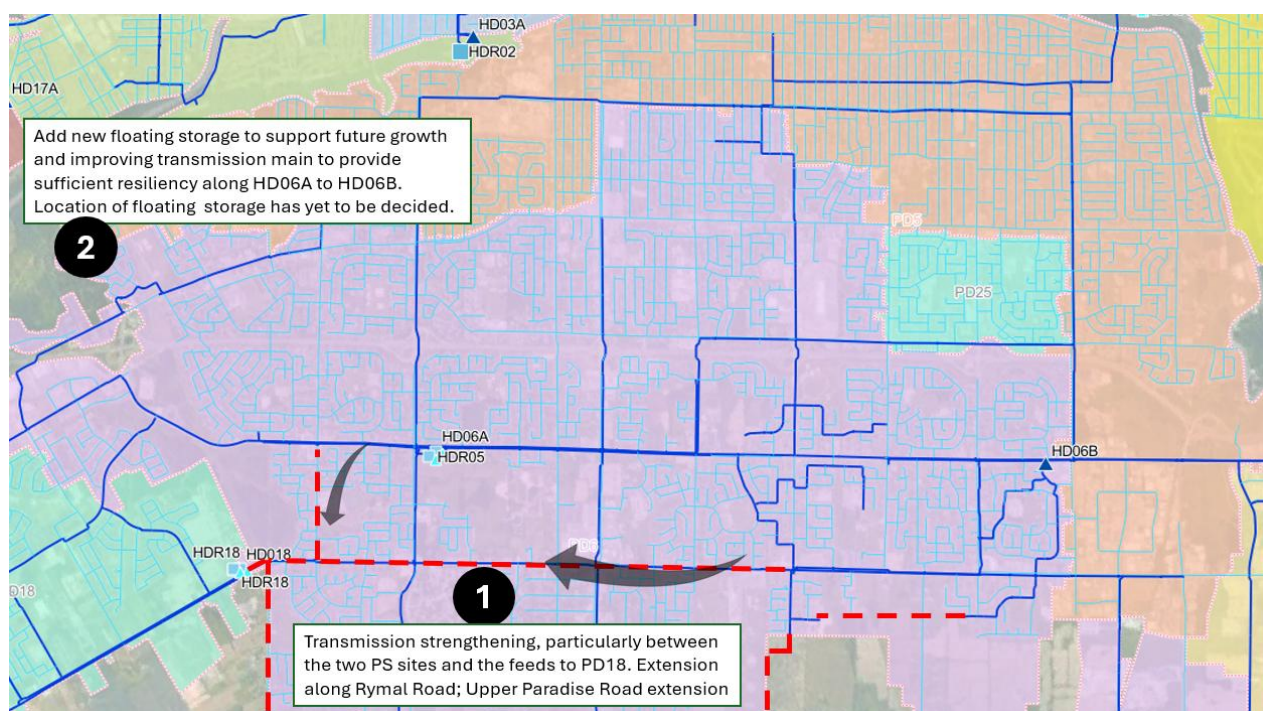
The following alternatives were considered as part of Strategy HM-2:

- **Do-Nothing:** Continue borrowing surplus storage from Kenilworth PS (HD005) and no transmission upgrades.
- **Alternative 1:** Continue utilizing external surplus storage from HD005 PS and maximize linkages between HD06A and HD06B to improve transmission capacity and resiliency within PD6 via a transmission extension along Rymal Road.
- **Alternative 2:** Add new floating storage facility to help meet the growth, while improving transmission between HD06A and HD06B.

Figure 8-13 presents a water servicing strategy for the Hamilton Mountain area. **Table 8-14** lists the pros and cons for each alternative.

Based on the pros and cons of each alternative, Alternative 1 (Continue borrowing storage from PD5 and provide transmission upgrades to improve hydraulic capacity and resiliency) has been identified as the preliminary preferred option. This alternative does not directly resolve the storage deficiency in PD6, but rather it continues to borrow storage from PD5 with improved transmission. The primary rationale for selecting Alternative 1 is that there are benefits in terms of maximizing use of existing infrastructure with increasing capacity and resiliency in the PD6 system, while avoiding the potential negatives of having too much storage in the Hamilton system (water age/quality challenges).

Although Alternative 1 is recommended as the preferred solution, it will be necessary for the City to conduct further assessment to confirm the preferred watermain alignments for the targeted improved capacity and resiliency. A future alignment assessment study is suggested to determine the ideal routes, considering potential construction impact on the community and environment.

Figure 8-13- Hamilton PD6 Transmission Alternatives

Table 8-14-Hamilton PD6 Transmission Alternatives Assessment

Alternatives	Pros ¹	Cons ¹
Do Nothing Screened Out	- No new infrastructure / costs. - Can generally maintain levels of service, when all infrastructure is operating.	- Does not improve the operational flexibility and resiliency in PD6 system. - PD6 and PD18 systems at risk during various watermain outages or facility outages.
Alternative 1 Carried Forward	- Increases transmission capacity and resiliency in PD6 system. - Maximizes use of existing infrastructure, by creating logical extensions at key locations where transmission have unused capacity. (Rymal extension; Upper Paradise Extension; Glancaster Extension; etc.) - Work along existing ROWs. - Reduces risk and complexity of water aging and quality.	System remains without any floating storage in PD6 system. Continues to be reliant on pumped storage from PD5.
Alternative 2 Screened Out	- Improves operational flexibility by adding floating storage in PD6 system. - Increases transmission capacity and resiliency in PD6 system. - Maximizes use of existing infrastructure, by creating logical extensions at key locations.	- Higher costs due to need for land and construction of a full floating storage with sufficient supply. - Higher complexity due to airport proximity - Difficulty in finding suitable land / site since high elevation areas do not exist nearby that would comfortably support a ground storage reservoir. (would need to be elevated tanks, which are limited in volume compared to the storage needs in PD6). - More storage can further exacerbate water quality/age challenges that exist due to large storage volumes already in Hamilton (PD1 / PD5)

Note 1: The evaluation criteria from Section 8.2 were reviewed and applied to each alternative. However, only the main differentiating criteria are identified to distinguish to find the preferred strategy

8.3.5.3 HM-3: PD7 Storage Constraint

PD7 does not have any dedicated floating storage and has pumped storage Highland Reservoir (HDR07), which is slightly below the theoretical direct storage requirements, as per MECP guidelines for fire, emergency, and equalization storage for future growth. It is noted that HDR07 storage site is physically constrained for expansion; therefore, a new location will be required to support PD7 growth. In line with the previously completed Class EA (2019), which identified a preferred site for a future PD7 elevated tank located along Trinity Church Road at east of Twenty Road, a new storage site is considered the preferred solution since it can not only support the PD7 storage deficit that exists in the future, but it also can be sized to offset the slight storage deficit that will exist in PD23 in the future. This solution is further discussed in **Section 8.3.6.2**, as part of the Binbrook strategy.

8.3.5.4 HM-4: PD7 Pumping Constraint and Transmission Limitation

The existing PD7 pumping capacity is insufficient to accommodate future growth, and there are transmission limitations, with low resiliency in suction and discharge transmission at Highland PS (HD007).

Strategy HM-4 explored opportunities to improve pumping capacity in PD7 area, while improving transmission capacity in PD7. The following alternatives were considered as part of strategy HM-4:

- **Do-Nothing:** Maintain Highland PS (HD007) as the only PD7 pumping station and do not upsize. Not viable, since increased demands in the system would not be able to be supported. As such, this alternative does not support the planned growth.
- **Alternative 1:** Expand HD007 PS such that it can support the 2051 MDD needs of ~48 ML/d.
- **Alternative 2:** Add second pumping station to help meet the growth, while sizing the facility large enough to provide sufficient resiliency in the PD7 (and Binbrook) system.

Figure 8-14 presents a water servicing strategy for the Hamilton Mountain area. **Table 8-15** lists the pros and cons for each alternative.

Based on the pros and cons of each alternative, Alternative 2 (New PD7 pumping station and transmission upgrades) has been identified as the preliminary preferred option to help resolve the pumping deficiency and transmission limitation long-term. The primary rationale for selecting Alternative 2 is that there are benefits in terms of increasing resiliency of supply being provided in this option. The option aligns with the previously preferred alternative from the 2019 Class EA, except with a smaller capacity due to the reduced projected population in PD7 in the current Master Servicing Strategy. Alternative 2 is also more flexible at supporting potential further expansion of the urban boundary.

Although Alternative 2 is recommended as the preferred solution, it will be necessary for the City to conduct further assessment to ensure that a specific site and alignment is agreed to for the PD7 work that considers the potential impacts on the community, the environment, and confirms technical and financial viability.

Figure 8-14- Hamilton Mountain PD7 Pumping / Transmission Alternatives

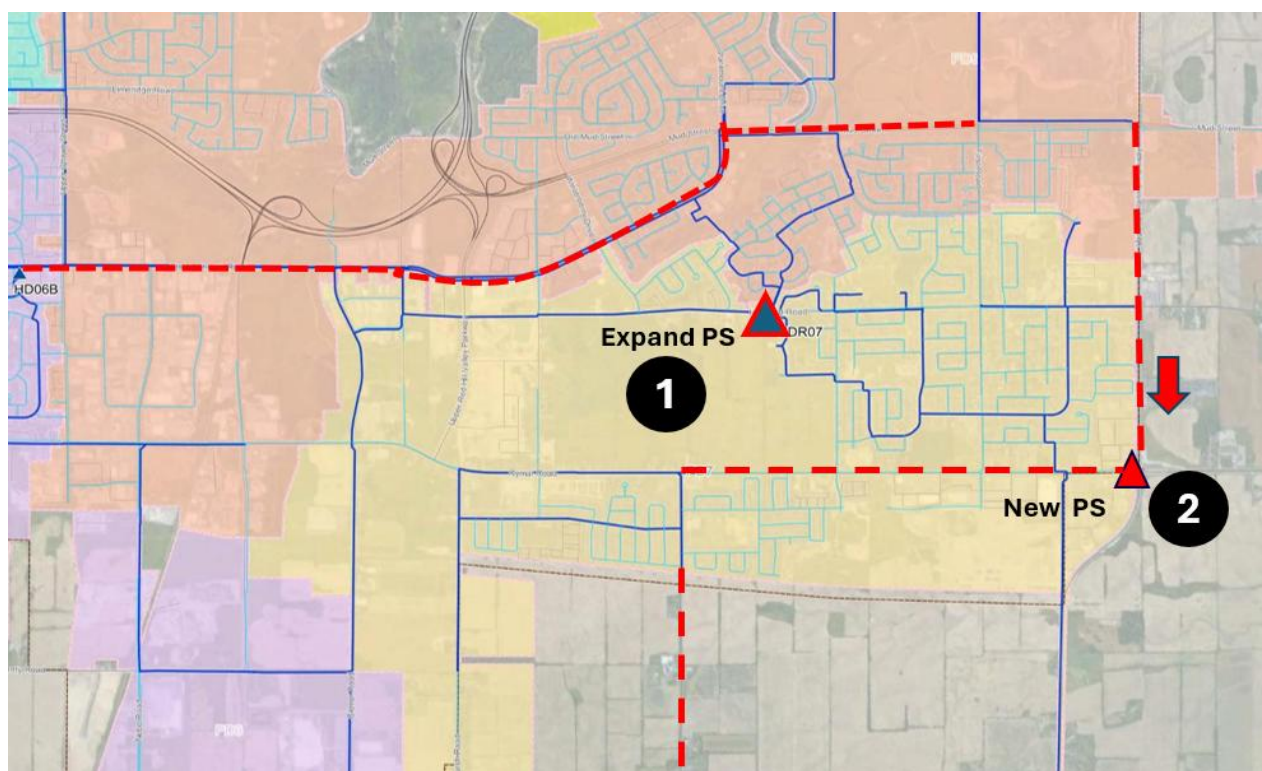


Table 8-15- Hamilton Mountain PD7 Pumping / Transmission Alternatives Assessment

Alternatives	Pros ¹	Cons ¹
Do Nothing Screened Out	No new infrastructure / costs.	- Does not support pumping needs for existing and future growth targets. - Does not improve the resiliency of supply into PD7 (& PD23) due to high reliance on the single PS and the limited suction feeds to HD007.
Alternative 1 Screened Out	- Lower cost alternative with moderate upsizing required from current capacity to reach 2051 need. - Maximize use of existing infrastructure.	- Does not improve the resiliency of supply into PD7 (and PD23) due to high reliance on the single PS and the limited suction feeds to HD007. - Does not help resolve the existing challenges with low pressures in PD5 (that are impacted by the limited suction feeds towards HD007).
Alternative 2 Carried Forward	- Increase operational resiliency by having a second pump station with a stronger suction feed / link to HD05A PS. - Also helps to improve resiliency of supply towards PD23 (Binbrook). - Maximizes use of the existing infrastructure (built watermain along Mud Street to Upper Centennial - Flexible solution that could be expandable if Elfrida Lands (east of Upper Centennial) are ever added to the urban boundary.	- Higher costs due to the construction of a full pumping station with sufficient capacity. - Requires some suction and discharge linear infrastructure to help support improvements in the transfer of the PS flows towards the rest of the PD7 network.

Note 1: The evaluation criteria from Section 8.2 were reviewed and applied to each alternative. However, only the main differentiating criteria are identified to distinguish to find the preferred strategy

8.3.6 Binbrook

Key challenges and opportunities were identified within the Binbrook water system (PD23) as summarized in **Section 7.2.6**. These issues relate to pumping capacity limitations, storage deficits, and transmission constraints between PD7 and PD23. Collectively, they represent the primary focus areas for long-term servicing improvements in the Binbrook system.

The following subsections outline the water servicing strategies developed to address each of these challenges. The three (3) key strategies for Binbrook include:

- Strategy B-1: PD23 Pumping Constraint
- Strategy B-2: PD7 and PD23 Storage Constraint
- Strategy B-3: PD23 Transmission Limitation

8.3.6.1 B-1: PD23 Pumping Constraint

The existing pumping capacity is insufficient to accommodate the projected future growth in Binbrook. However, there is an ongoing design project being completed which has identified the upgrade requirements to increase the capacity of the HD019 PS. The preliminary sizing upgrades have been identified to maximize the existing facility. They have estimated the ability to maximize flows up to ~200 L/s with station upgrades and a twin 400 mm suction feed from PD7 (see **Section 8.3.6.3**).

8.3.6.2 B-2: PD7 and PD23 Storage Constraint

PD23 has a single elevated tank (HDT23), which is slightly below the theoretical direct storage requirements, as per MECP guidelines of fire, emergency, and equalization storage for future growth.

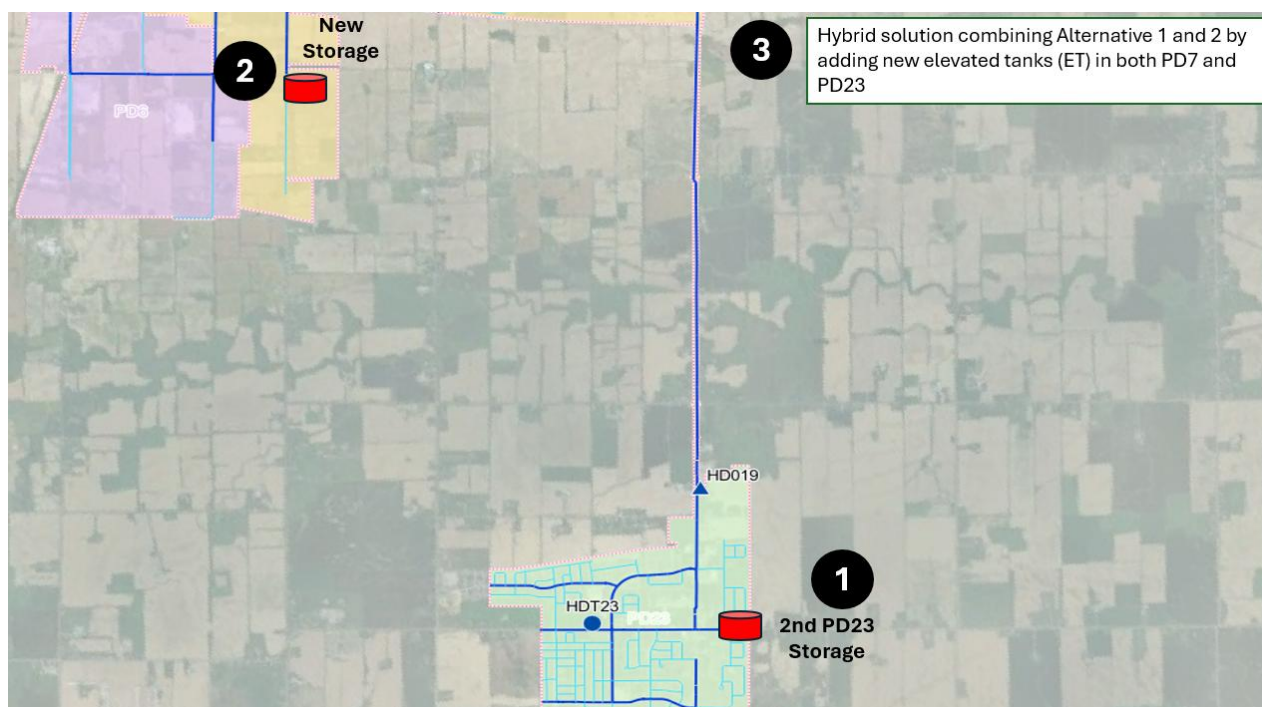
Strategy B-2 explored opportunities to improve storage capacity in PD23 area either as a true PD23 storage, or as transferred storage from PD7.

The following alternatives were considered as part of strategy B-2:

- **Do-Nothing:** Maintain Binbrook Elevated Tank (HDT23) and do not add floating storage in PD7 or PD23. Not viable, since future storage needs exist in both PD7 and PD23. It is not recommended to have multiple “pumped storage” transfers across multiple pressure districts in a row (i.e., shouldn’t borrow from a PD that already relies on borrowed storage).
- **Alternative 1:** Maintain PD7 without floating storage and add a second PD23 elevated tank.
- **Alternative 2:** Add new elevated tank (ET) in PD7 capable of supporting the deficits in both PD7 and PD23. Pump partial storage to PD23 to support the planned growth.
- **Alternative 3:** Add new Elevated Tanks (ET) in both PD7 and PD23.

Figure 8-15 presents a water servicing strategy for the Binbrook PD23 area. **Table 8-16** lists the pros and cons for each alternative.

Based on the pros and cons of each alternative, Alternative 2 (Add elevated tank in PD7) has been identified as the preliminary preferred option to help resolve the storage deficiency long-term. The primary rationale for selecting Alternative 2 is that there are benefits in terms of less operational complexity with water quality and turnover challenges.

Figure 8-15- Binbrook PD23 Storage Alternatives

Table 8-16- Binbrook PD23 Storage Alternatives Assessment

Alternatives	Pros ¹	Cons ¹
Do Nothing Screened Out	No new infrastructure / costs	Does not support future storage needs in either PD7 or PD23. Not recommended to have multiple “pumped storage” transfers in a row
Alternative 1 Screened Out	- Increases storage capacity and achieves storage needs for future growth in PD23. - Provides operational flexibility in PD23 with multiple storage facilities.	- Does not directly support storage deficit in PD7. Would still rely on pumped storage from PD5. - Operational challenges with having large amounts of storage at the end of the system in a generally small area. i.e. water age/quality (PD23 – Binbrook)
Alternative 2 Carried Forward	- Increases storage capacity and achieves storage needs for future growth in both PD7 and PD23 - Improves operational flexibility and resiliency in PD7. PD23 still relies on a single storage, but has increased resiliency through proposed twin suction mains to HD019 PS. - Aligns with prior Class EA, so preferred PD7 storage site is already identified. - Increased volume of stored water is in PD7, so it can be turned over faster through operations.	Some resiliency limitations in PD23 if/when the existing PD23 is taken offline for maintenance / rehabilitation. This will largely force rehab work to occur during non-summer conditions.
Alternative 3 Screened Out	- Increases storage capacity and achieves storage needs for future growth in both PD7 and PD23. - Improves operational flexibility and resiliency in both PD7 and PD23 by providing multiple storage facilities.	- Highest costs due to need for land and the construction of two PD7 and PD23 ET with sufficient capacity. - Operational challenges with having large amounts of storage at the end of the system in a generally small area (PD23 – Binbrook).

Note 1: The evaluation criteria from Section 8.2 were reviewed and applied to each alternative. However, only the main differentiating criteria are identified to distinguish to find the preferred strategy

8.3.6.3 B-3: PD23 Transmission Limitation

There are existing transmission limitations in the PD23 system, with a high reliance on the single 400 mm transmission connection between PD7 and HD019 along Hwy 56. Strategy B-3 explored opportunities to improve transmission capacity towards PD23, while also adding resiliency. The following alternatives were considered as part of strategy B-3:

- **Do-Nothing:** Maintain single feed 400 mm watermain from PD7 to Binbrook PS (HD019).
- **Alternative 1:** Add suction feed from PD7 to HD019 PS along Fletcher Road.
- **Alternative 2:** Twin suction feed from PD7 to HD019 PS along Hwy 56.

Figure 8-16 presents a water servicing strategy for the Binbrook PD23 area. **Table 8-17** lists the pros and cons for each alternative.

Based on the pros and cons of each alternative, Alternative 1 has been identified as the most suitable option to help resolve transmission limitations. The primary rationale for selecting Alternative 1 is that there is higher resiliency with two unique alignments, rather than twinning watermain along the same right-of-way.

Although Alternative 1 is recommended as the preferred solution, the City may wish to conduct a detailed alignment assessment with consultation that considers the potential impacts on the community, the environment, and confirms technical and financial viability.

Figure 8-16- Binbrook PD23 Transmission Alternatives

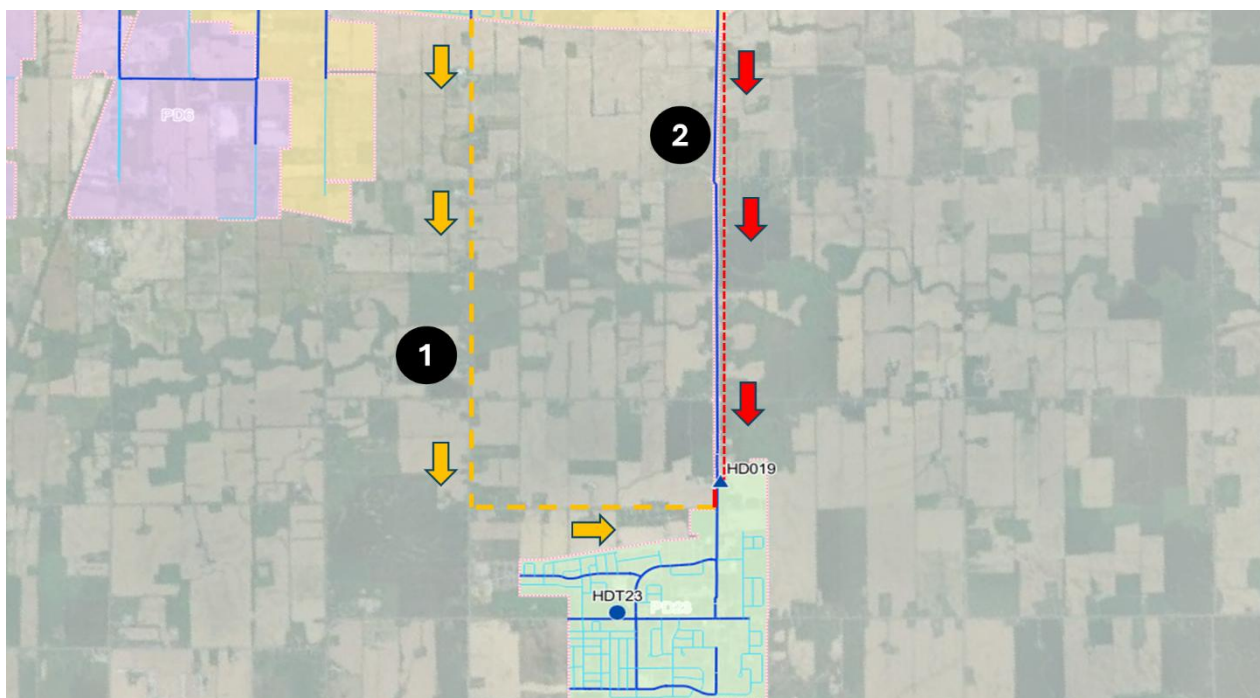


Table 8-17- Binbrook PD23 Transmission Alternatives Assessment

Alternatives	Pros ¹	Cons ¹
Do Nothing Screened Out	No new infrastructure / costs	- Less operational resiliency in transmission. (at higher risk of watermain breaks) - Higher head loss along the suction main lead to lower pumping station capacity at HD019 PS
Alternative 1 Carried Forward	- Increases operational flexibility and resiliency. - Improves the hydraulic connectivity from PD7 to PD23 system. - Reduces head loss along suction main, which allows for higher pump station capacity at HD019 PS. - Better resiliency having two separate roads for the two watermain towards HD019 PS	Higher costs due to longer watermain route from Blue Mountain Drive to HD019 PS along Fletcher Road
Alternative 2 Screened Out	- Increases operational flexibility and resiliency. - Improves the hydraulic connectivity from PD7 to PD23 system. - Reduces head loss along suction main, which allows for higher pump station capacity at HD019 PS. - Lower cost alternative due to shorter watermain needs.	- Less resilient since both mains are on the same right of way and could be impacted simultaneously. - Still moderately high costs due to the length of watermain required and potential constructability challenges.

Note 1: The evaluation criteria from Section 8.2 were reviewed and applied to each alternative. However, only the main differentiating criteria are identified to distinguish to find the preferred strategy

8.3.7 Ancaster

Key challenges and opportunities were identified within the Ancaster water system (PD13, PD14, PD15, and PD18) as summarized in **Section 7.2.7**. These issues relate to pumping capacity limitations, lack of floating storage, and transmission constraints in PD18. Collectively, they represent the primary focus areas for long-term servicing improvements in the Ancaster system. These challenges have been addressed as a combined servicing strategy because the challenges are all highly inter-related.

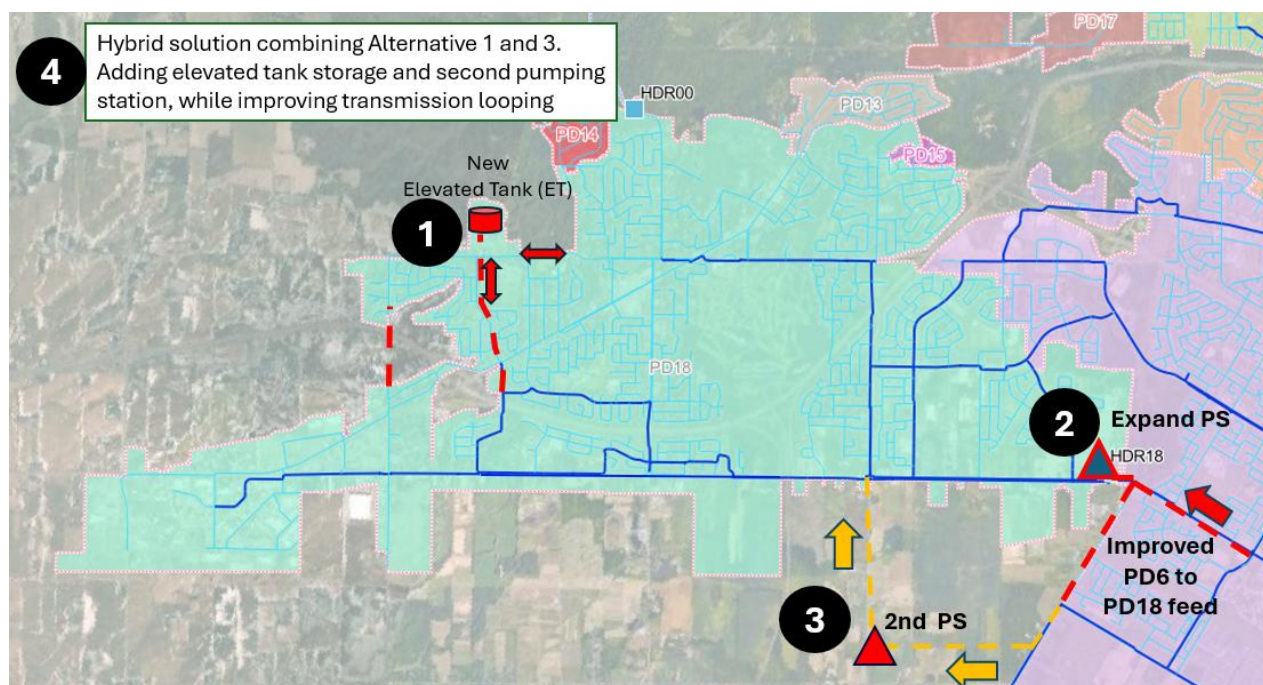
This servicing strategy explored opportunities to improve pumping and storage capacity in PD18, while improving transmission along PD18. Transmission upgrades at the suction piping to HD018 PS is considered for all alternatives to increase the resiliency of the current single feed. The following servicing strategy alternatives were considered:

- **Do-Nothing:** Maintain no floating storage in PD18 and do not upsize Garner PS (HD018). Not viable, since increased demands in the system would not be able to be supported. As such, this alternative does not support the planned growth.
- **Alternative 1:** Add an elevated tank (ET) storage to provide partial floating storage (remainder of storage continues to be pumped storage from HDR18).
- **Alternative 2:** Maintain no floating storage in PD18 and expand HD018 PS such that it can support the peak hour demands needs (and maximum day plus fire demand needs), while improving the transmission to provide resiliency and support peak pumping.
- **Alternative 3:** Maintain no floating storage in PD18 and add a second pumping station (along PD6 / PD18 future district boundary near Book Road and Southcote Road) to support future growth. Improving transmission to provide sufficient resiliency and support peak pumping in the PD16 system.
- **Alternative 4:** Hybrid solution of both Alternative 1 and Alternative 3, whereby an elevated tank is included to provide partial floating storage. Additionally, a second pumping station (in the vicinity of Book and Southcote Road) to improve resiliency of supply and additional capacity. Improving transmission looping to improve connectivity of the three facilities (both on the PD6 suction side; and PD18 discharge side).

Figure 8-17 presents a water servicing strategy for the Ancaster area. **Table 8-18** lists the pros and cons for each alternative.

Based on the pros and cons of each alternative, Alternative 4 (adding new elevated tank and second PD18 PS) has been identified as the most suitable option to help resolve the pumping and storage deficiencies long-term. The primary rationale for selecting Alternative 4 is that there are clear benefits in terms of resiliency and operational flexibility of storage and supply being provided in this option. Currently, there is a moderately high level of risk associated with the HD018 PS and the transmission mains that feed it. There are already challenges with suction pressure at HD018 PS indicating that further expansion will likely only exacerbate those challenges. Therefore, a new PD18 PS will reduce reliance on HD018 PS.

Although Alternative 4 is recommended as the preferred solution, it may be necessary for the City to conduct further assessment (Class EA / Class EA amendment) to find a suitable site for the PD18 elevated tank and pumping station. The location shown currently is only an example of a potential site within PD18. Additionally, the PD18 linear upgrades will need to be coordinated with the proposed PD18 PS site. The order of implementation between a second pump station and new storage should be considered as part of a future Class EA.

Figure 8-17- Ancaster PD18 Servicing Strategy Alternatives

Table 8-18- Ancaster PD18 Servicing Strategy Alternatives Assessment

Alternatives	Pros ¹	Cons ¹
Do Nothing Screened Out	No new infrastructure / costs	- Does not support future pumping needs, storage needs or transmission resiliency. - Not capable of supporting growth.
Alternative 1 Screened Out	- Improved operational flexibility and resiliency due to new floating storage and some improvements with linear resiliency (PD6 feeds to HDR18) - Increases storage capacity of PD18	- Still highly reliant on the single pump station (HD018 PS) to provide near-constant supply. Due to the large PD, a single ET is only providing a partial buffer, it does not have enough volume to support any prolonged PS outages. - Moderate costs due to the construction of new ET.
Alternative 2 Screened Out	- Lower cost alternative with moderate upsizing required from current capacity. - Maximizes use of existing infrastructure. - Increases capacity of PD18 to meet growth.	- Minimal flexibility and resiliency in operation due to being continually reliant on HD018 PS. - System can not handle any (even brief) outages of HD018 PS.
Alternative 3 Screened Out	- Improved operational flexibility and resiliency by having two pump stations that can both operate to support demands. - Increases capacity of PD18 to meet growth.	- Higher costs due to need for land and construction of a full pumping station with sufficient capacity to provide resiliency. - Still somewhat limited resiliency without any floating storage in PD6 or PD18.
Alternative 4 Carried Forward	- Improved operational flexibility and resiliency due to both new floating storage (to allow for brief outages of supply; and to support instantaneous spikes in demand). - Improved operational flexibility and resiliency due to second PS that takes some of the risk away from HD018 PS. - Increases capacity of PD18 to meet growth.	More expensive alternative due to adding both elevated tank and second pumping station.

Note 1: The evaluation criteria from Section 8.2 were reviewed and applied to each alternative. However, only the main differentiating criteria are identified to distinguish to find the preferred strategy.

9.0 Preferred Water Servicing Strategy and Capital Program

Several separate water servicing strategies are recommended that collectively form the overall preferred water strategy to service the projected growth to 2051. The preferred servicing strategy was developed to ensure that the extension of the existing water distribution system is aligned with existing planning policies, designates residential and employment growth areas, can support intensification, and that the Interim Master Servicing Strategy follows an integrated approach with the City's SOGR program. The primary objective of the water servicing strategy is to build off the configuration of the existing system within the City of Hamilton.

The water capital program will work as a foundation for the City of Hamilton Capital Budget. The capital program provides a list and timing of new assets that the City will operate and maintain; and therefore, it is the starting point for the planning of operation and maintenance costs and resources allocation for new water infrastructure.

9.1 Cost Estimation Framework and Methodology

The cost of estimation methodology for capital projects at an Interim Master Servicing Strategy planning level are typically based on an overall unit cost approach. The unit cost rates used for this Interim Master Servicing Strategy (IMSS) are representative in 2025 dollars. A summary of the unit costs is provided in **Appendix E – Costing Framework Technical Memorandum**.

A capital cost is provided for all projects proposed as part of this Interim Master Servicing Strategy. The costing framework combines project characteristics (Complexity and Project Type) with a defined set of cost components that roll up to Total Project Cost.

- Base construction costs are built from unit rates (for linear works) or capacity-based curves (for vertical works).
- Allowances for General Items, Provisional Items, and Construction Contingency are applied as percentages of Installation Cost.
- Design (soft) costs are applied as percentages of Total Construction Cost and vary by project size.
- A Project Contingency is then applied based on cost estimate class and project complexity.
- Unit rates and curves have been updated using recent tender data and market information to ensure estimates reflect current construction trends.

9.2 Capital Program for the Preferred Water Servicing Strategy

The Preferred Water Servicing Strategy includes a combination of the individual strategies by area and are designed to address existing system constraints and support long-term growth to 2051. The strategy builds on previous planning efforts and incorporates updated demand projections, hydraulic modelling, and sustainability principles to ensure reliable, efficient, cost effective and environmentally and community responsible water servicing across the City of Hamilton. The capital program is presented in **Table 9-1**. A detailed capital program costing is provided in **Appendix F – Capital Program**.

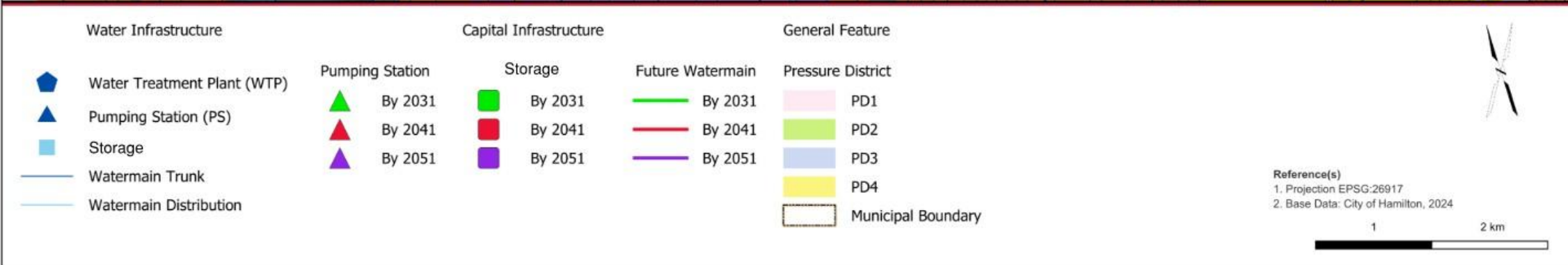
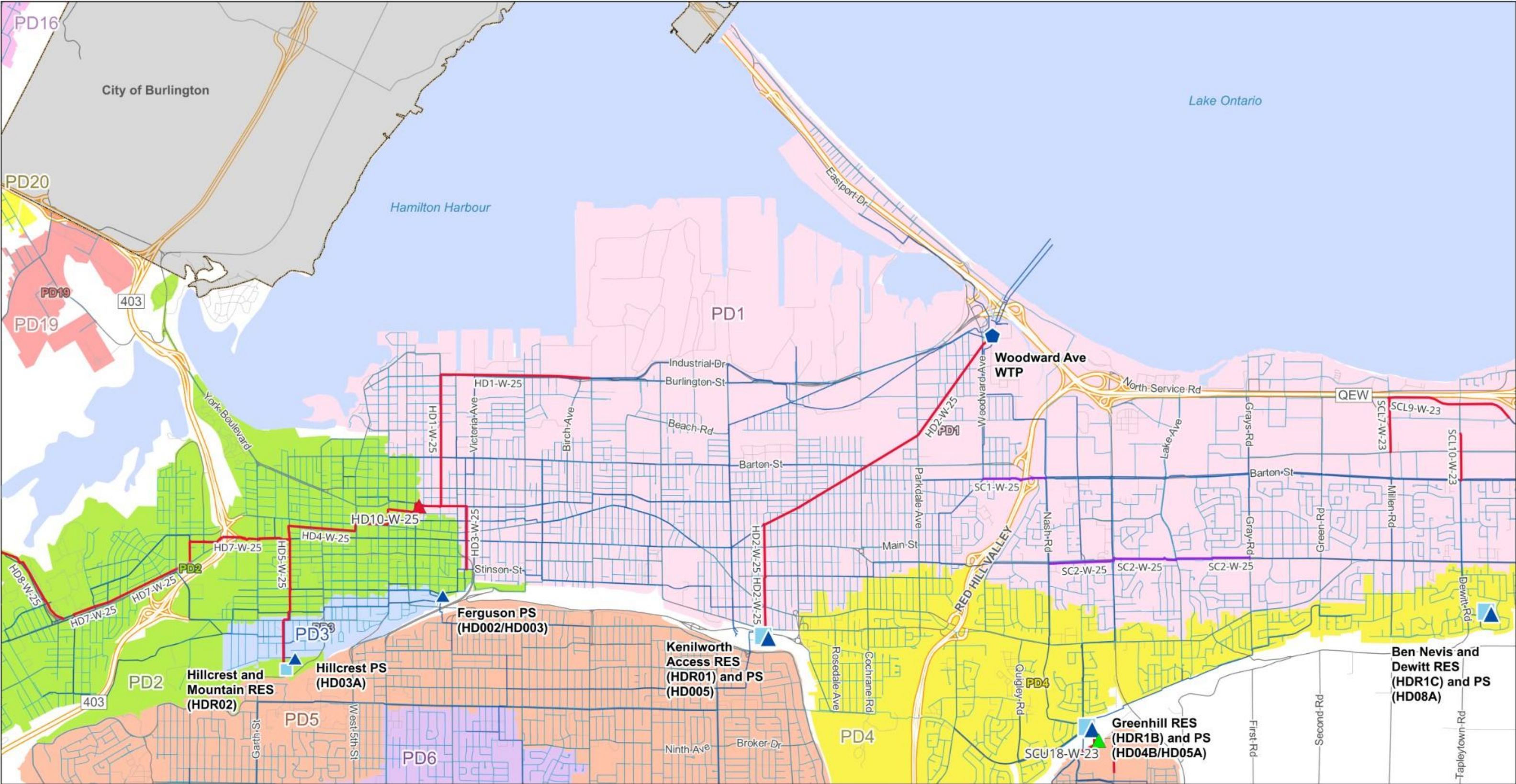


Figure 9 1 - Capital Program for the Preferred Water Servicing Strategy – Downtown Hamilton

Project Name:
Interim Water, Wastewater and Stormwater Master Servicing Strategies

Client Name:
City of Hamilton
(Ontario, Canada)

Last Updated: November 2025
Document ID: 717010-W-028

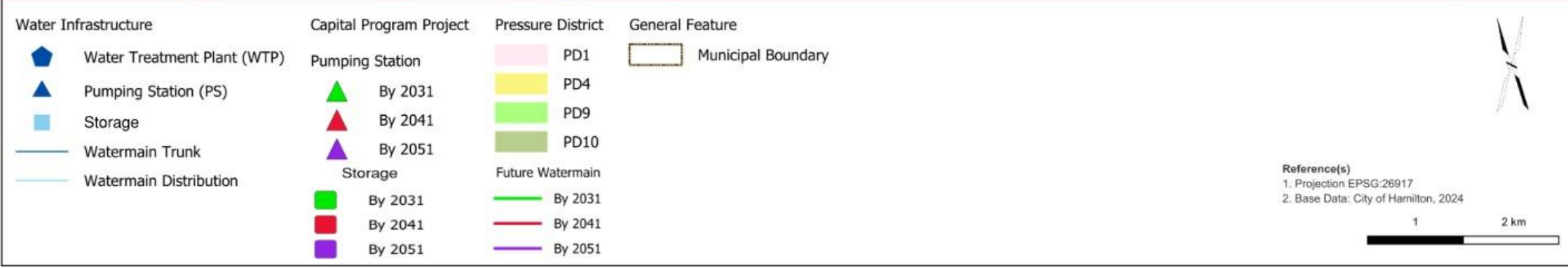
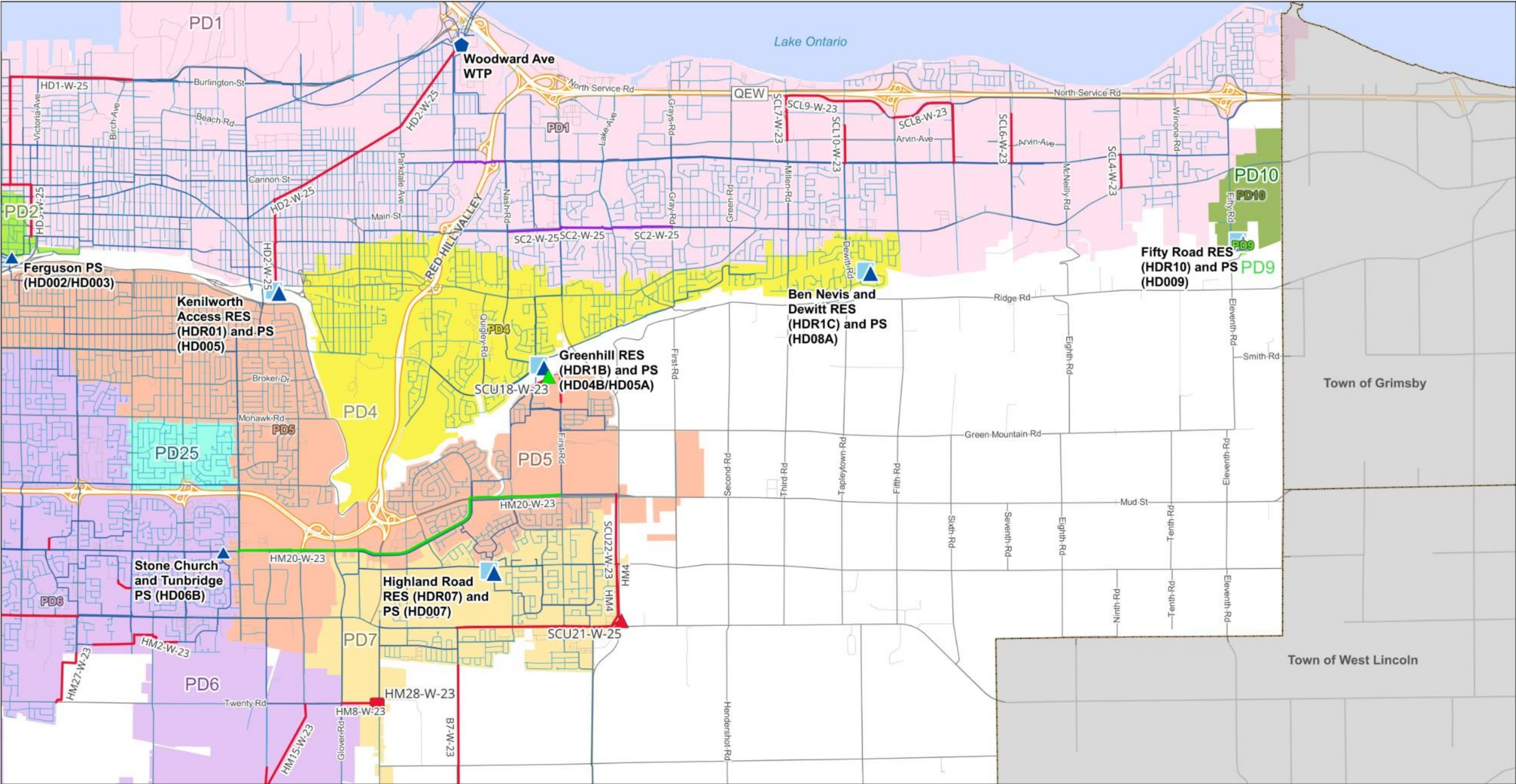


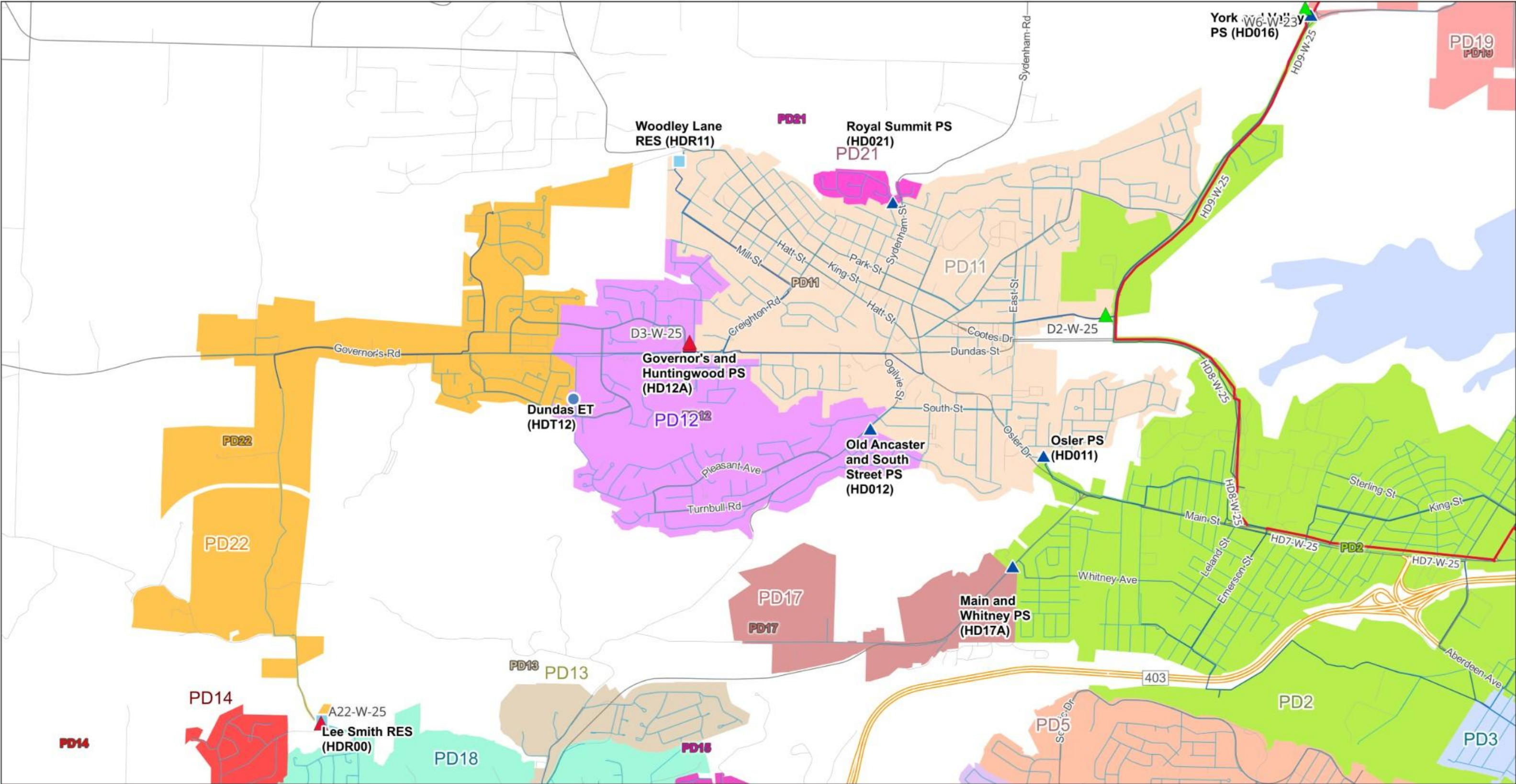
Figure 9 2 - Capital Program for the Preferred Water Servicing Strategy – Stoney Creek

Project Name:
Interim Water, Wastewater and Stormwater Master Servicing Strategies

Client Name:
City of Hamilton
(Ontario, Canada)

GEI

Last Updated: November 2025
Document ID: 717010-W-028



Water Infrastructure

Water Treatment Plant (WTP)

Pumping Station (PS)

Storage

Watermain Trunk

Watermain Distribution

Capital Infrastructure

By 2031

By 2041

By 2031

By 2041

By 2051

By 2031

By 2041

By 2051

By 2031

By 2041

By 2051

General Feature

PD2

PD11

PD12

PD17

PD21

PD22

Municipal Boundary

Reference(s)

1. Projection EPSG:26917

2. Base Data: City of Hamilton, 2024

0.6

1.2 km

Figure 9 3 - Capital Program for the Preferred Water Servicing Strategy – Dundas

Project Name:

Interim Water, Wastewater and Stormwater Master Servicing Strategies

Client Name:

City of Hamilton (Ontario, Canada)

GEI

Last Updated: November 2025
Document ID: 717010-W-028

Document Path: B:\Working\HAMILTON ONT. CITY OF-402126 - 717010 Hamilton W, WW & SW Master Plans\3. Work in Progress\GIS and Databases\717010-W-028-New Capital Program.mxd

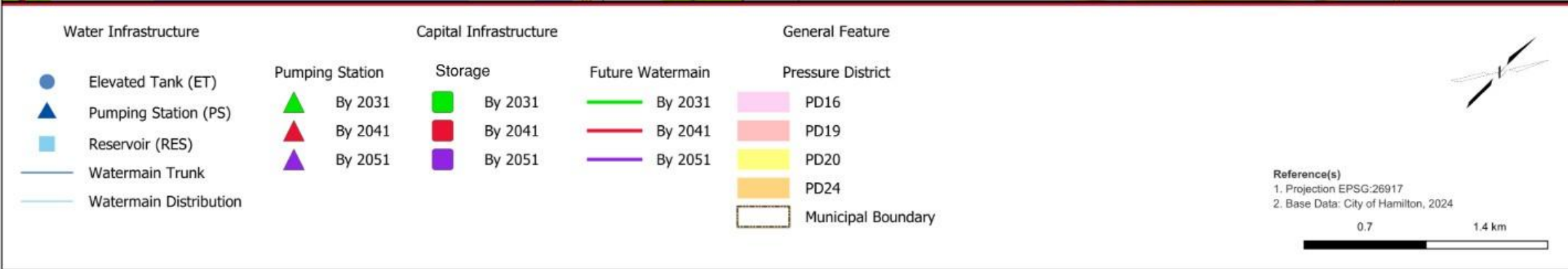
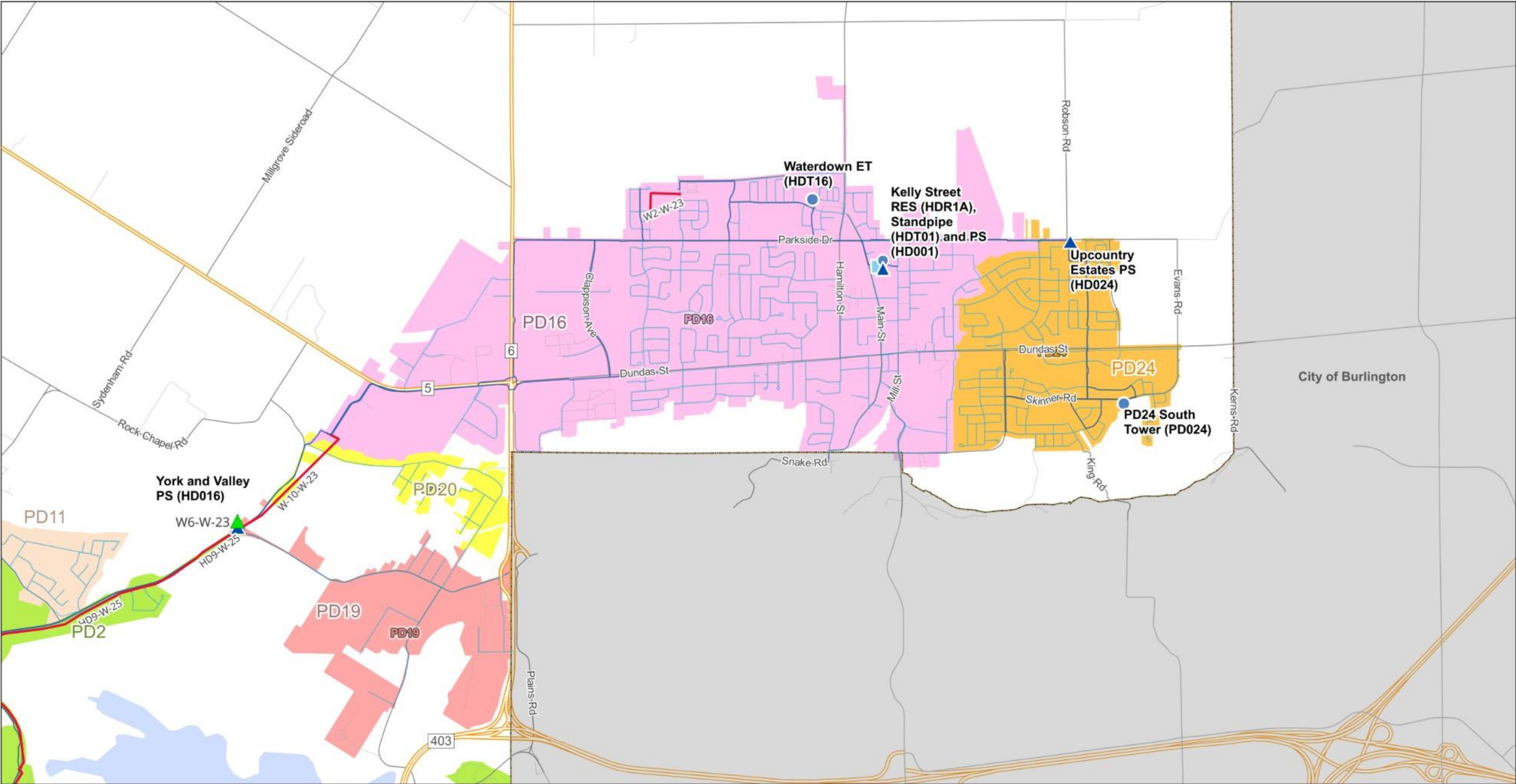


Figure 9 4 - Capital Program for the Preferred Water Servicing Strategy – Waterdown

Project Name:
Interim Water, Wastewater and Stormwater Master Servicing Strategies

Client Name:
City of Hamilton
(Ontario, Canada)

GEI

Last Updated: November 2025
Document ID: 717010-W-028

Document Path: B:\Working\HAMILTON ON, CITY OF\402126 - 717010 Hamilton W, WW & SW Master Plans\3 Work in Progress\GIS and Databases\717010-W-028-New Capital Program.mxd

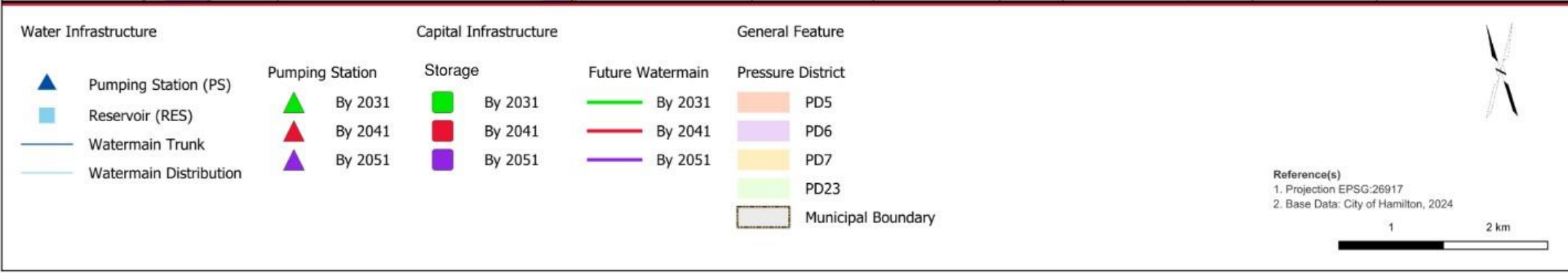
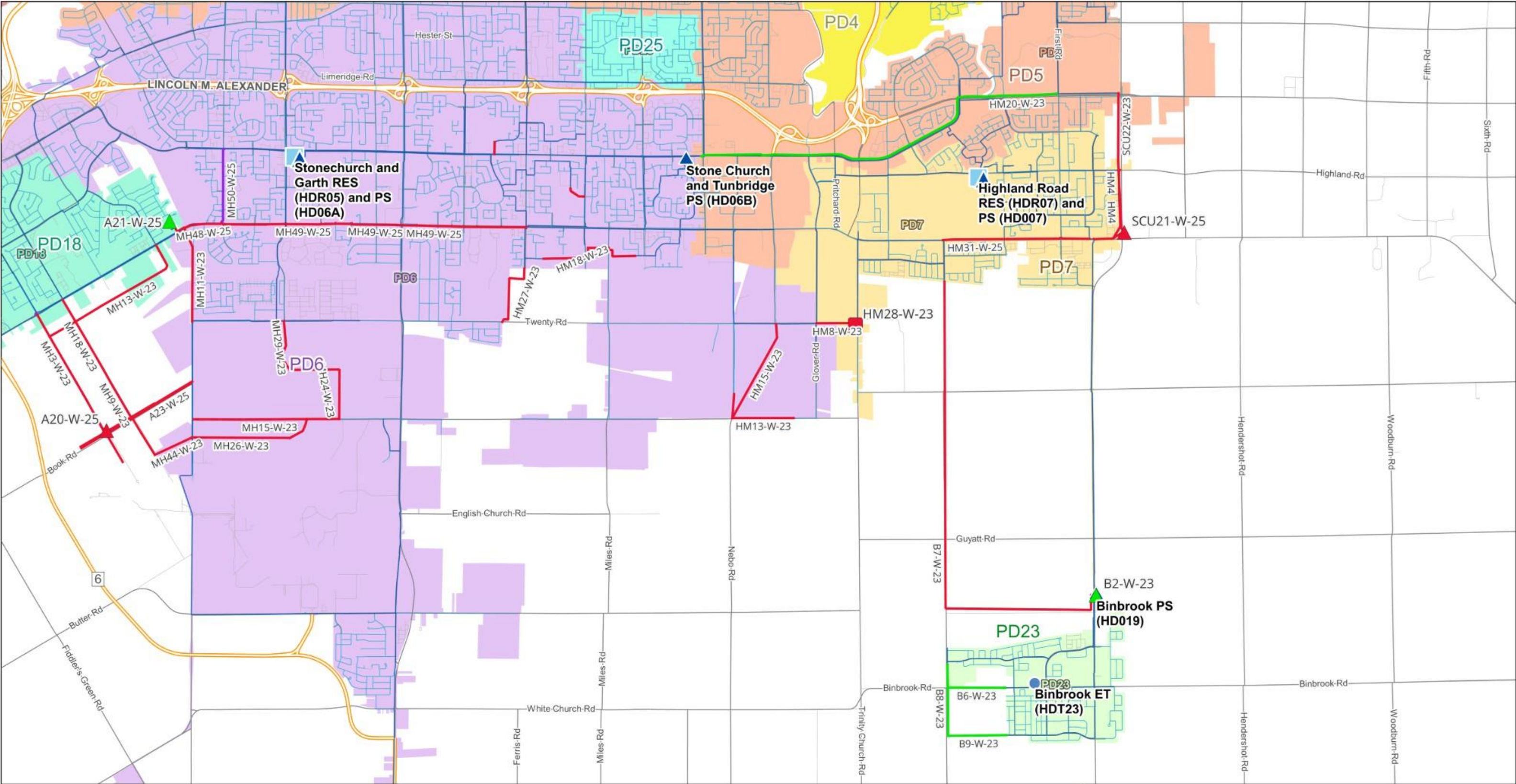


Figure 9 6 - Capital Program for the Preferred Water Servicing Strategy – Binbrook & Mount Hope

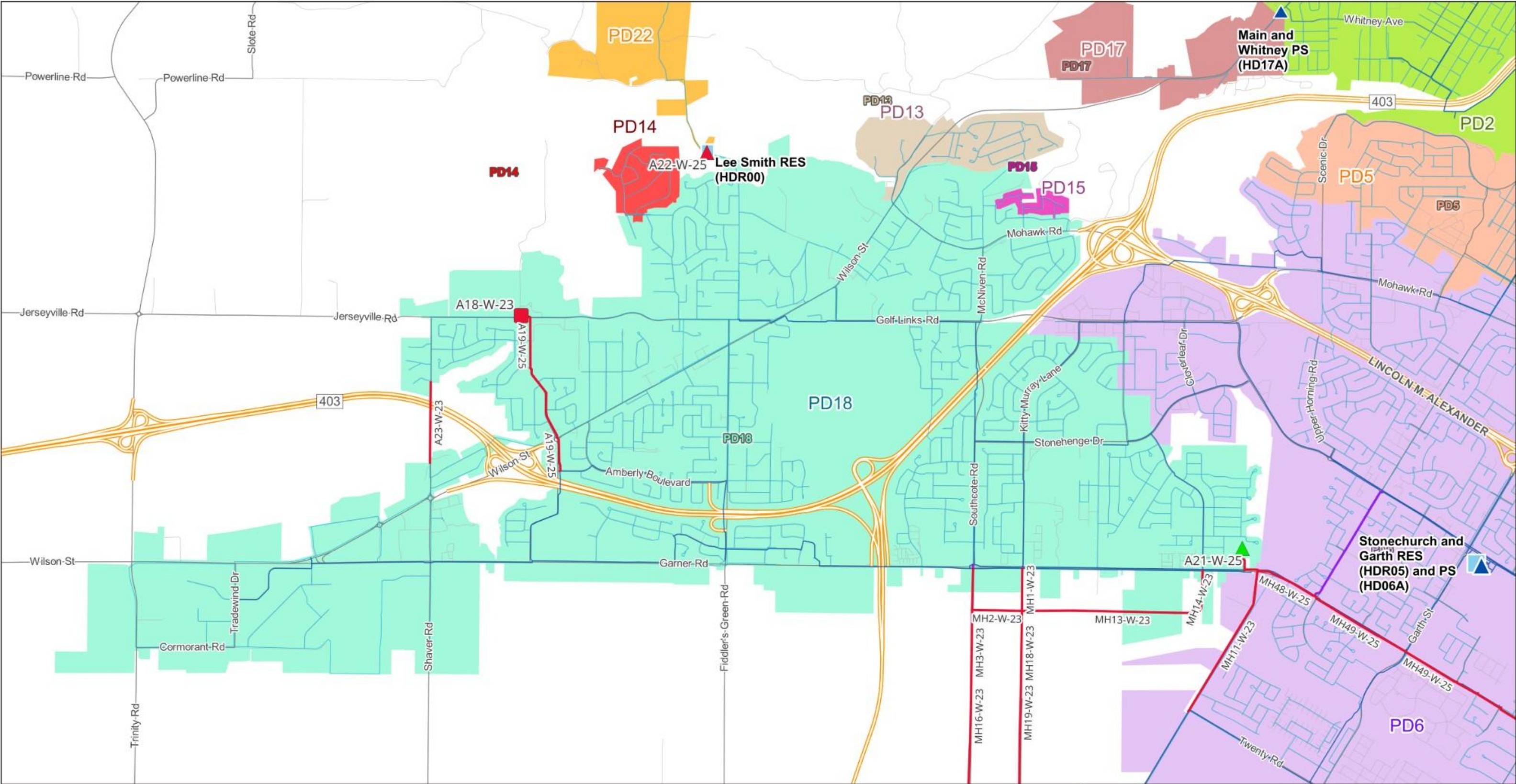
Project Name:
Interim Water, Wastewater and Stormwater Master Servicing Strategies

Client Name:
City of Hamilton
(Ontario, Canada)

GEI

Last Updated: November 2025
Document ID: 717010-W-028

Document Path: B:\Working\HAMILTON ON, CITY OF\402126 - 717010 Hamilton W, WW & SW Master Plans\3 Work in Progress\GIS and Databases\717010-W-028-New Capital Program.mxd



Water Infrastructure

- Pumping Station (PS)
- Reservoir (RES)
- Watermain Trunk
- Watermain Distribution

Capital Infrastructure

Pumping Station

- By 2031
- By 2041
- By 2051

Storage

- By 2031
- By 2041
- By 2051

Future Watermain

- By 2031
- By 2041
- By 2051

General Feature

- PD13
- PD14
- PD15
- PD18
- Municipal Boundary

Reference(s)

1. Projection EPSG:26917
2. Base Data: City of Hamilton, 2024

0.7 1.4 km

Figure 9 7 - Capital Program for the Preferred Water Servicing Strategy – Ancaster

Project Name:
Interim Water, Wastewater and Stormwater Master Servicing Strategies

Client Name:
City of Hamilton
(Ontario, Canada)

Last Updated: November 2025
Document ID: 717010-W-028

Document Path: B:\Working\HAMILTON ON, CITY OF\402126 - 717010 Hamilton W, WW & SW Master Plans\3 Work in Progress\GIS and Databases\717010-W-028-New Capital Program.mxd

Table 9-1- Capital Program for the Preferred Water Servicing Strategy

Project ID	Project Description / Purpose	Area	Pressure District	Construction Type	Project Type	Size / Capacity	Length (m)	Planning Period	Total Estimated Cost (\$2025)
HD1-W-25	1200 mm transmission main upgrade within PD1 from the existing 1200 mm at Burlington Street East and Sherman Avenue North. Assumed to travel along Burling Street East towards Ferguson Avenue North, and then south down Ferguson until Wilson Street. Transmission intended to help increase PD1 transmission towards the west side of the system. (part of DH-1 Strategy)	Downtown Hamilton	1	Linear	Watermain	1200 mm	3510	By 2041	\$ 43,330,000
HD2-W-25	1500 mm transmission main upgrade within PD1 from the Woodward WTP site towards the Kenilworth Reservoir (HDR01) and PS (HD005) site. Assumed to travel along the existing utilities corridor (replacing old cast iron mains within the same route) towards Graham Ave and Dunsmure before traveling south down Graham Avenue. Transmission intended to help increase PD1 transmission towards the west side of the system and towards HDR01. (part of DH-1 Strategy)	Downtown Hamilton	1	Linear	Watermain	1500 mm	5240	By 2041	\$ 80,522,000
HD3-W-25	900 mm transmission main upgrade within PD1 that is intended to link the PD1 transmission mains to a proposed PD2 Pump Station site. PD2 PS site is to be determined. For now, the alignment is assumed to be along Wilson Street and West Avenue North between Mary / Wilson and West/Stinson. Transmission intended to help provide strong suction pressure to future PD2 pump station. (part of DH-1 Strategy)	Downtown Hamilton	1	Linear	Watermain	900 mm	1360	By 2041	\$ 14,052,000
HD4-W-25	900 mm transmission main upgrade within PD2 that is intended to act as a discharge watermain for the proposed PD2 pump station. The overall purposes of the new PD2 transmission are to link the new PD2 PS to the existing transmissions, provide a stronger hydraulic link towards the PD2 reservoirs and provide a new transmission across Hwy 403 towards Dundas / Waterdown. For now, this first part of the alignment is assumed to be along various streets towards Locke Street and Main Street. (part of DH-3 Strategy)	Downtown Hamilton	2	Linear	Watermain	900 mm	2150	By 2041	\$ 19,853,000
HD5-W-25	900 mm transmission main upgrade within PD2. This segment of the overall PD2 upgrades is focused on improving the hydraulic link towards HDR02 and the new PD2 pump station. For now, this part of the alignment is assumed to be along Locke Street between Main Street and Homewood Avenue. (part of DH-3 Strategy)	Downtown Hamilton	2	Linear	Watermain	900 mm	940	By 2041	\$ 9,075,000
HD6-W-25	750 mm transmission main upgrade within PD2. This segment of the overall PD2 upgrades is focused on improving the hydraulic link towards HDR02 and the new PD2 Pump Station. For now, this part of the alignment is assumed to be along Mountain Avenue between Homewood Avenue and HDR02. (part of DH-3 Strategy)	Downtown Hamilton	2	Linear	Watermain	750 mm	780	By 2041	\$ 7,106,000
HD7-W-25	900 mm transmission main upgrade within PD2 that is intended to continue the extension of the new PD2 pump station discharge mains across Hwy 403 and towards the growth areas of Dundas and Waterdown. For now, the alignment is assumed to be mainly along Main Street West between Locke Street and Cootes Drive. Transmission intended to help provide resiliency of supply across Hwy 403 towards Dundas and Waterdown. (part of DH-3 Strategy)	Downtown Hamilton	2	Linear	Watermain	900 mm	3240	By 2041	\$ 34,304,000
HD8-W-25	600 mm transmission main upgrade within PD2 that is intended to twin the current watermain that heads from Main Street towards the Waterdown HD016 PS. This first segment is considered to travel mainly along Cootes Drive between Main Street and King Street East. Transmission intended to help provide resiliency of supply across Hwy 403 towards Dundas and Waterdown. (overlaps with part of Dundas D-1 Strategy)	Downtown Hamilton / Dundas / Waterdown	2	Linear	Watermain	600 mm	2120	By 2041	\$ 16,094,000
HD9-W-25	600 mm transmission main upgrade within PD2 that is intended to twin the current watermain that heads from Main Street towards the Waterdown HD016 PS. This second segment is considered to travel mainly along Olympic Drive / York Road between King Street East / Cootes and the HD016 PS. Transmission is intended to help provide resiliency of supply across Hwy 403 towards Dundas and Waterdown. (overlaps with part of Waterdown WD-3 Strategy)	Downtown Hamilton / Dundas / Waterdown	2	Linear	Watermain	600 mm	2530	By 2041	\$ 22,045,000
HD10-W-25	New (second) PD2 pump station that is intended to both help support the growth in PD2 (and subsequent pressure districts supported by PD2) and to add resiliency of supply into the area. Firm capacity target for the facility is 85 ML/d (984 L/s), such that the 2051 Average Day Demands could be met by the new PS in the event of major shutdowns / isolations of the existing site. (part of DH-3 Strategy)	Downtown Hamilton	2	Vertical	Pumping Station	85 ML/d	N/A	By 2041	\$ 40,565,000
SC1-W-25	1200 mm transmission main upgrade within PD1 that is intended to provide an additional crossing across of the Red Hill Valley Parkway (RHVP). For now, the alignment is assumed to be along Melvin Street between Woodward Avenue and Nash Road. Transmission is intended to help provide resiliency of supply across the RHVP, since the current system relies heavily on the 2250 mm crossing. (part of SC-1 Strategy)	Stoney Creek (Lower)	1	Linear	Watermain	1200 mm	810	By 2051	\$ 15,794,000
SC2-W-25	900 mm transmission main upgrade within PD1 that is intended to provide an additional east-west watermain across towards the east side of PD1 in Stoney Creek. For now, the alignment is assumed to be along Queenston Street between Nash Rpad and Gray Road. Transmission is intended to help provide resiliency of supply across the system, since the current system relies heavily on the 1200 mm Barton watermain. (part of SC-2 Strategy)	Stoney Creek (Lower)	1	Linear	Watermain	900 mm	2590	By 2051	\$ 23,858,000
SCU21-W-25	New (second) PD7 pump station that is intended to both help support the growth in PD7 (and subsequent PD23) and to add resiliency of supply into the area. Firm capacity target for the facility is 25 ML/d (289 L/s), such that the 2051 Average Day Demands could be met by the new PS in the event of major shutdowns/isolations of the existing site. Site should be expandable for potential beyond 2051. (part of HM-4 Strategy)	Stoney Creek (Upper) / Hamilton Mountain	7	Vertical	Pumping Station	25 ML/d	-	By 2041	\$ 16,030,000
SCU6-W-23	DC servicing upgrade: 400 mm main along First Road West from Toffee Trail to Glover Mountain Road	Stoney Creek (Upper)	5	Linear	Watermain	400 mm	810	By 2031	\$ 5,375,000

Project ID	Project Description / Purpose	Area	Pressure District	Construction Type	Project Type	Size / Capacity	Length (m)	Planning Period	Total Estimated Cost (\$2025)
SCU18-W-23	Greenhill PS W-HD05A Upgrades: Addition of fourth pump (~76 ML/d), along with various other upgrades (surge protection; etc.) to maximize station capacity (part of HM-1 Strategy)	Stoney Creek (Upper)	5	Vertical	Pumping Station	76 ML/d	-	By 2031	\$ 32,747,000
SCU23-W-23	PD5 Trunk Feedermain:1200 mm main from HD05A to Valve Chamber 3B (twin feedermain up the mountain) (part of HM-1 Strategy)	Stoney Creek (Upper)	5	Linear	Watermain	1200 mm	370	By 2041	\$ 8,488,000
SCU22-W-23	PD5 Feedermain along Upper Centennial Parkway: 600 mm main from Mud Street to new pump station. Transmission is intended to act as the suction feed towards a proposed second PD7 Pump Station. (part of HM-4 Strategy)	Stoney Creek (Upper)	5	Linear	Watermain	600 mm	1890	By 2041	\$ 14,969,000
SCL4-W-23	DC servicing upgrade: 300 mm main Replacement on Lewis Road from Hwy to Barton Street	Stoney Creek (Lower)	1	Linear	Watermain	300 mm	500	By 2031	\$ 913,000
SCL6-W-23	DC servicing upgrade: 300 mm main along Glover Road from Barton Street to South Service Road Extension	Stoney Creek (Lower)	1	Linear	Watermain	300 mm	700	By 2031	\$ 1,279,000
SCL7-W-23	DC servicing upgrade: 400 mm main along Millen Road from South Service Road to Arvin Avenue	Stoney Creek (Lower)	1	Linear	Watermain	400 mm	670	By 2041	\$ 4,211,000
SCL8-W-23	DC servicing upgrade: 400 mm main along South Service Road from Fruitland Road to Jones Road	Stoney Creek (Lower)	1	Linear	Watermain	400 mm	950	By 2041	\$ 5,972,000
SCL9-W-23	DC servicing upgrade: 400 mm main along South Service Road from Millen Road to Seaman Street	Stoney Creek (Lower)	1	Linear	Watermain	400 mm	1600	By 2041	\$ 9,573,000
SCL10-W-23	DC servicing upgrade: 300 mm main along Dewitt Road from CNR Tracks to Barton Street	Stoney Creek (Lower)	1	Linear	Watermain	300 mm	610	By 2041	\$ 1,115,000
SCL11-W-23	DC servicing upgrade: 400 mm main along Jones Road from South Service Road to Barton Street	Stoney Creek (Lower)	1	Linear	Watermain	400 mm	920	By 2041	\$ 5,752,000
HM30-W-25	400 mm PD7 main from Highland Road East to Rymal Road East (part of future PD7 PS discharge) (part of HM-4 Strategy)	Hamilton Mountain	7	Linear	Watermain	400 mm	1250	By 2041	\$ 8,287,000
HM31-W-25	400 mm PD7 main from Swayze Road to Fletcher Road (part of future PD7 PS discharge) (part of HM-4 Strategy)	Hamilton Mountain	7	Linear	Watermain	400 mm	2040	By 2041	\$ 12,512,000
HM32-W-25	New PD7 PS Discharge Pipe: 600 mm PD7 main from New PD7 PS to Rymal Road East and Swayze Road (part of HM-4 Strategy)	Hamilton Mountain	7	Linear	Watermain	600 mm	150	By 2041	\$ 1,233,000
HM2-W-23	DC servicing upgrade: 400 mm main from m West of Upper Gage Avenue to Miles Road	Hamilton Mountain	6	Linear	Watermain	400 mm	430	By 2031	\$ 2,833,000
HM3-W-23	DC servicing upgrade: 400 mm main from Miles Road to 300 metres west	Hamilton Mountain	6	Linear	Watermain	400 mm	300	By 2031	\$ 1,978,000
HM4-W-23	DC servicing upgrade: 400 mm main from West extension of Terni Boulevard to East Terni Boulevard	Hamilton Mountain	6	Linear	Watermain	400 mm	50	By 2031	\$ 331,000
HM5-W-23	DC servicing upgrade: 400 mm main from 140 metres east of Upper Wentworth Street to 570 metres Wentworth Street	Hamilton Mountain	6	Linear	Watermain	400 mm	430	By 2031	\$ 2,833,000
HM8-W-23	DC servicing upgrade: 400 mm main from Glover Road to Trin Church Road	Hamilton Mountain	7	Linear	Watermain	400 mm	580	By 2041	\$ 3,823,000
HM12-W-23	DC servicing upgrade: 300 mm main from Dickenson Road to Hydro Corridor	Hamilton Mountain	6	Linear	Watermain	300 mm	350	By 2041	\$ 639,000
HM13-W-23	DC servicing upgrade: 300 mm main from Nebo Road to 800 metres Nebo Road	Hamilton Mountain	6	Linear	Watermain	300 mm	800	By 2041	\$ 1,462,000
HM15-W-23	DC servicing upgrade: 300 mm main from Twenty Road to Dickenson Road	Hamilton Mountain	6	Linear	Watermain	300 mm	1475	By 2041	\$ 1,540,000
HM18-W-23	DC servicing upgrade: 400 mm main from 590 metres east of Upper Wentworth Sreet to 300 metres Miles Road	Hamilton Mountain	6	Linear	Watermain	400 mm	450	By 2031	\$ 2,965,000
HM20-W-23	Stone Church Feedermain - Part 2: 1200 mm main from First Road West to HD06B. Supports increased PD5 flow transfer from HD05A towards HD06B (helping PD5 and PD6) (part of HM-1 Strategy)	Hamilton Mountain	5	Linear	Watermain	1200 mm	5420	By 2031	\$ 48,330,000
HM28-W-23	New Elevated Tank (10 ML) for PD7 (420 Trinity Church location). Provides PD7 floating storage. (part of HM-3 and B-2 Strategy)	Hamilton Mountain	7	Vertical	Elevated Tank	10 ML	-	By 2041	\$ 18,713,000
HM1-W-23	DC servicing upgrade: 400 mm main from 160 metres North of Stone Church Road to Ston Church Road	Hamilton Mountain	6	Linear	Watermain	400 mm	160	By 2031	\$ 1,054,000
HM21-W-23	DC servicing upgrade: 400 mm main from Upper Sherman Ave to Acadia Drive	Hamilton Mountain	6	Linear	Watermain	400 mm	210	By 2031	\$ 1,384,000
HM27-W-23	DC servicing upgrade: 400 mm main from South Limit at Hydro Corridor to Springside Drive	Hamilton Mountain	6	Linear	Watermain	400 mm	1980	By 2031	\$ 11,502,000
MH48-W-25	750 mm transmission main upgrade within PD6 that is intended to provide additional hydraulic connectivity and resiliency towards the HDR18 reservoir. For now, the alignment is assumed to be along Rymal Road between Upper Paradise Road and HDR18. (part of HM-2 and Ancaster Strategy)	Hamilton Mountain/Mount Hope	6	Linear	Watermain	750 mm	535	By 2041	\$ 4,867,000
MH49-W-25	750 mm transmission main upgrade within PD6 that is intended to provide additional hydraulic connectivity between HD06A PS and HD06B PS and towards the HDR18 reservoir. For now, the alignment is assumed to be along Rymal Road between Upper Wentworth Street and Upper Paradise Road, since there is an opportunity to fully utilize other built works at either end. (part of HM-2 Strategy)	Hamilton Mountain / Mount Hope	6	Linear	Watermain	750 mm	4325	By 2041	\$ 35,712,000
MH50-W-25	750 mm transmission main upgrade within PD6 that is intended to provide additional hydraulic connectivity between HD06A PS and HD06B PS and towards the HDR18 reservoir. For now, the alignment is assumed to be along Upper Paradise Street between Stone Church Road and Rymal Road, since there is an opportunity to fully utilize other built works at either end. (part of HM-2 Strategy)	Hamilton Mountain / Mount Hope	6	Linear	Watermain	750 mm	1074	By 2041	\$ 9,301,000

Project ID	Project Description / Purpose	Area	Pressure District	Construction Type	Project Type	Size / Capacity	Length (m)	Planning Period	Total Estimated Cost (\$2025)
MH5-W-23	DC servicing upgrade: 600 mm PD18 Watermain on Southcote Road from Garner Road to 383 metres south. (Upsized to 600 mm to act as the primary discharge main from new PD18 PS)	Ancaster / Mount Hope	18	Linear	Watermain	600 mm	340	By 2041	\$ 7,026,000
MH1-W-23	DC servicing upgrade: 300 mm PD 18 Watermain on Smith Road from Garner Road to 389 metres south	Ancaster / Mount Hope	18	Linear	Watermain	300 mm	360	By 2041	\$ 376,000
MH2-W-23	DC servicing upgrade: 400 mm PD 18 Watermain on new road from Southcote Road to Smith Road	Ancaster / Mount Hope	18	Linear	Watermain	400 mm	420	By 2041	\$ 2,767,000
MH3-W-23	DC servicing upgrade: 600 mm PD 18 Watermain on Southcote Road from New road to Hydro Corridor. (upsized to 600 mm to act as the primary discharge main from new PD18 PS)	Ancaster / Mount Hope	18	Linear	Watermain	600 mm	740	By 2041	\$ 5,473,000
MH7-W-23	DC servicing upgrade: 400 mm PD 6 Watermain on Book Road from metres east of Smith Road to Smith Road	Ancaster / Mount Hope	6	Linear	Watermain	400 mm	320	By 2041	\$ 2,443,000
MH8-W-23	DC servicing upgrade: 600 mm PD 18 Watermain on Southcote Road from Book Road to 590 metres north. (upsized to 600 mm to act as the primary discharge main from new PD18 PS)	Ancaster / Mount Hope	18	Linear	Watermain	600 mm	530	By 2041	\$ 553,000
MH9-W-23	DC servicing upgrade: 300 mm PD 18 Watermain on Smith Road from Book Road to 603 metres north	Ancaster / Mount Hope	18	Linear	Watermain	300 mm	520	By 2041	\$ 542,000
MH10-W-23	DC servicing upgrade: 400 mm PD 18 Watermain on new road from Smith Road to 421 metres east	Ancaster / Mount Hope	18	Linear	Watermain	400 mm	420	By 2041	\$ 2,767,000
MH11-W-23	DC servicing upgrade: 400 mm PD 6 Watermain on Glancaster Road from Garner Road HD to Twenty Road	Ancaster / Mount Hope	6	Linear	Watermain	400 mm	1310	By 2041	\$ 7,838,000
MH13-W-23	DC servicing upgrade: 400 mm PD 18 Watermain on new road from Raymond Road Extension to 863 metres west	Ancaster / Mount Hope	18	Linear	Watermain	400 mm	850	By 2041	\$ 5,342,000
MH14-W-23	DC servicing upgrade: 400 mm PD 18 Watermain on new road from Raymond Road Extension to 552 metres east	Ancaster / Mount Hope	18	Linear	Watermain	400 mm	540	By 2041	\$ 3,559,000
MH15-W-23	DC servicing upgrade: 300 mm PD 6 Watermain on Dickenson Rd from Garth Street Extension to 953 metres west	Ancaster / Mount Hope	6	Linear	Watermain	300 mm	890	By 2041	\$ 929,000
MH16-W-23	DC servicing upgrade: 600 mm PD 18 Watermain on Southcote Road from Hydro Corridor to 293 metres south. (Upsized to 600 mm to act as the primary discharge main from new PD18 PS)	Ancaster / Mount Hope	18	Linear	Watermain	600 mm	300	By 2041	\$ 2,326,000
MH17-W-23	DC servicing upgrade: 400 mm PD 6 Watermain on Smith Road from Book Road to 259 metres south	Ancaster / Mount Hope	6	Linear	Watermain	400 mm	260	By 2041	\$ 1,714,000
MH18-W-23	DC servicing upgrade: 300 mm PD 18 Watermain on Smith Road from Hydro Corridor to 627 metres north	Ancaster / Mount Hope	18	Linear	Watermain	300 mm	670	By 2041	\$ 699,000
MH19-W-23	DC servicing upgrade: 300 mm PD 18 Watermain on Smith Road from Hydro Corridor to 350 metres south	Ancaster / Mount Hope	18	Linear	Watermain	300 mm	360	By 2041	\$ 376,000
MH22-W-23	DC servicing upgrade: 400 mm PD 6 Watermain on Book Road from Glancaster Road to 595 metres west	Ancaster / Mount Hope	6	Linear	Watermain	400 mm	620	By 2041	\$ 4,086,000
MH23-W-23	DC servicing upgrade: 300 mm PD 6 Watermain on Dickenson Road from Glancaster Road to 598 metres east	Ancaster / Mount Hope	6	Linear	Watermain	300 mm	630	By 2041	\$ 657,000
MH24-W-23	DC servicing upgrade: 400 mm PD 6 Watermain on new Garth Street Extension from Dickenson Road to 837 metres north	Ancaster / Mount Hope	6	Linear	Watermain	400 mm	1350	By 2041	\$ 8,077,000
MH25-W-23	DC servicing upgrade: 400 mm PD 6 Watermain on Dickenson Road from Garth Street to 870 metres east	Ancaster / Mount Hope	6	Linear	Watermain	400 mm	420	By 2041	\$ 2,767,000
MH26-W-23	DC servicing upgrade: 400 mm PD 6 Watermain on new Garth Street Extension from Glancaster Road to 1365 metres east	Ancaster / Mount Hope	6	Linear	Watermain	400 mm	1360	By 2041	\$ 8,137,000
MH27-W-23	DC servicing upgrade: 400 mm PD 6 Watermain on new Garth Street Extension from Dickenson Road to MH26-W-23	Ancaster / Mount Hope	6	Linear	Watermain	400 mm	370	By 2041	\$ 2,439,000
MH28-W-23	DC servicing upgrade: 400 mm PD 6 Watermain on Smith Road from 265 metres south of Book Road to 625 Book Road	Ancaster / Mount Hope	6	Linear	Watermain	400 mm	330	By 2041	\$ 2,175,000
MH29-W-23	DC servicing upgrade: 400 mm PD 6 Watermain on new Garth Street Extension from Twenty Road to 662 metres south	Ancaster / Mount Hope	6	Linear	Watermain	400 mm	680	By 2041	\$ 4,275,000
MH30-W-23	DC servicing upgrade: 400 mm PD 6 Watermain on Book Road from Smith Road to Southcote Road	Ancaster / Mount Hope	6	Linear	Watermain	400 mm	440	By 2041	\$ 2,900,000
MH44-W-23	DC servicing upgrade: 400 mm PD 6 Watermain on new Garth Street Extension from Glancaster Road to Smith Road	Ancaster / Mount Hope	6	Linear	Watermain	400 mm	520	By 2041	\$ 3,426,000
MH45-W-23	DC servicing upgrade: 300 mm PD 6 Watermain on Southcote Road from Book Road to 590 metres south	Ancaster / Mount Hope	6	Linear	Watermain	300 mm	460	By 2041	\$ 480,000
MH46-W-23	DC servicing upgrade: 300 mm PD 6 Watermain on Book Road from Southcote Road to 420 metres west	Ancaster / Mount Hope	6	Linear	Watermain	300 mm	400	By 2041	\$ 418,000
MH47-W-23	DC servicing upgrade: 300 mm PD 18 main on Book Road from West of Southcote Road to East Smith Road	Ancaster / Mount Hope	18	Linear	Watermain	300 mm	1190	By 2041	\$ 1,243,000
B2-W-23	Expansion of HD019 PS, increasing firm capacity from 75 L/s to ~175 L/s. (as per conceptual design) (4-pump configuration - 3 duty and one standby; rated capacity of ~45 L/s at 46.9 metres TDH each pump; with upsized standby power and incoming utility power). (part of B-1 Strategy)	Binbrook	23	Vertical	Pumping Station	8.7 ML/d	-	By 2031	\$ 12,123,000
B5-W-23	DC servicing upgrade: 400 mm Fletcher Road main from Binbrook Road to Pumpkin Pass	Binbrook	23	Linear	Watermain	400 mm	330	By 2031	\$ 2,175,000
B6-W-23	DC servicing upgrade: 400 mm Binbrook Road main from West of Royal Winter Boulevard to Fletcher Road	Binbrook	23	Linear	Watermain	400 mm	850	By 2031	\$ 5,342,000
B7-W-23	DC servicing upgrade: 400 mm Binbrook Trunk Feedermain - Along Fletcher's Road and Cemetery Road from Hydro Corridor to HD019. (part of B-3 Strategy)	Binbrook	23	Linear	Watermain	400 mm	6950	By 2031	\$ 36,018,000

Project ID	Project Description / Purpose	Area	Pressure District	Construction Type	Project Type	Size / Capacity	Length (m)	Planning Period	Total Estimated Cost (\$2025)
A19-W-25	600 mm main from New PD18 Elevated Tank to Cavendish Dr. To improve fill / drain cycle during pump operations and to reduce pressure variations. Assumed alignment that should be verified with Elevated Tank Class EA (part of Ancaster Strategy)	Ancaster	18	Linear	Watermain	600 mm	1480	By 2041	\$ 11,006,000
A20-W-25	New PS with rated capacity 25 ML/d (289 L/s) (part of Ancaster Strategy). New PS location assumed to be near Southcote / Book. Class EA to confirm. Sized to support at least average day demand needs (resiliency sizing)	Ancaster	18	Vertical	Pumping Station	25 ML/d	-	By 2041	\$ 18,216,000
A21-W-25	HD018 expansion of 19 ML/d (220 L/s) increasing capacity from 28 ML/d to 47 ML/d (part of Ancaster Strategy - short-term). Ongoing plan to upsize two of the four pumps to increase near term capacity.	Ancaster	18	Vertical	Pumping Station	46.6 ML/d	-	By 2031	\$ 469,000
A22-W-25	New PD22 Circulation Pump with capacity 0.2 ML/d (2.3 L/s). To be added in coordination with New PD22 PS (part of Dundas PD22 strategy). Needed to help create turnover along Sulphur Springs Road during future operation of PD22	Ancaster	22	Vertical	Pumping Station	0.2 ML/d	-	By 2041	\$ 8,978,000
A23-W-25	New 600 mm suction feed (PD6) towards the proposed New PD18 PS site. Currently assumed to be along Book Road East from Southcote Road to Glancaster Road. (part of Ancaster Strategy)	Ancaster	6	Linear	Watermain	600 mm	1410	By 2041	\$ 9,924,000
A2-W-23	DC servicing upgrade: 300 mm main along Shaver Road from Westview Ave to Katsura Places	Ancaster	18	Linear	Watermain	300 mm	800	By 2031	\$ 1,462,000
A18-W-23	Elevated Tank for 10 ML of additional storage to support partial storage needs in PD18 (part of Ancaster Strategy)	Ancaster	18	Vertical	Elevated Tank	10 ML	-	By 2041	\$ 21,774,000
D2-W-25	New PD11 PS with capacity of 14 ML/d (162 L/s) (part of Dundas Strategy D-1)	Dundas	11	Vertical	Pumping Station	14 ML/d	-	By 2031	\$ 14,119,000
D3-W-25	HD12A PS (Governor's Road PS) Upgrade of 5.1 ML/d (59 L/s) increasing capacity from 1.3 MLD to 6.4 MLD (part of Dundas Strategy D-2)	Dundas	12	Vertical	Pumping Station	6.4 ML/d	-	By 2041	\$ 228,000
D4-W-25	New PD22 PS with capacity of 3 ML/d (35 L/s) (part of Dundas Strategy D-4)	Dundas	22	Vertical	Pumping Station	3.0 ML/d	-	By 2041	\$ 10,021,000
W2-W-23	400 mm main on new road from Sadielou Boulevard to Mosaic Drive	Waterdown	16	Linear	Watermain	400 mm	700	By 2031	\$ 4,400,000
W6-W-23	HD016 PS expansion with 117 L/s Capacity increase from 208 L/s to 325 L/s (part of WD-1 Strategy)	Waterdown	16	Vertical	Pumping Station	10.1 ML/d	-	By 2031	\$ 17,189,000
W10-W-23	600 mm PD16 Feedermain discharge twinning from PS HD016 to Thorncrest at Algonquin Avenue (part of WD-1 Strategy)	Waterdown	16	Linear	Watermain	600 mm	1200	By 2031	\$ 31,919,000
CW2-W-23	Regional Subdivider's Share for Local Improvements	Citywide	-	Linear	Watermain	-	-	-	\$ 1,738,000
CW3-W-23	Intensification Infrastructure Upgrades - Water (0-5 years)	Citywide	-	Linear	Watermain	-	-	-	\$ 22,456,000
CW15-W-23	Large diameter and cut-in valves on existing watermains	Citywide	-	Linear	Watermain	-	-	-	\$ 2,103,000
CW4-W-23	Intensification Infrastructure Upgrades - Water	Citywide	-	Linear	Watermain	-	-	-	\$ 22,456,000
CW25-W-23	LRT Related	Citywide	-	Linear	Watermain	-	-	-	\$ 5,639,000
Total Water Program									\$949,886,000

9.3 Capital Program Implementation

The preferred water servicing strategy will support the servicing needs of the City's lake-based system for future growth to 2051. This strategy will be implemented in accordance with each project's Class EA schedule. The Interim Master Servicing Strategy (IMSS) was prepared as a broad level assessment and recognizes that further detailed assessment will be required through separate studies to satisfy project specific fulfillment of the MEA Class EA requirements for Schedule B and C projects identified within this study.

During the next steps of the implementation program, primarily during Class EAs and / or detailed design of the projects, the following requirements should be considered:

- Refinement of infrastructure locations and alignments
- Review and confirmation of potential property requirements
- Identification of preferred construction methodologies
- Completion of additional supporting investigations as required (e.g., source water protection, climate change impacts, geotechnical, hydrogeological, etc.)
- Review and mitigation of potential construction related impacts
- Fulfillment of all provincial, municipal and conservation authority approval requirements

With respect to planning and budgeting, this program will be utilized as a high-level baseline estimate for the City's capital budget. These costs will be further developed and refined during the implementation phase as detailed information becomes available.

The anticipated timing of each project within the preferred strategy has been established based on the projected population and employment growth within the City's water system.

For any proposed storage solutions (floating or pumped storage), subsequent studies and future design should integrate considerations of the impacts to water age and chlorine residual such that water quality risks are mitigated.