

1. INTRODUCTION

The City of Guelph retained Earth Tech Canada Inc. to undertake Master Servicing and System Optimization Studies for its water and wastewater linear infrastructure. The intent was to determine how best to provide water distribution/storage and wastewater conveyance servicing for the City well into the future. The work was to focus on optimizing each system to best service existing customers, and expand the systems to service future growth. An additional goal was to enable a better understanding of the City's water distribution and sewerage collection network infrastructure and each system's characteristics for the purpose of enhancing the reliability, operational efficiency, and capacity.

The plan was completed in 3 phases:

- Phase I – System Optimization: Water Distribution/Storage and Wastewater Conveyance;
- Phase II – Master Servicing Water Distribution/Storage and Wastewater Conveyance; and
- Phase III – Asset Management: Water Distribution/Storage and Wastewater Conveyance.

Phase I of the work program supported the Phase II and III activities which were completed concurrently. The work was also completed concurrent with the City's Local Growth Management Strategy (LGMS) work to identify to what extent and how the City of Guelph would grow into the future (i.e. population distribution and density). The LGMS was an input into the work, in addition to other City initiatives which were being undertaken concurrent with or in advance of this Servicing Master Plan. This includes the Water Supply Master Plan completed in 2006 by Earth Tech; the Wastewater Treatment Master Plan undertaken at the same time as this work; previous Transportation Master Planning and a number of other planning activities consistent with the Province's Ontario Places to Grow Act. The latter is resulting in an Official Plan Amendment being undertaken by the City.

1.1. Existing Water Supply and Distribution System

The City's existing water supply and distribution system consists of 23 wells, 3 elevated storage tanks, 6 major in-ground storage reservoirs, 3 booster stations operating 2 pressure zones and over 500 km of watermains ranging in diameter from 75 mm to 1050 mm.

The Master Plan focused on optimization of the City's existing water distribution system, booster pumping stations and elevated/in-ground storage reservoir capacities under both current operating conditions and in the future. It also reviewed a number of alternatives to provide future servicing for future growth. Future growth was defined by the City as that being sustainable within its existing boundaries, with limitations on water supply and wastewater treatment discharge assimilative capacity. .

1.2. Existing Sanitary Sewerage Collection System

The City of Guelph has approximately 490 km of sanitary sewers ranging in size from 100 mm to 1650 mm in diameter, and 4 sewage pump stations, all delivering sanitary sewage flows from the City to a central wastewater treatment facility located at Wellington Street which discharges to the Speed River. The objectives of this Master Plan project was to assess current hydraulic conditions within the sanitary sewer system, and determine the relative amount of inflow/infiltration that may be entering the system and determine how this could be mitigated or eliminated to "free-up" sewer capacity for improved

operations under current conditions, and/or to facilitate growth as desired by the City in the future. In addition, any new trunk sewer or pump station works were to be identified to service future growth to the extent desired by the City.

1.3. Environmental Assessment Master Planning Process

Master Plans are long range plans which integrate infrastructure requirements for existing and future land use with environmental assessment planning principles. These plans examine an infrastructure system, or group of related projects, to outline a framework for planning for subsequent projects and/or developments. As a minimum, Master Plans should address Phases 1 and 2 of the Municipal Engineers Association (MEA) Class EA Master Plan Approach No. 1 (September 2007 MEA Municipal Class EA Document, Appendix 4). Master planning provides a municipality with a broad framework through which the need and justification for specific projects can be established such that the environmental assessment process can be satisfied.

2. WATER/WASTEWATER SYSTEM OPTIMIZATION

Initial master plan work activities involved proper definition and characterization of the City's existing water distribution and storage system and the City's wastewater collection and pumping system. This included updating and calibrating the City's existing water and wastewater system models to the extent possible based on historical and/or information obtained as part of the project. As part of this work, the models were upgraded and converted to more current GIS based software for ease of use for current and ongoing master planning work and operational assessment.

The modeling outputs were used to identify water/wastewater system constraints and opportunities for the review and optimization of each system, and to address any deficiencies under current operating conditions. More importantly, they identified opportunities to accommodate future growth. Recommendations for ongoing system definition and model updating, development and calibration were also identified for future implementation by the City. This resulted in the identification of recommended works to optimize the City's water/wastewater system operations, and address short-term needs based on the various Priority Service Areas (PSAs) identified by the City. Preliminary Development Charge requirements were developed to support the City's update of their Development Charge Rate Bylaw. Early outputs were later refined and completed with new direction from the City arising from the LGMS. This resulted in more focused water/wastewater servicing strategies and development of detailed implementation plans to meet future growth requirements in various portions of the City, including intensification within the downtown core. Additional modeling of various growth scenarios was undertaken to assist the City in determining the impact of intensification within the City's core are; i.e. extent of limitations based on infrastructure and/or optimization opportunities. Details of these work activities and the accompanying analysis of the City's water/wastewater systems are outlined in the main report.

2.1. Water Distribution and Storage

All water distribution system alternatives include improvements to the existing system to address existing limitations and system pressure issues that will be further exacerbated by intensification and new development. Additional infrastructure is required to service growth to ensure acceptable system

pressures and fireflows, and to provide storage. Improvements common to all alternative include the following:

- Reinforce existing mains in City core (Zone 1): proposed transmission main loop around downtown area
- New East-West and North-South transmission mains in Zone 1 to improve water supply transmission from Woods PS
- New Zone 3, south of Clair road with storage facility and booster pumping station (from zone 1)
- New East West transmission across zone 2 (along Speedvale) and additional Zone 2 storage
- Modifications to pressure zone boundaries to address high and low elevation issues

In addition to the above proposed upgrades, the model results indicate that there are headloss and possible capacity issues in numerous pipes spread throughout the system as shown in Figure 5.1. A systematic approach to prioritize these based on headloss and pipe diameter was undertaken to carry budget forward for replacement as road upgrades or sewer replacements are undertaken. As specific developments (such as intensification projects) are under consideration, the model can be used to review this issue in more detail and watermain upgrades scheduled accordingly. The model requires further calibration to undertake assessment at this level of detail.

2.2. Wastewater Conveyance and Pumping

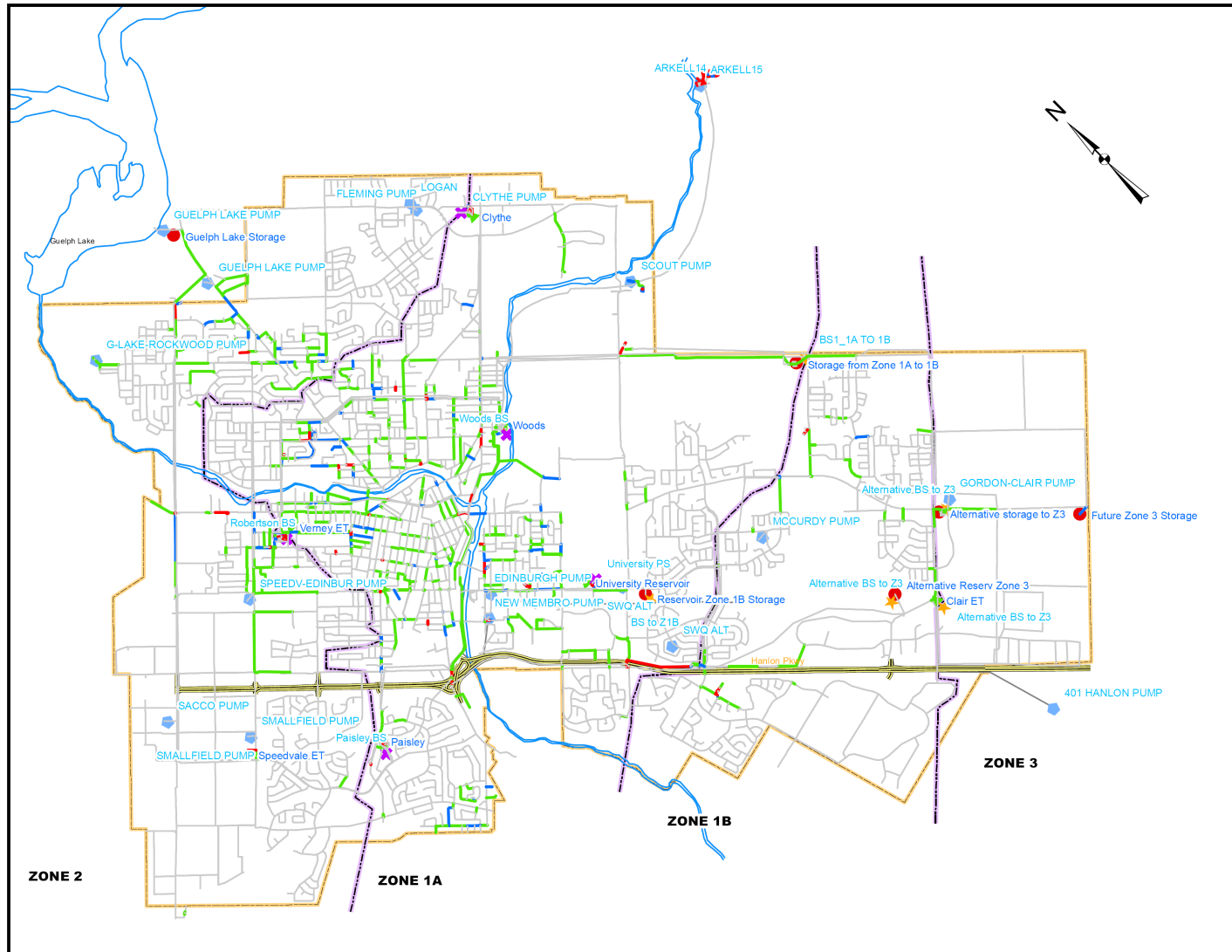
All wastewater collection system alternatives include improvements to the existing system to address existing capacity issues that will be further exacerbated by intensification and new development. Improvements common to all alternative include the following:

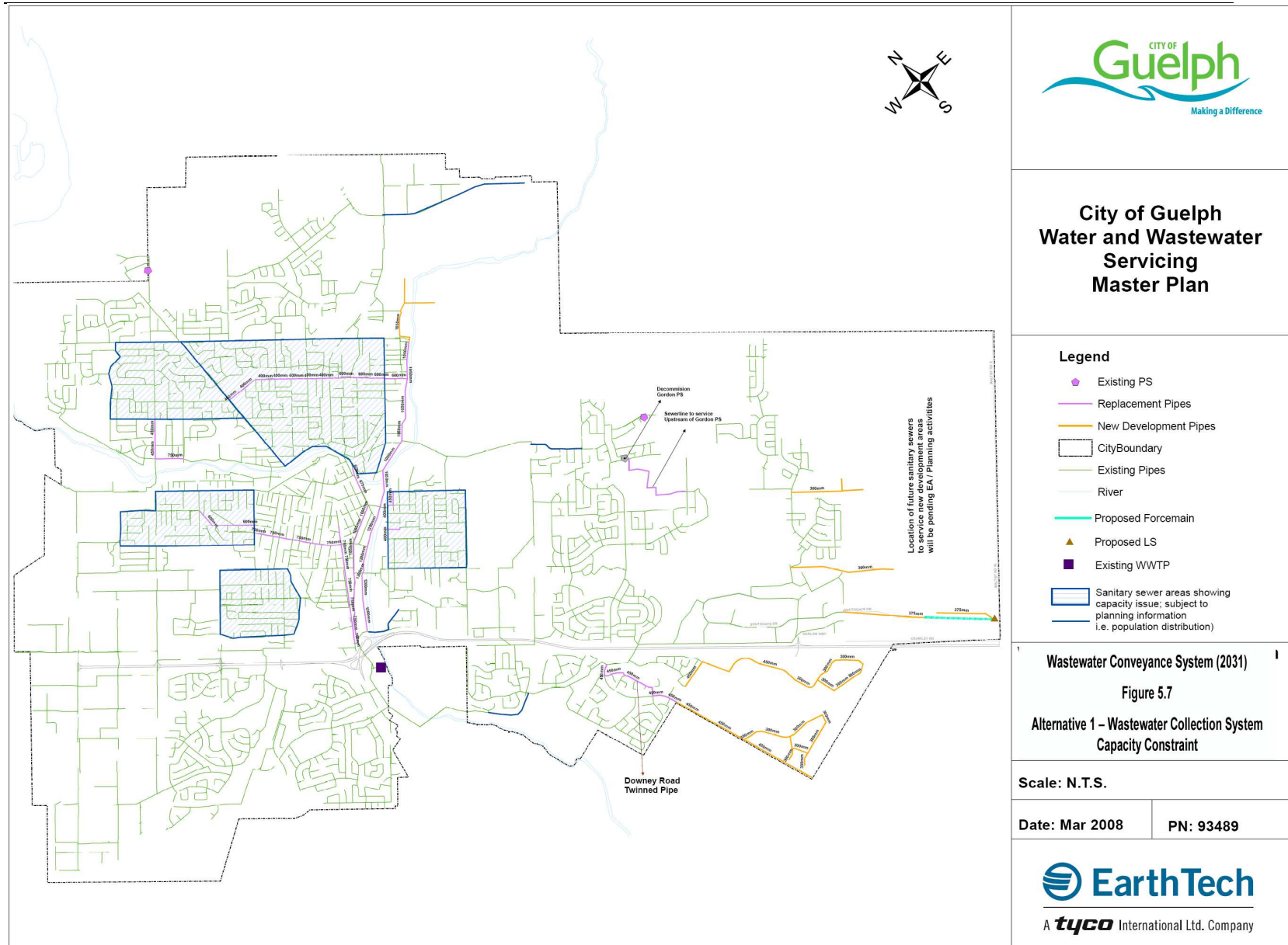
- Reinforce City core gravity sewers around downtown area to service intensification
- Upgrades/replacement of subtrunks
- Install new gravity sanitary sub-trunks to service new growth areas which feed into existing conveyance system
- Increase in trunk capacity to accommodate existing and proposed I/I
- Options to provide storage to provide moderation of peak flows to WWTP; these options include:
 - Oversize trunk sewers
 - Underground storage tanks along the Speed River
 - Equalization tanks at the WWTP

The main differences between the proposed gravity alternatives consist of varying strategies to replace the three main trunk sewers conveying sewage westerly to the plant:

- York Trunk
- Waterloo Trunk
- Speed River Trunk

In addition to upgrades to main infrastructure, the model indicates that there are capacity issues spread throughout the system. A review of sewer capacity under existing storm conditions indicated a number of gravity sewers which, under a 25 year storm condition, have flows that exceed 95% of the pipes' capacities. The majority of these are in the downtown area as shown in Figure 5.7. As some of these issues are related to slope and are limited by upstream and downstream pipe inverts, all cases are not





indicative of a capacity issue. However, it is recommended that an allowance for pipe replacement be carried forward to address capacity issues as road upgrades or watermain replacements are undertaken. As specific developments (such as intensification projects) are under consideration, the model can be used to review this issue in more detail and sewer upgrades scheduled accordingly. Additional information from the asset management database should be reviewed for age and condition when planning this work.

2.3. Asset Management

In keeping with the City of Guelph's commitment to sustainable growth and asset stewardship, an integral component of this Master Plan was the establishment of tools to better manage linear water and wastewater assets over their life cycle. Through development of the Master Plan, the City's decision-making process was documented and captured in these tools to ensure a consistent and defensible evaluation of each asset. In addition, the information needed to support the decision-making process was also evaluated and data capture strategies developed to ensure that both existing infrastructure and the infrastructure proposed in this Master Plan can be managed by the City and support appropriate funding levels for rehabilitation and eventual replacement. The main report forms the basis for a comprehensive asset management plan that will be used to maintain expected service levels and mitigate risk of failure for all City-owned infrastructure.

3. FUTURE GROWTH NEEDS

Population and water demand/sewage flow projections were required to confirm future water/wastewater servicing requirements. From a population growth perspective, the City adopted growth projections to 2027 as part of the Development Charges Study as prepared by C.N. Watson and Associates in 2003. These growth projections were used as the starting point for the Water Supply Master Plan.

The WSMP concluded that the City's existing groundwater system would at best service approximately 145,000 people and an employment equivalent of 80,000 people (225,000 total) if optimized and maximized. If new wells outside of the City's jurisdiction were considered along with local water supply from Guelph Lake and Aquifer storage recovery this could increase to as much as 210,000 people and an employment equivalent of 115,000 people (335,000 total). Based on the above referenced growth projections this represents a growth accommodation potential between Year 2017 and 2037. Preliminary growth projections calls for 165,000 people and a 30,000 population equivalent (195,000 total) from the Local Growth Management Strategy, to as high as 195,000 people and a 45,000 population employment equivalent (240,000 total) to Year 2031, both based on 40% intensification in the downtown core.

The above population projections were used to estimate future water demand and sewage flows based on per capita consumption and contribution, with allocations for industrial, commercial and institutional use. It is important to note that the preliminary LGMS population projection scenarios do not represent the City's final planning projections. These will be confirmed as part of the Local Growth Management Strategy in consultation with the Province under the Places to Grow legislation. The intent of providing this range in growth is to capture potential growth that may occur in the current City and identify/confirm water and wastewater servicing alternatives to support this potential growth in the future.

4. MASTER PLANNING

Having confirmed the existing water/wastewater system constraints and opportunities, water and wastewater strategies were developed to meet environmental assessment and growth needs. Limitations on the water supply that could be provided by the existing groundwater based or local surface water supply systems dictated the extent of servicing. A number of water/wastewater servicing strategies were reviewed to service various degrees of intensification and/or new Greenfield development within City boundaries. In addition, requirements to service outside areas under existing agreements or that could potentially come forward in the future were considered. Table 4.1 summarizes the population scenarios considered within this assignment.

Table 4.1: City of Guelph Water Distribution/Storage and Wastewater Conveyance Master Plan Future Population, Water Demands and Sewage Flows

Year (1)	Population (2)	Population Equivalent (3)	Total Population (2) + (3)	Water Avg. Day Use (4) (m ³ /day)	Wastewater Avg. Day Flow (5) (m ³ /day)
2001 (6)	109450 (6)				
2006 (7)	120000				
2031 (GMS3)(8)	165000	95000	260000	78000	78000
2031 (GMS1)(8)	175000	100000	275000	82500	82500
2031 (GMS2)(8)	195000	110000	305000	91500	91500

Notes:

- (1) From C.N. Watson memo dated September 19, 2005 used for the Water Supply Master Plan growth projections, unless otherwise noted. The 2.5% Growth assumption was used for consistency with “Places to Grow”, and to size distribution/conveyance works appropriately in the long term. Water Storage is MOE criteria driven.
- (2) Residential Population only from (1).
- (3) Population “Equivalent” for Industrial/Commercial/Institutional from (1).
- (4) **300 litres per capita per avg. day water use assumption. Add 1.5 maximum day factor (=450 lpcd) from the Water Supply Master Plan for maximum flow requirements.**
- (5) **300 litre per capita per day (equivalent population) wastewater flow assumption. Add 0.1/s/ha Infiltration/Inflow allowance plus Harmon factor for peak flows.**
- (6) From TRANS CAD Model, used as the basis for this population distribution by Traffic zone within the city boundary.
- (7) Current Population Reconciliation confirmed by the City Planning Department for the Growth Management Strategy, as per August 21, 2006 comments.
- (8) Preliminary population information as provided by the City of Guelph LGMS, November 2007 to March 2008.

4.1. Water System Servicing

From a water system servicing perspective, a number of considerations had to be taken into account given the City’s aggressive water conservation and reduction strategies, multiple supply sources from groundwater predominantly within the City and future groundwater potential from outside the City including from Guelph Lake. In addition, the various constraints and opportunities identified the need to create a third pressure zone for optimal servicing. The alternatives developed for water system servicing are summarized in Table 4.2.

Table 4.2 Identification of Alternative Solutions: Water Distribution / Storage System

Alternative	Description
A. Do Nothing: Status quo	<ul style="list-style-type: none"> The “Do Nothing” alternative represents what would likely occur if none of the alternative solutions were implemented.
B. Limit Community Growth	<ul style="list-style-type: none"> Reduce future water storage and distribution needs by limiting the extent, density, type and/or location of future residential, industrial, commercial and institutional growth in the City.
C. Water Conservation/ Demand Management	<ul style="list-style-type: none"> Continue to develop water conservation strategy \ Reduce water losses Reduce water use or implement reuse of grey water
D. Improvements to Existing System: New Facilities and Watermains	<ul style="list-style-type: none"> Alt Solution 1. <ul style="list-style-type: none"> Zone 1 (south) - Split in existing PZ 1 to create new pressure zone 1b (south of Kortright Rd); New Zone 3 (south of Clair Rd) Improvements to Zone 2 (north of Speedvale) – transmission/ supply/ storage/ pumping Alt Solution 2. <ul style="list-style-type: none"> New Zone 1 (south) elevated tank – centrally located; decommission existing tanks (Verney & Clair) New Zone 3 (south of Clair Rd) Improvements to Zone 2 (north of Speedvale) – transmission/ supply/ storage/ pumping Alt Solution 3. <ul style="list-style-type: none"> Zone 1 (south) – change to Closed System; decommission elevated tanks; increase storage and pumping capacity at Woods New Zone 3 (south of Clair Rd) Improvements to Zone 2 (north of Speedvale) – transmission/ supply/ storage/ pumping

4.2. Wastewater Servicing

Servicing strategies were identified which maximize the existing infrastructure through optimization based on the constraints and/or opportunities identified by reducing inflow/infiltration into the system to maximize available capacity. Once determined, servicing needs were determined for various growth servicing scenarios for intensified and/or new development areas. Also outlined were potential wastewater reuse opportunities that may require in the future separate potable/non-potable water supply systems. Although this was reviewed from a conveyance perspective as part of this study, it is anticipated that the Wastewater Treatment Master Plan will provide direction on when and to what extent water reuse opportunities could be applied based on treatment capacity and/or process selection. Details with respect to the above are outlined as follows. The alternatives developed from wastewater system servicing purposes are summarized in Table 4.3.

Table 4.3 Identification of Alternative Solutions: Wastewater Conveyance System

Alternative	Description
A. Do Nothing: Status quo	<ul style="list-style-type: none"> The “Do Nothing” alternative represents what would likely occur if none of the alternative solutions were implemented.
B. Limit Community Growth	<ul style="list-style-type: none"> Reduce future sanitary collection system needs by limiting the extent, density, type and/or location of future residential, industrial, commercial and institutional growth in the City.
C. I/I Reduction and Re-Use Alternatives	<ul style="list-style-type: none"> Reduce water use and implement inflow/infiltration reduction options.
D. Improvements to Existing System: New Trunk Sewers	<ul style="list-style-type: none"> Alt Solution 1. - Replace main trunk sewers (with storage options) Alt Solution 2. - Interceptor: Consolidate main trunk sewers to York Trunk (with storage options) Alt Solution 3. - Interceptor: Consolidate main trunk sewers to Speed River Trunk (with storage options)
E. Improvements to Existing System: Pumping Station & Forcemain	<ul style="list-style-type: none"> Alt Solution 4. - New main Pumping Station from York Trunk with Forcemain to WWTP

4.3. Evaluation Process/Results

A descriptive or qualitative evaluation was used to consider the suitability of alternative solutions/strategies, and identify significant advantages and disadvantages with respect to social/cultural, natural environment, public health and safety, economic/financial, legal/jurisdictional and technical evaluation criteria. In this respect, comparisons and trade-offs are made between alternatives as described in the master plan report, and formed rationale for the identification of a preferred solution or servicing strategy. Trade-offs involved forfeiting an advantage or accepting a disadvantage to address a higher priority consideration. The alternatives were ranked in order of preference (based on advantages/disadvantages), with respect to each evaluation grouping and the criteria describing the environment.

Each alternative was evaluated against the criteria with relative scores (i.e. relative to other alternatives) shown on a pie chart from 0 to 8, with 0 (all white) having the most positive/lowest impact and 8 (all black) having the most negative/highest impact. The individual ratings for each criterion for water and wastewater servicing are illustrated in the main report.

Equal weightings for each of the above groupings were subsequently normalized to provide a total overall rating for each alternative, as summarized in Table 6.3 for Water and Table 6.5 for Wastewater. These ratings were then further considered with respect to application in the short-, mid- and long-terms to address the City’s water and wastewater servicing needs.

**Table 6.3 Guelph Water/Wastewater Servicing Master Plan
Water Servicing Alternatives Evaluation Summary**

Evaluation Criteria	Alternative A	Alternative B	Alternative C		Alternative D		
	"Do Nothing"	Limit Community Growth	Water Conservation/Demand Management		Improvements to Existing System: New Facilities and Watermains		
			Unaccounted for Water	Pricing/Controls/Education	1. Zone 1 - Split in existing PZ 1	2. Zone 1 - new elevated tank	3. Zone 1 - change to Closed System
Public Health and Safety	Cannot meet water security needs in long term. Ongoing impacts; problem areas with respect to system pressures and fireflows in south end	Does not address existing system deficiencies	Does not address existing system deficiencies	Does not address existing system deficiencies	Existing and long term requirements can be met Additional zone to maintain Zone split may result in increased dead-ends/increased flushing requirements (water quality issues)	Existing and long term requirements can be met Maintain as single zone easiest to operate and maintain emergency response	Can meet long term requirements System more difficult to operate to meet emergency requirements
Natural Environment	Does not address City adopted growth strategy	Counter to adopted growth strategy; Impact from intensification results in reduced servicing to City core.	Low impact to natural environment	Low impact, non-invasive for added short term supply.	Preferred alternative. Low to moderate impacts from new transmission pipes through utility corridors/existing roadways. Need for land for booster pumping stations and reservoirs.	Meets growth needs for long term. Moderate impacts from new elevated tank in central Zone 1 location; new transmission pipes - number of water crossings to service zone 1. Need for land for booster pumping station and reservoir for Zone 3.	Meets growth needs for long term. Moderate to high impacts from new in-ground reservoir and expanded central pumping station in Zone 1; new transmission pipes - number of water crossings to service zone 1. Need for land for booster pumping station and reservoir for Zone 3. High energy use/emissions due to pumping to meet all system requirements
Social/Cultural	Cannot meet growth objectives, triple bottom line Social cost high, benefit low Physical impact low due to inaction	Cannot meet growth objectives, triple bottom line Social cost high, benefit low Physical impact low due to inaction	Partly meets growth objectives. Meets triple bottom line with low benefit potential. Social cost high, benefit very low. Low physical impacts	Partly meets growth objectives, preferred for short term. Meets triple bottom line with low benefit potential Social cost high, benefit very low. Low physical impacts	Preferred alternative. Meets growth requirements over mid to long term Meets triple bottom line with moderate impacts. Moderate social cost/impact. Physical impact due to new facilities	Meets growth requirements over long term Meets triple bottom line with moderate impacts. Moderate social cost/impact. Social impact due to new elevated tank in zone 1	Meets growth requirements over long term Meets triple bottom line with moderate impacts. Moderate to high social cost/impact.
Economic/Financial	Moderate capital, operational, lifecycle cost due to inaction. Likelihood of emergency response to impact infrastructure cost/user rates.	Low capital, operational, lifecycle costs and user rate/infrastructure aspects due to growth limitations.	Minimal capital, operational, lifecycle costs and user rate/infrastructure aspects.	Minimal capital, operational, lifecycle costs, infrastructure aspects with user rate increases.	Moderate to high capital (\$125 M). Preferred alternative.	High capital (\$142 M).	High capital (\$146M). high lifecycle costs and user rate/infrastructure aspects.
Legal/Jurisdictional	Moderate impact due to inaction/emergency response. No land required as a result.	Minimal impact due to growth limitations. No land needs. Negative economic development as a result.	No land Geopolitical issues. Entirely within City.	No land Geopolitical issues. Entirely within City.	Land likely required for booster pumping stations and zone 3 storage.	Land likely required for booster pumping stations and zone 1 and 3 storage; new elevated tank in zone 1	Land likely required for booster pumping stations and zone 3 storage. New zone 1 storage in ground (possibly at existing PS)
Technical	Does not address criteria. Emergency response only.	Addresses some issues by limiting growth, but not others.	Minimal impact for most issues but does not address a few.	Minimal impact for most issues but does not address a few.	Low to moderate impacts for most issues; open system provides most stable operation. Easiest to implement with phased approach.	Moderate impacts for most issues with new infrastructure; open system provides most stable operation - single elevated tank in Zone 1 resolves operational issues but large transmission mains required north-south. Less use of existing infrastructure.	Moderate to high impacts for most issues with new infrastructure; Zone 1 closed system reliant on pumping to meet all conditions - pressure swings less moderated than open system.
OVERALL EVALUATION	Not an option	Subject to City direction	Should be part of any plan.	To be addressed as part of Bill 175 requirements currently underway	preferred strategy		
LEGEND	LOWEST IMPACT MOST PREFERRED	LOW TO MODERATE IMPACT	MODERATE IMPACT	MODERATE TO HIGH IMPACT	HIGH IMPACT		

**Table 6.5 Guelph Water/Wastewater Servicing Master Plan
Wastewater Conveyance Alternatives Evaluation
Summary**

Evaluation Criteria	A. Do Nothing	B. Limit Community Growth	C. I/I Reduction & Re-Use Alternatives	D. Upgrade Existing Wastewater Conveyance System			E. Pumping Station and Foremain
				1. Replace Main Trunk Sewers	2. Interceptor: Consolidation of Waterloo & Speed River Trunks into YorkTrunk	3. Interceptor: Consolidation of Waterloo & York Trunks into Speed River Trunk	
Natural Environment Considerations	- little impact - degradation of water quality	- little impact - some improvement to water quality	Re-Use - greater potential impact due to infrastructure requirements - improved water quality but lower degree than others I/I Reduction - benefits Natural Environment by reduced infrastructure needs in collection system and at WWTP; potential for improved effluent quality	- impacts due to infrastructure works needed to service	- impacts due to infrastructure works needed to service	- impacts due to infrastructure works needed to service	- impacts due to infrastructure works needed to service
Social Cultural	- does not facilitate growth - no temporary construction/safety aspects	- facilitates short term growth only - little construction/safety impacts	- re-use and reduced I/I - facilitates some short/long term growth - short and long term construction impacts for re-use	- facilitates short and long term growth - short term construction and long term impacts	- facilitates long term growth - short term construction and long term impacts	- facilitates long term growth - short term construction and long term impacts	- facilitates long term growth - short term construction and long term impacts
Economic	- emergency costs and impacts - degradation of existing facilities	- low cost and rate impacts - maximizes infrastructure use	- high costs and rate impacts - reuses some infrastructure, but new/additional required	- moderate capital/low operating costs Est Capital (without storage) = \$68M Est Capital (with storage in pipe) = \$79M Est Capital (with storage in tanks) = \$75M - rate impacts - good use of City infrastructure	- high capital/low operating costs Est Capital (without storage) = \$75M Est Capital (with storage in pipe) = \$85M Est Capital (with storage in tanks) = \$80M - rate impacts - good use of City infrastructure	- High capital/low operating costs Est Capital (without storage) = \$76M Est Capital (with storage in pipe) = \$86M Est Capital (with storage in tanks) = \$81M - rate impacts - use of existing infrastructure plus completely new infrastructure - good use of City infrastructure	- very high capital and operating costs Est Capital (without storage) = \$81M Est Capital (with storage in tanks) = \$88M - rate impacts - use of existing infrastructure plus completely new infrastructure
Legal	- emergency process and approach requirements - no additional land requirements	- reduced process and approach needs - reduced land requirements	- additional process and approach requirements - significant land requirements	- normal process and approach with some added planning implications - some land implications for infrastructure/facilities	- normal process and approach with some added planning implications - some land implications for infrastructure/facilities	- normal process and approach with some added planning implications - some land implications for infrastructure/facilities	- additional process and approach activities - land required for facilities and infrastructure
Technical	- does not meet servicing needs - degradation of existing operations/facilities - emergency infrastructure/ energy needs - little flexibility and innovation	- meets short term servicing to some extent - maintains current operations - reduced infrastructure/energy requirements - readily implementable and flexibility - little innovation opportunities	- meets short and long term servicing needs to some extent - considerable infrastructure/ energy requirements for re-use - longer term implementation, less flexibility, innovation can be applied	- meets short /long term servicing needs with minimal operational complexity - land constraints and constructability impacts - somewhat flexible and readily implementable - moderate infrastructure with little innovation opportunities	- meets short/long term servicing needs with minimal operational complexity - land constraints and constructability impacts - somewhat flexible and readily implementable - moderate infrastructure with little innovation opportunities	- meets short/long term servicing needs with minimal operational complexity - land constraints and constructability impacts - somewhat flexible and readily implementable - moderate infrastructure with little innovation opportunities	- meets short/long term servicing needs with minimal operational complexity - land constraints and constructability impacts - not as readily implementable - high cost infrastructure with some innovation opportunities; possible to offset pumping at WWTP
OVERALL EVALUATION	Not an option	Subject to City direction	Should be part of any plan.	preferred alternative			
LEGEND	Lowest Impact (Most Preferred)	Low to Moderate	Moderate	Moderate to High	High (Least Preferred)		

4.4. Preferred Servicing Plans

Although not identified as a preferred alternative from a long-term servicing perspective, Water Conservation and Inflow/Infiltration reduction are two measures that should be employed in advance of the need to expand an existing facility, or implement new water/wastewater infrastructure to reduce their need and/or delay their timing from a short-term servicing perspective. These programs should be implemented in advance of, or in conjunction with, any proposed infrastructure expansion or new works.

In addition, the City should consider implementing a pilot project to investigate further Re-use Alternatives as treatment requirements continue to increase from a regulatory and/or Speed/Grand River watershed water quality perspective. Once the level of treatment required approaches provincial water quality requirements, a pilot program to identify large scale users, the infrastructure needed to service these users and how this would have to be integrated into future development policies and requirements should be looked at. This can be implemented in the future.

4.4.1. Water

The preferred alternative for the water distribution system was Alternative 1. The proposed improvements include the following:

- Zone 1 split - to address existing low pressure areas in the south of zone 1 which are partially a result of the decrease in the hydraulic grade line from the Verney tank to the Clair tank, changes over time are proposed which would allow the City to split this zone into two. The proposed boundary split is located approximately along Kortright Road from east to west. The existing Verney and Clair tanks would service these zones 1A and 1B respectively. The TWL in these tanks are at approximately the same elevation but water would need to be boosted from zone 1A to zone 1B due to headlosses through the system as water is transmitted southwards. Zone 1B would typically be operated at a higher sustainable pressure than it is currently. Also required would be piping to split zones and minimize deadends and new booster pumping station(s) from PZ1A to PZ1B.
- Reinforce existing mains in City core (Zone 1): proposed transmission main loop around downtown area
- New East-West and North-South transmission mains in Zone 1 to improve water supply transmission from Woods PS
- New Zone 3, south of Clair road with storage facility and booster pumping station (from zone 1)
- New East West transmission across zone 2 (along Speedvale) and additional Zone 2 storage
- Modifications to pressure zone boundaries to address high and low elevation issues

Alternative 1 offered the following advantages over the other alternatives:

- Best use of existing infrastructure
- Can be phased in with improvements in tank operation
- Eliminates operational issues associated with two elevated tanks in one zone

- Includes new transmission mains and pumping stations to improve pressures in south areas
- Addresses deficiencies in existing system
- Lowest capital cost and lowest life cycle cost

4.4.2. Wastewater

The preferred wastewater collection system alternative was determined to be Alternative 1. This alternative includes improvements to the existing system to address existing capacity issues that will be further exacerbated by intensification and growth to the east of the City. Proposed improvements include the following:

- Trunk replacement - replace each of the main trunk sewers as required to service its own current drainage area. A review of the Asset Management information indicated that the condition of the York Trunk warrants replacement first, primarily due to its age. However, other considerations include that it is this trunk that services the downtown area which is slated for intensification as well as development of the York lands area.
- Reinforce City core gravity sewers around downtown area to service intensification
- Install new gravity sanitary sub-trunks to service new growth areas which feed into existing conveyance system
- Increase in trunk capacity to accommodate existing and proposed I/I
- Options to provide storage to provide moderation of peak flows to WWTP; these options include:
 - Oversize trunk sewers
 - Underground storage tanks along the Speed River
 - Equalization tanks at the WWTP

The model also indicates capacity constraints in the Downey Road sewer, particularly with the Hanlon Creek Business Park construction. It is proposed to monitor flow at this point to determine when this upgrade is required.

Alternative 1 offered the following advantages over the other alternatives:

- Addresses deficiencies in existing system and poor structural condition of older trunk sewers
- Can be phased in with road improvements and watermain installation
- Increase in diameter of main trunk sewers reduces upgrades upstream in system
- Further storage could be implemented to minimize peak to ADF ratio
- Results in major upgrades through core of City and east-west trunk sewers
- New sewers to accommodate growth can be implemented within existing gravity system
- Lowest capital cost

4.5. Public Consultation

4.5.1. Project Initiation

Project initiation notices were issued for the water/wastewater servicing master plans in 2006, published in the Guelph Mercury June 23rd and June 30th, respectively. Letters were mailed to the agency contact list June 21st, 2006. Only 6 people called the City and/or Earth Tech and were added to the mailing list. We received letters from the MOE and MMAH advising of legislative requirements.

4.5.2. Public Meeting No. 1

The first Public Information Centre (PIC) was held on Wednesday, March 5, 2008 from 7 to 9pm at the River Run Centre located in Guelph. It was attended by 10 members of the public including a City Councilor in addition to several City staff. One comment form was completed and submitted at the PIC.

The intent of PIC 1 was to introduce the Master Plan project, the Problem Statement, and evaluation criteria. A review of the existing water distribution system and wastewater conveyance system was provided and alternatives provided which addressed existing system limitations and to meet growth requirements. The evaluation process and preferred alternative were portrayed for comment. The advertisement for PIC 1 was placed in the Guelph Tribune on February 29, 2008. In addition, as a follow-up to this PIC and to encourage feedback on the project, a notice was again placed in the Guelph Tribune on March 14, 2008, to inform the public that the project information and PIC presentation materials were available on the City's website.

4.5.3. Public Meeting No. 2

The second Public Information Centre was held on Thursday, April 10, 2008 from 7 to 9pm at the Evergreen Seniors Centre located in Guelph. It was attended by 6 members of the public including two Councilors from the Township of Puslinch. One comment form was completed and submitted at the PIC.

The purpose of PIC 2 was to review the preferred future water distribution system and wastewater conveyance system and provide an outline of implementation plans for each. The advertisement for PIC 2 was placed in the City Section of the Guelph Tribune on March 28 and April 4, 2008.

4.5.4. Key Issues Raised

Most of the comments raised at and following the PICs related to the City's management of existing infrastructure and ensuring that the City is operating in a sustainable manner. For example one comment was that the City needs to ensure that Council has properly funded maintenance and replacement of its watermains and sanitary sewers before investing in the infrastructure required for growth. A suggestion was made to the City to undertake an overall Water Master Plan encompassing all of the water and wastewater related master plans including water supply; water/wastewater conveyance and storage; wastewater recovery and stormwater conveyance and recovery. There was an inquiry from the Wellington Dufferin Guelph Public Health Unit regarding whether treated sewage effluent re-use is being reviewed. City staff responded to provide further information on wastewater re-use which is being investigated under the wastewater treatment master plan.

5. IMPLEMENTATION PLANNING

Once preferred water/wastewater system servicing strategies were identified, implementation planning was prepared on a short-term (2008 – 2012); mid-term (2012 to 2017); and long-term (2018 to 2031) basis outlining the specific water distribution, pumping, storage, sanitary sewer and pumping station works recommended within each timeframe. Included were relative EA implications, triggers for implementation complete with estimated costs.

5.1. Implementation Planning Assumptions

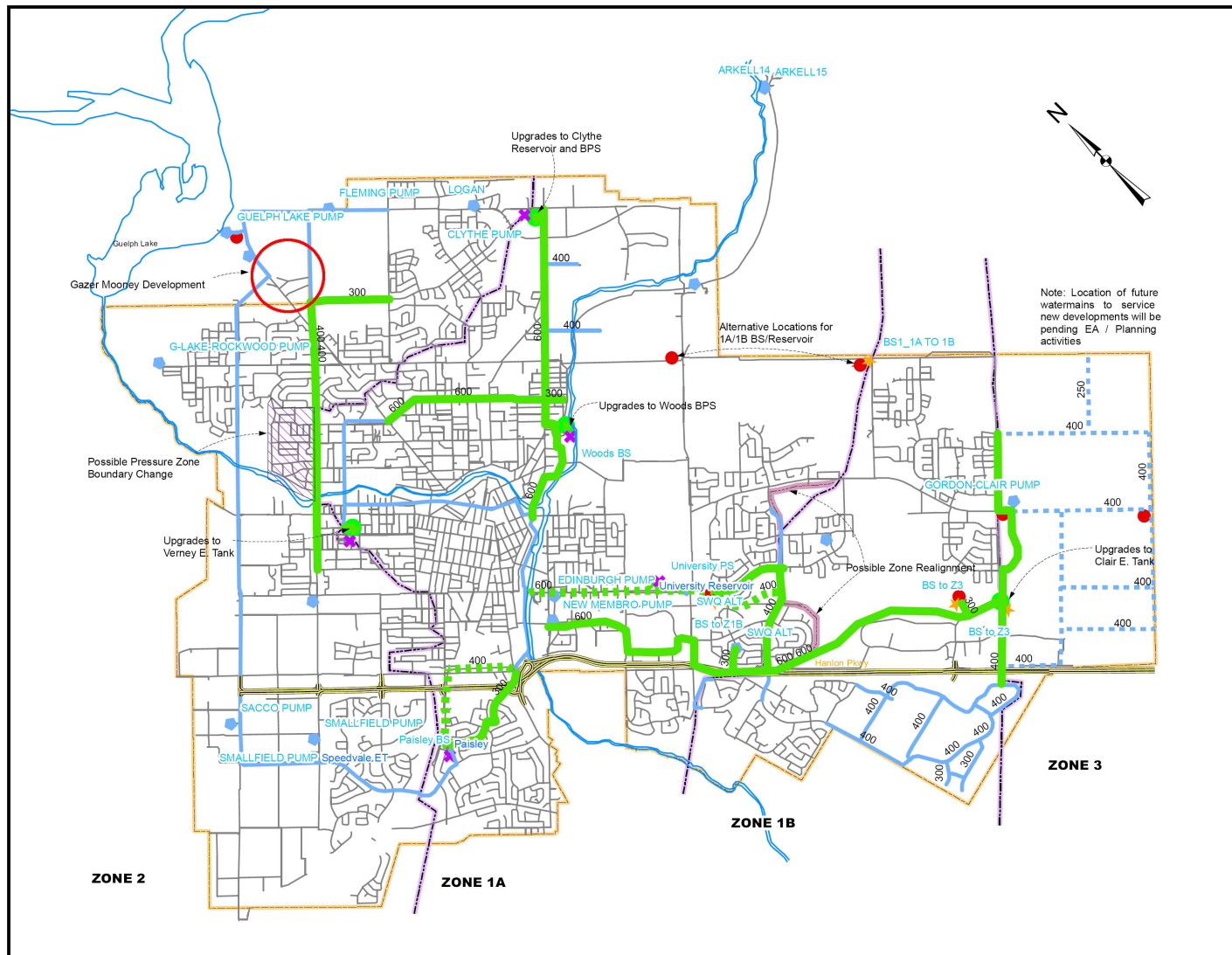
As the City had not yet finalized its growth management study (LGMS), the estimated population at 2031 was assumed to review alternatives and confirm the final strategy. To develop implementation plans for the preferred alternatives, further assumptions regarding the timeline, location and density of future population growth were reviewed and approved by City planning staff. It was also assumed that all works would be required within the 25 year timeframe of this Master Planning exercise. It may be more reasonable to assume that some of the long term maintenance works (e.g. pipe upgrades) will extend beyond 2031 as they are done in concert with road restoration or other projects.

The assumptions for developing the implementation plans are summarized below:

- Implementation of new water supply facilities are assumed to follow the WSMP schedule (e.g. water supply facilities are developed and constructed in accordance with this schedule).
- The Asset Management inventory currently includes information regarding the installation date of the linear infrastructure; this was reviewed to determine a basis for scheduling upgrades to the existing system. As the database is updated to include condition assessment information, these priorities should be revisited to confirm the timing of required works.
- Watermain and sanitary sewer replacements to be coordinated with road reconstruction projects. Each watermain and sewer replacement is priced independently, i.e. as though done as its own project. It is incumbent on the City to minimize cost and disruption by scheduling these replacements (as well as storm if required) along with road reconstruction.
- Infrastructure shown in new development areas will be subject to EA and planning approvals (e.g., Provincial review of adequacy of current policies/legislation to protect the Paris Galt Moraine). For budgeting purposes, the trunk infrastructure required to service these areas (and any possible Pumping stations etc.) have been estimated and included.
- Assumed growth priorities in first 10 years include:
 - continued growth in approved development areas of south end;
 - development of York district area (Ontario Reformatory lands);
 - intensification in downtown core (drainage to York trunk sewer).

5.2. Water Servicing

Short-term infrastructure requirements are depicted in Figure 7.1. The major linear infrastructure requirements in the 0 to 5 year timeframe include installation of large diameter transmission mains to improve water transmission from north to south to service existing and new customers in the far south end of Guelph. This could be accommodated via a new main paralleling the Hanlon expressway on the east



**City of Guelph -
Water and Wastewater
Servicing
Master Plan**

Legend

- Proposed Water Mains (Diam. in mm)
- Proposed PS
- ★ Proposed BS
- + Existing BS
- ▲ Existing Storage
- Proposed Storage
- Existing Pipes
- - - Pressure Zone Boundary
- City Boundary
- Improvements 0-5 Years
- - - Alternative Routing 0-5 Years
- - - Additional Pipes South End

**Water Distribution/Storage System
(2031)
Figure 7.1
Alternative 1 –
Zone 1 Separated**

N.T.S.

February 2008

P.N.: 93489



side, primarily through parks and the Hanlon Road utility corridor. This coincides with the proposed development of new municipal well(s) to be located in the Southwest Quadrant (this Class EA study is currently ongoing). Alternate routes may be preferable depending on road reconstruction schedules (e.g. Edinburgh south of Wellington).

Also proposed in this timeframe is a east west transmission main from Woods Reservoir and Pumping Station to the Clythe PS; this project is to include a new outlet main from the Woods station for redundancy.

5.2.1. Mid-Term Recommendations (2012 to 2017)

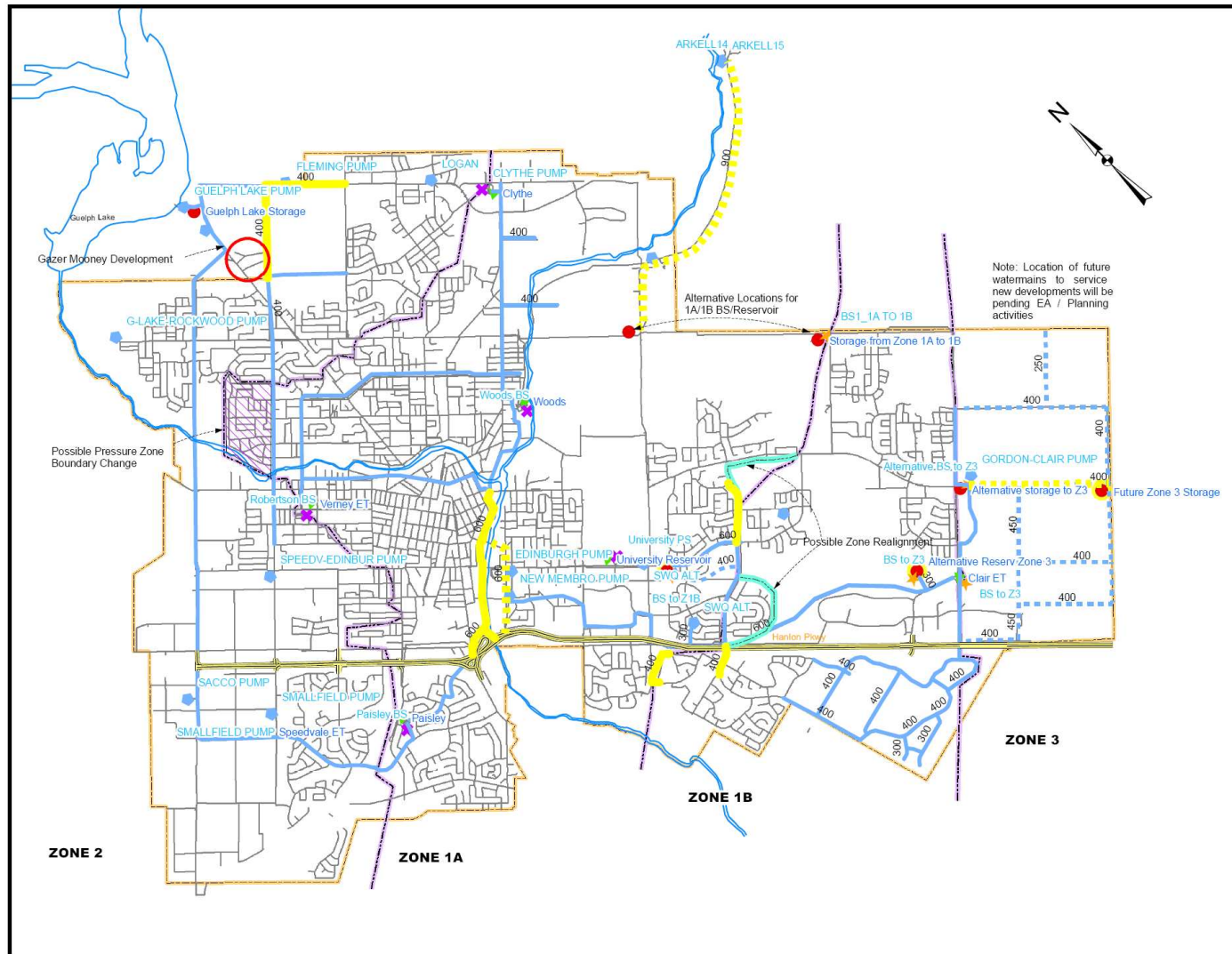
Mid-term infrastructure requirements are depicted in Figure 7.2. The main linear infrastructure requirements in the 5 to 10 year timeframe include completion of works necessary to implement the Zone 1A/1B split: this consists of additional watermains/valves to eliminate deadends; and an additional crossing of the Hanlon Expressway at Kortright Road.

Further improvements for east west transmission include a new main from Woods PS westward towards the Hanlon, with connection to the watermain southward paralleling the Hanlon.

Intensification downtown may require commencement of a transmission main looping around Stevenson/Emma to the Verney tank. This may also be expedited to provide additional redundancy in servicing the tower (criticality issue).

5.2.2. Long-Term Recommendations (2018 to 2031)

Long-term infrastructure requirements are depicted in Figures 7.3 and 7.4. The infrastructure requirements beyond 10 years include completion of the downtown transmission main to service intensification (Exhibition/ Dublin) and to transmit water from new water supply facilities located outside of the City. This includes the proposed surface water treatment plant and aquifer storage recovery (ASR) system at Guelph Lake, where under this Master Plan, storage is also assumed. A new watermain located along Woodlawn Rd or along the north City boundary would facilitate improved east-west transmission and growth in the north. Continuation south from Woodlawn to the Paisley facilitate would provide looping around zone 2.





**City of Guelph -
Water and Wastewater
Servicing
Master Plan**

Legend

- Proposed Water Mains (Diam. in mm)
- Proposed PS
- ★ Proposed BS
- + Existing BS
- ▲ Existing Storage
- Proposed Storage
- Existing Pipes
- Pressure Zone Boundary
- City Boundary
- Improvements 5-10 Years
- Alternative Routing 5-10 Years

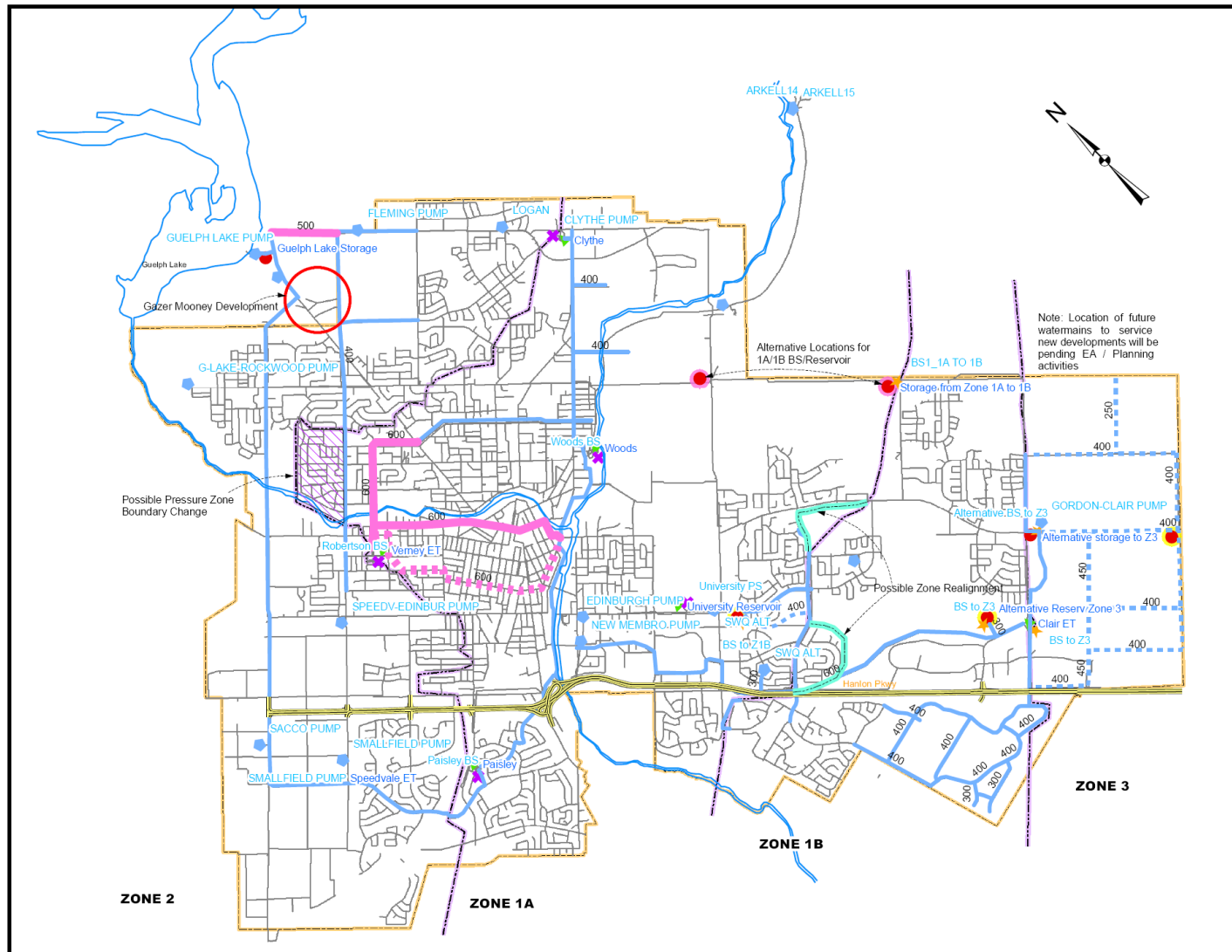
**Water Distribution/Storage System
(2031)
Figure 7.2
Alternative 1 –
Zone 1 Separated**

N.T.S.

February 2008	P.N.: 93489
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**City of Guelph -
Water and Wastewater
Servicing
Master Plan**

Legend

- Proposed Water Mains (Diam. in mm)
- Proposed PS
- ★ Proposed BS
- ✚ Existing BS
- ▲ Existing Storage
- Proposed Storage
- Existing Pipes
- Pressure Zone Boundary
- ▭ City Boundary
- Improvements 10-15 Years
- Alternative Routing 10-15 Years

Water Distribution/Storage System

(2031)

Figure 7.3

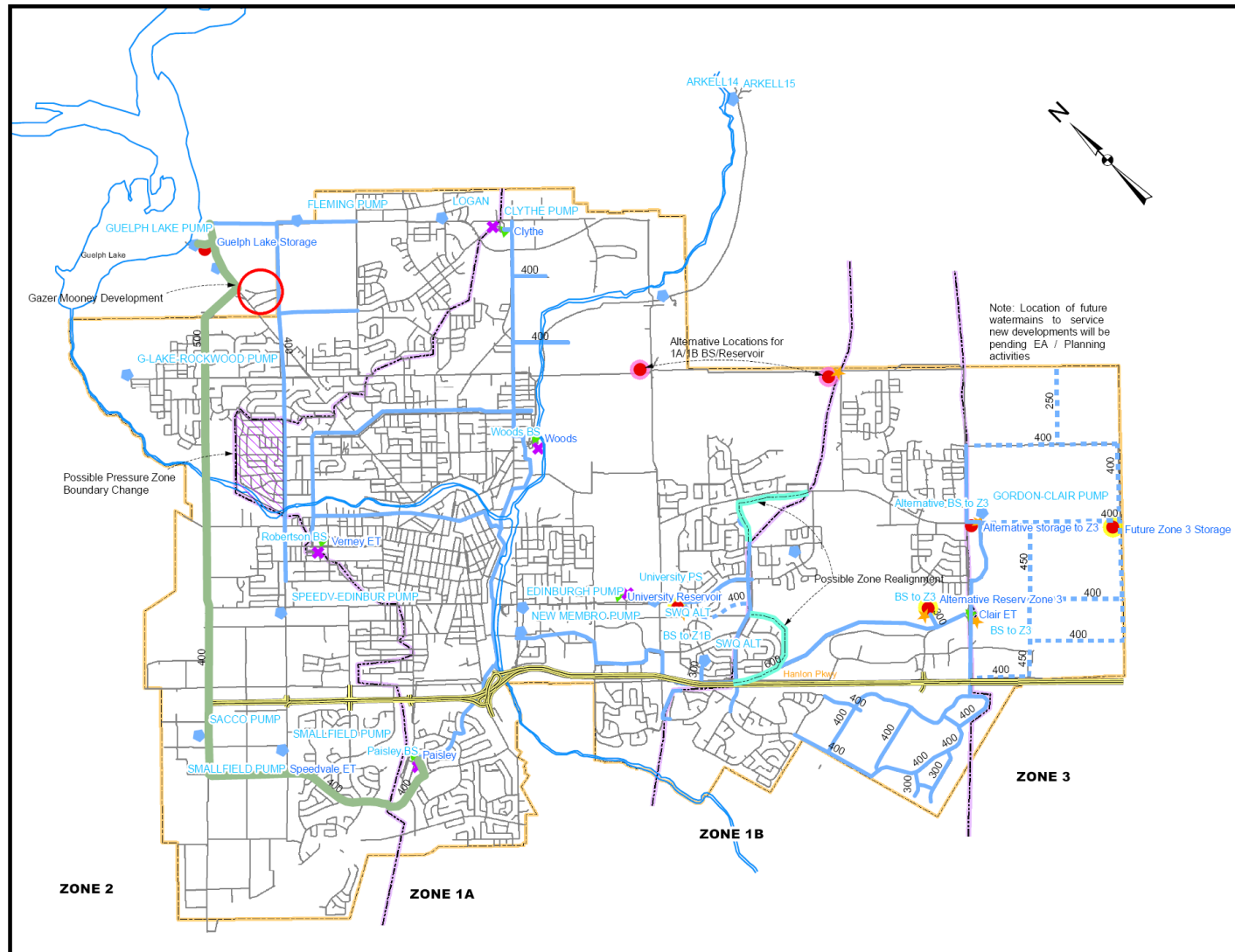
Alternative 1 –
Zone 1 Separated

N.T.S.

February 2008

P.N.: 93489





**City of Guelph -
Water and Wastewater
Servicing
Master Plan**

Legend

- Proposed Water Mains (Diam. in mm)
- Proposed PS
- ★ Proposed BS
- + Existing BS
- ▲ Existing Storage
- Proposed Storage
- Existing Pipes
- Pressure Zone Boundary
- City Boundary
- Improvements 15-25 Years

**Water Distribution/Storage System
(2031)
Figure 7.4
Alternative 1 –
Zone 1 Separated**

N.T.S.

February 2008

P.N.: 93489



5.2.3. Project List with Budgetary Estimate and Class EA Schedule

5.2.3.1. Studies

Years	est. timing	Project no.	Project Description	Budgetary Estimate	Class EA Schedule
0-1	2009	W-S-1	Calibrate model - c factor testing; Verney/Clair Model Optimization; Transient analysis	\$ 300,000	A
0-1	2009	W-S-2	Distribution system water quality assessment & modelling/flushing	\$ 100,000	A
0 - 1	2009	W-S-3	Property Needs Study	\$ 100,000	A
0 - 5	2009 - 2014	W-S-4	Asset Management	\$ 500,000	A
2 - 5	2011 - 2014	W-S-5	Performance/ Benchmarking/Criticality investigations	\$ 200,000	A
2 - 3	2011 - 2012	W-S-6	Review opportunities for capturing energy/ energy pumping efficiency & optimization	\$ 150,000	A
5 - 25	2014; 2024	W-S-7	Water Supply - Distribution Master Plan Update	\$ 900,000	Master Plan EA
Subtotal				\$ 2,250,000	

5.2.3.2. Linear Infrastructure

Years	est. timing	Project no.	Project Description	Budgetary Estimate	Class EA Schedule
0 - 5	2008 - 2009	W-I-1	Clair Road Zone 3 Main - Crawley to Gordon	\$ 2,515,050	A
1 - 2	2009 - 2010	W-I-2	*Scout Camp Aqueduct Modifications - allowance	\$ 2,000,000	A
0 - 5	EA - 1 implement 2 - 4	W-I-3	Parallel Hanlon - Wellington to Clair (river crossing) or Water to Clair (river crossing) (600mm)	\$ 10,192,500	B
0 - 5	1 - 2		Edinburgh - Wellington to Zone 1A/B Reservoir & BS		A
0 - 5	4 - 5	W-I-4	Edinburgh - Zone 1A/B Reservoir & BS to Kortright 1B Main (600mm)	\$ 1,265,625	A/B
0 - 5			OR Edinburgh - Zone 1A/B Reservoir & BS through Park to Kortright 1B Main (600mm)		
0 - 6	4 - 6	W-I-5	Kortright Zone 1B Main (400mm) - Hanlon to Edinburgh Road	\$ 1,458,000	A
0 - 5	EA/des - 2 implement 3 - 4	W-I-6	*Speedvale - Watson to Westmount (300/400mm)	\$ 6,075,000	A*/B
0 - 5	4 - 5	W-I-7	*Zone boundary change - Zone 1/2 (north of Speedvale)	\$ 400,000	A
0 - 5		W-I-8	Watson from Eastview to Speedvale (400mm)	\$ 1,093,500	A

Linear Infrastructure (cont'd)

Years	est. timing	Project no.	Project Description	Budgetary Estimate	Class EA Schedule
0 - 10	EA - 2 des 3 - 4 east 5 - 6 west 7 - 8	W-I-9	Wellington - Hanlon (north of Speed River) to Watson (600mm)	\$ 10,125,000	B
			OR Wellington - Hanlon (south of Speed River on Water St) to Edinburgh to Watson		
6 - 10	7 - 8	W-I-10	*Gazer-Mooney redundancy - off Speedvale	\$ 100,000	A
6 - 10	7 - 8	W-I-11	Kortright Zone 1B Main (400mm) - Edinburgh to Rickson	\$ 486,000	A
6 - 10	7 - 8	W-I-12	Complete Zone 1A/B split piping & Valves (Hanlon crossing @ Kortright etc)	\$ 500,000	A
6 - 10		W-I-13	*Carter Aqueduct Replacement (more accessible) - allowance	\$ 4,000,000	B
8 - 10	EA/des - 8/9 implement 9-10	W-I-14	*Arnell wellfield transmission main (for redundancy, assume 900mm)	\$ 14,985,000	B
11 - 15		W-I-15	Watson from Speedvale to Hwy 24 (400mm)	\$ 972,000	A
11 - 15		W-I-16	*Hanlon Crossing - to Paisley (supply security)	\$ 2,500,000	A or B
			or Silvercreek - Wellington to Paisley BS (400mm) (security)		A
11 - 15		W-I-17	Stevenson - Woods PS to Emma/Verney (river crossing) to Tank (600mm)	\$ 8,437,500	B
11-15		W-I-18	Exhibition/Dublin - Tank to Wellington (600mm)	\$ 5,062,500	A
11 - 25		W-I-19	*Asset replacement - pipes with headloss ≤ 5 and ≥ 2 m/1000m (allowance for 50%)	\$ 8,783,775	A
0 - 25		W-I-20	*Replace distribution piping < 100 mm diameter/ looping deadends/WQ issues	\$ 9,801,550	A
0 - 25		W-I-21	*Asset replacement - all pipes with headloss greater than 5m/1000m	\$ 6,754,050	A
16 - 25		W-I-22	Woodlawn Road - Watson to Imperial (400/500mm)	\$ 9,720,000	A+ or B (river
16 - 25		W-I-23	Imperial - Woodlawn to Paisley BS (400mm)	\$ 3,645,000	A
16 - 25		W-I-24	*connections between transmission mains and/or river crossing for criticality	\$ 2,000,000	A/B
develop- ment driven		W-I-25	New Development Allowance	\$ 15,000,000	A/B
Subtotal				\$ 127,872,000	

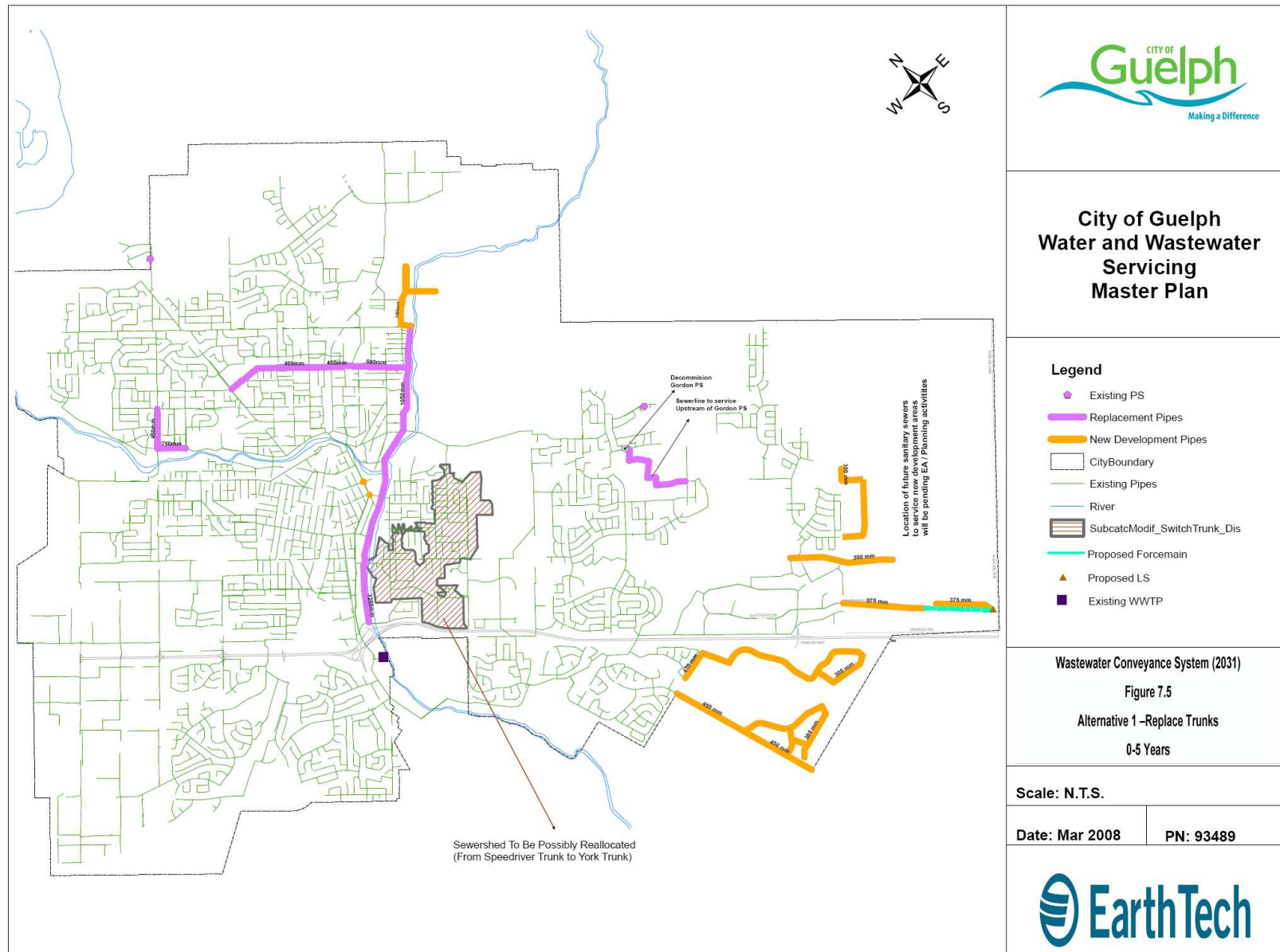
5.2.3.3. Facilities

Years	est. timing	Project no.	Project Description	Budgetary Estimate	Class EA Schedule
5	2012	W-F-1	*Paisley Upgrades (pumps to supply zone 2; permanent generator; VFDs) - allowance	\$ 1,500,000	A
0 - 5	study - 1 installation - 2	W-F-2	*Control Package Verney/Clair, Valves, VFDs, Pumps @ Woods	\$ 1,350,000	A
0 - 5	EA - 4 Des - 5 implement - 6-7	W-F-3	*Upgrade/Expansion to Clythe Booster & Reservoir (Zone 1A/2) possible zone 1/2 boundary changes decommissioning of Eastview BPS	\$ 5,000,000	B
6 - 10	EA - 6 Des - 7 implement - 8-9 (2015/16)	W-F-4	*Robertson Booster PS Upgrades/Expansion	\$ 6,075,000	B
0 - 10		W-F-5	*Distribution System Water Quality capital works - chlorination; corrosion control (allowance)	\$ 4,000,000	A
6 - 10	EA - 5 Des - 6 implement - 7-8	W-F-6	Southwest Quadrant - Zone 1A/B BPS & Reservoir	\$ 13,500,000	B/C
6 - 10	EA - 6 Des - 8 implement - 9-10	W-F-7	Zone 3 Elevated Tank	\$ 2,700,000	B/C
>10		W-F-8	Zone 3 Booster expansion	\$ 405,000	A/B
11 - 15		W-F-9	East Side (Arnell/Victoria) Zone 1A/B BPS & Reservoir	\$ 13,500,000	B/C
16 - 25		W-F-10	Guelph Lake Storage & BS	\$ 13,500,000	B/C
Subtotal				\$ 61,530,000	

5.3. Wastewater Servicing

5.3.1. Short Term Recommendations (2008 to 2012)

Short-term infrastructure requirements are depicted in Figure 7.5. The major linear infrastructure requirements in the 0 to 5 year timeframe include installation of the large diameter York trunk sewer from Victoria Road to the Hanlon expressway. This is a priority project due to the age of the existing sewer and reports of its very poor condition, particularly along the York corridor. Completion of this project first would allow development of the York lands as well as intensification in the downtown core. Budget has also been included to provide additional storage within the collection system with installation of each major trunk to trim peak flows experienced at the WWTP. This equalization could be implemented in the collection system or at the plant. There has also been some discussion on increasing the size of the York trunk to minimize the upgrade requirements of the parallel trunks (Speed River and Waterloo trunks). This should be reviewed during preliminary design to determine the maximum capacity which could be accommodated within the allowable profiles of the collection system and the plant inlet works. It is envisioned that the area south of the Speed River currently discharging to the Speed River Trunk could be moved into the York trunk as the elevations appear to be the same. Again, this would need to be confirmed by field assessment and design.



Also planned in the first five years is replacement of the Stevenson Trunk feeding into the York trunk, to address existing deficiencies (capacity) and allow intensification. Completion of the Arthur trunk includes the section from Emma St. to Kitchener St. and the Speedvale collector from the Arthur trunk to Metcalf St.

5.3.2. Mid-Term Recommendations (2012 to 2017)

Mid-term infrastructure requirements are depicted in Figure 7.6. The main linear infrastructure requirements in the 5 to 10 year timeframe include replacement of the Speed Trunk from east of the Hanlon Expressway to Eramosa Road, again, with or without additional storage. Other system improvements include replacement of the Water St. collector and the Downey trunk (pending flow monitoring outputs).

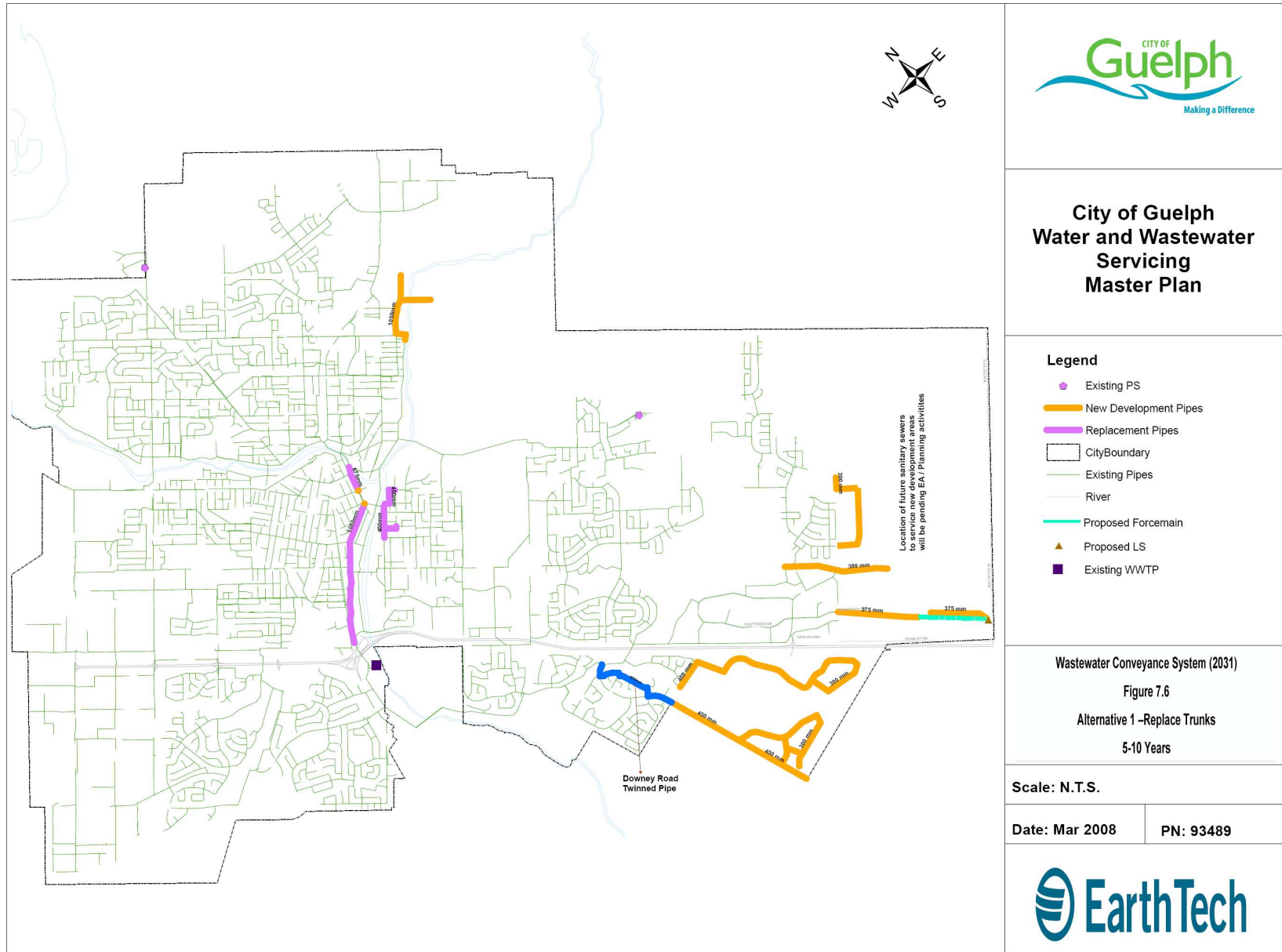
5.3.3. Long-Term Recommendations (2018 to 2031)

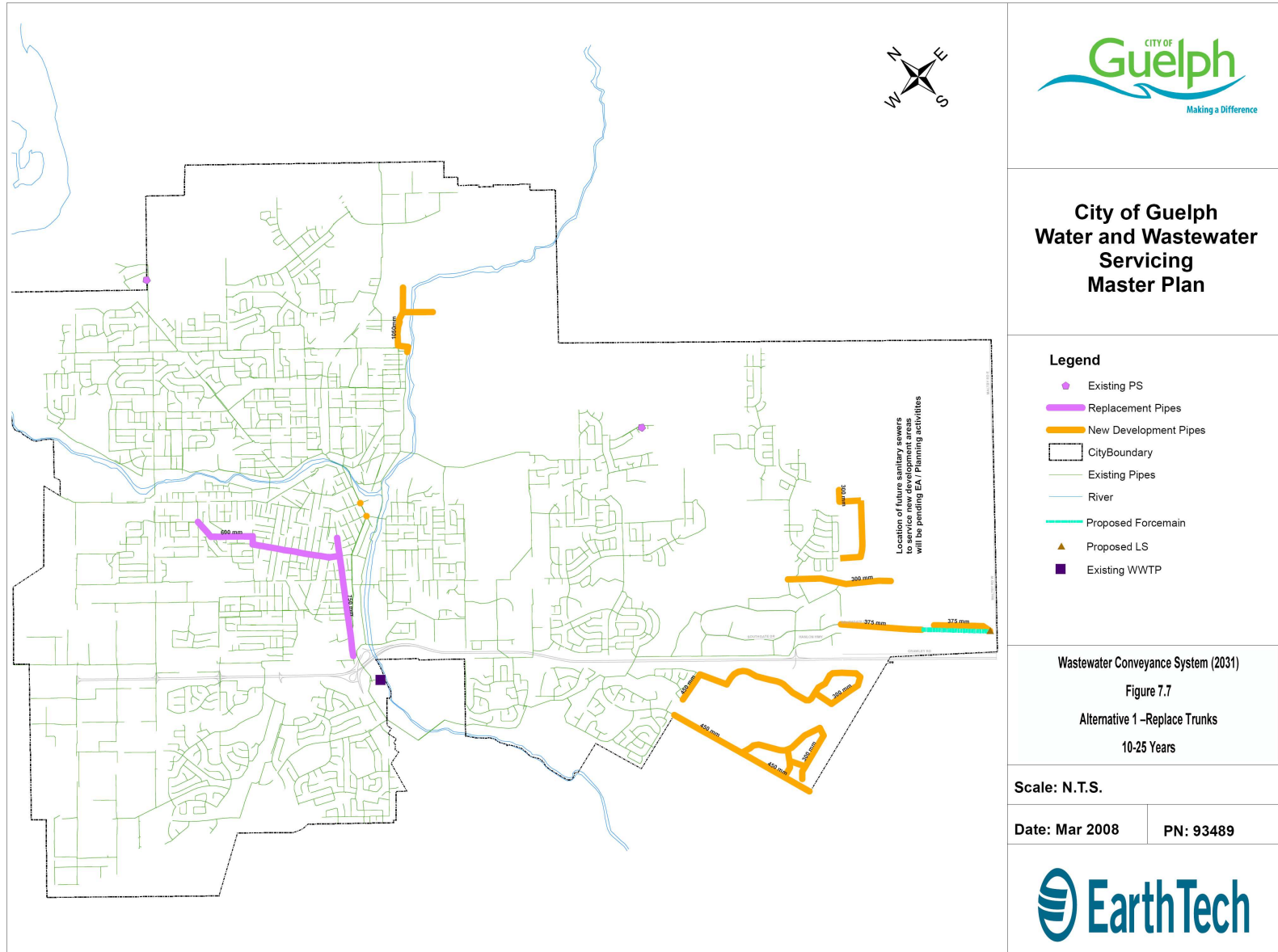
Long-term infrastructure requirements are depicted in Figure 7.7. The main linear infrastructure requirements in the over 10 year timeframe include replacement of the Waterloo Trunk from east of the Hanlon Expressway to Yorkshire Road, and its contributing Yorkshire Trunk.

5.3.4. Project List with Budgetary Estimate and Class EA Schedule

5.3.4.1. Studies

Years	est. timing	Project no.	Project Description	Budgetary Estimate	Class EA Schedule
ongoing	2009	WW-S-1	Camera and structural assessment of all major trunks: York; Speed; Waterloo; capacity review on Hanlon crossing to the WWTP	\$ 250,000	A
0 - 5	2008 - 2010	WW-S-2	Area I&I Studies	\$ 500,000	A
0 - 5	2009	WW-S-3	Review opportunities for capturing energy (via heat exchange) in new trunks	\$ 50,000	A
0 - 5		WW-S-4	Flow monitors - study portion	\$ 150,000	A
0 - 10		WW-S-5	Asset Management	\$ 300,000	A
6 - 25	2016; 2026	WW-S-6	Wastewater Master Plan Update	\$ 600,000	Master Plan EA
		WW-S-7	Stormwater Master Plan		Master Plan EA
Subtotal				\$ 1,850,000	





5.3.4.2. Linear Infrastructure

Years	Project no.	Project Description	Budgetary Estimate	Class EA Schedule
0 - 5	WW-I-0	Flow monitors at Arthur; York; Speed; Downey; South of Clair - installation of permanent facilities	\$ 1,537,500	A
0 - 10	WW-I-1	*Replace existing York Trunk from east of Hanlon to Victoria	\$ 9,136,800	A+ or B
0 - 5	WW-I-2	*Replace Stevenson Trunk from York Trunk to Eramosa Rd	\$ 3,414,150	A
7 - 15	WW-I-3	Replace Speed Trunk from East of Hanlon to Eramosa R.	\$ 4,244,400	A
11 - 25	WW-I-4	Replace Waterloo Trunk from East of Hanlon to Yorkshire	\$ 1,779,300	A
10 - 25	WW-I-5	Replace Yorkshire Trunk	\$ 2,756,681	A
0 - 5	WW-I-6	*Replace Arthur Trunk (Marlborough) from Emma to Kitchener	\$ 540,000	A
0 - 5	WW-I-7	Speedvale Collector from Arthur Trunk to Metcalf	\$ 915,300	A
6 - 10	WW-I-8	*Replace Water St Collector	\$ 861,300	A
6 - 10	WW-I-9	Downey Trunk from Downey to Hazelwood to Teal	\$ 1,620,000	A+ or B
0 - 10	WW-I-10	river & Hanlon crossings (allowance); including relocation catchment area south of river discharging @ river slightly west of Edinburgh	\$ 3,375,000	A+ or B
6 - 25	WW-I-11	*Area Asset Replacement (allowance)	\$ 9,247,500	A
0 - 25	WW-I-12	Siphon improvements	\$ 6,000,000	A+/B
0 - 25	WW-I-13	Infrastructure improvements: manhole improvements; eliminate cross connections (dual functional manholes) etc	\$ 5,000,000	A
0 - 25	WW-I-14	I/I reduction implementation program	\$ 10,000,000	A
development driven	WW-I-15	new gravity sewers - allowance	\$ 23,350,656	A or B
	WW-I-16	new forcemains - allowance	\$ 1,350,000	A or B
0 - 5	WW-I-17	Wastewater effluent re-use "Purple Pipe" (allowance)	\$ 5,000,000	A+/B
Subtotal			\$ 90,129,000	

5.3.4.3. Facilities

Years	Project no.	Project Description	Budgetary Estimate	Class EA Schedule
development driven (0-5)	WW-F-1	*Decommission SPS on Gordon (after installation of sewer)	\$ 2,700,000	A/B
0 - 10	WW-F-2	Improvements to lift stations & forcemains (allowance)	\$ 2,000,000	A
0 - 15	WW-F-3	Storage/Equalization (within trunks - York/Speed; at WWTP)	\$ 8,000,000	A / B
0 - 5	WW-F-4	New SPS in South (ICI) - development south of Clair	\$ 2,025,000	B
development	WW-F-5	Possible new SPS in South (ICI) - future development south of Clair	\$ 2,025,000	B
Subtotal			\$ 16,750,000	