

6. EVALUATION OUTPUTS

To evaluate the various alternatives outlined in Section 5, an evaluation framework and criteria needed to be confirmed through project team and public review. The intent was to define the evaluation framework and criteria to be used to meet short and long term water/wastewater requirements, assess impacts on the natural environment, undertake financial evaluation, and confirm public acceptance and the social and technical/operational issues to be addressed.

Preliminary Environmental Assessment (EA) criteria and a proposed evaluation process were first presented to the project team, agencies, and the general public in early 2008 (see Section 6.5). The proposed criteria (35 in all) and process were revised incorporating the comments received, and then confirmed via the Public Meeting presentation in March 2008. These were finalized in April 2008.

6.1. General Criteria

Evaluation criteria were developed based on the environmental components that address the broad definition of the environment described in the Environmental Assessment Act. Table 6.1 summarizes the EA criteria for the project as described in Section 2.

Table 6.1 - Criteria

Component	Description
Public Health and Safety	<ul style="list-style-type: none"> The ability of an alternative solution to provide safe drinking water under required system pressures and flows, convey sewage for treatment purposes and meet all legislative requirements and regulations.
Natural Environmental	<ul style="list-style-type: none"> Component having regard for protecting the natural and physical components of the environment (i.e. air, land, water and biota) including the natural heritage-environmentally sensitive areas.
Social/Cultural	<ul style="list-style-type: none"> Component that evaluates potential effects on residents, neighbourhoods, businesses, community character, social cohesion, community features and historical/archaeological and heritage components in addition to municipal development objectives.
Economic/Financial	<ul style="list-style-type: none"> Component that compares the potential costs.
Legal/Jurisdictional	<ul style="list-style-type: none"> Component that considers land requirements for each alternative.
Technical	<ul style="list-style-type: none"> Component that considers technical suitability and other engineering aspects of the water and/or wastewater systems.

More specifically, each of the criteria includes a number of issues against which each of the alternatives was evaluated. The aspects of the alternative which correspond to the issue (e.g. potential impacts) were identified and documented and then assigned a qualitative score compared to the other alternatives.

❖ **Public Health & Safety:**

- Ability to meet provincial water quality requirements
- Ability to meet water system pressure requirements, including minimum fire flow and pressures
- Ability to meet storage requirements for peak demands and fire storage
- Ability to meet peak flow capacity at WWTP

❖ **Natural Environmental:**

- Potential effects to the natural environment including siting/routing considerations and/or constraints.
- Potential impacts to water resources e.g. fisheries, stream base flow, aquifers, groundwater.
- Potential impacts to natural heritage features, including provincially significant wetlands (PSWs), environmentally significant areas (ESAs), Areas of Natural and Scientific Interest (ANSIs), and sensitive species habitat (i.e. vulnerable/threatened/ endangered or locally/regionally rare).
- Environmental management planning considerations including mineral resources.
- Odour issues, air quality

❖ **Social Cultural Considerations:**

- Land use impacts/ compatibility.
- Short-term construction related impacts including dust, traffic, access, and noise.

- Potential siting/routing considerations including cultural/ heritage (e.g. archaeological) and/or tourist recreational.
 - Potential impacts from operations including noise and odour
 - First Nations considerations
 - Agricultural resources
 - Potential effects on short term and long term community growth including conforming with municipal and provincial planning policies; i.e. ability to provide adequate servicing to meet City objectives
- ❖ **Economical/Financial Considerations:**
- Estimated capital costs
 - Estimated operations and maintenance costs
 - Impacts to rate payers.
- ❖ **Legal/Jurisdictional Considerations:**
- Complexity of approvals considering current and future regulatory environment
 - Location of new facilities relative to City boundaries (i.e. in or outside) and associated jurisdictional issues.
 - Land Requirements.
 - Administrative functionality.
- ❖ **Technical Considerations:**
- Ability to implement alternative solutions
 - Ability to meet water distribution requirements (pressures, flows, sufficient storage volumes)

- Ability to provide peak flow moderation in wastewater conveyance system
- Maintaining operation during construction; minimizing disruptions/downtime
- Constructability; difficulty of construction (e.g. number of water crossings, tunnels and shafts, deep open cut sections, construction in limited area, protection of utilities, trees etc)
- Schedule and Timing – flexibility for scheduling works
- Water Quality – minimizing dead-ends/ flushing requirements
- Suitability to phased implementation
- Ability to respond to change in regulatory treatment requirements/standards
- Ability of alternative to use existing infrastructure
- Energy requirements
- Operational complexity

The above categories and associated evaluation criteria meet the definition of the environment as defined in the Environmental Assessment Act¹.

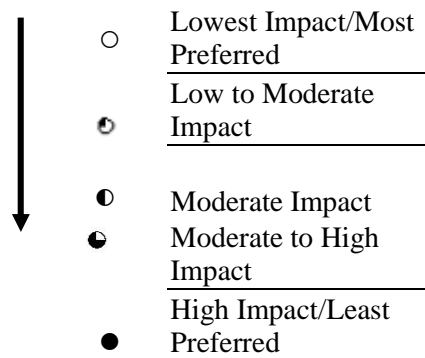
The above environmental components including the associated evaluation criteria are presented in subsequent evaluation tables.

¹ The Environmental Assessment Act (Section 1. (c)(i) to (vi)) defines the “environment” as: “air, land, water, plant and animal life including human life, the social and cultural conditions that influence the life of humans or a community; any building, structure, machine or other device or thing made by humans; any solid, liquid, gas, odour, heat, sound vibration or radiation resulting directly or indirectly from the human activities, or; any part or combination of the foregoing and the interrelationships between any two or more of them, in or of Ontario”. This definition of the environment is used and is reflected in the environmental components used in the evaluation of alternative solutions and design concepts.

6.2. Evaluation Process

Evaluation was not based on a numerical ranking system to ensure statistical validity. Such an approach would have to strictly adhere to statistical methods that are often difficult to apply in a multi-faceted issue such as a Class EA. For example, considerable time and resources can be spent on agreeing on evaluation category weightings (e.g., disagreement on weighting or importance given to a specific category or criteria).

Instead, a descriptive or qualitative evaluation was used to consider the suitability of alternative solutions/strategies, and identify significant advantages and disadvantages with respect to the evaluation criteria. In this respect, comparisons and trade-offs are made between alternatives as described later 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. For information purposes only, the alternatives were ranked in order of preference (based on advantages/disadvantages), under the discussion with respect to each evaluation grouping and criteria describing the environment. For the evaluation, the following rating symbols were applied to each alternative solution and evaluation criteria:



The evaluation of alternative solutions was captured in matrix form to allow for the direct comparison between alternatives.

6.3. Evaluation Results

Each alternative was evaluated utilizing these 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 Tables 6.2 and 6.4.

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. This is discussed further in Section 7 as part of a proposed implementation strategy.

Table 6.2
Guelph Water/Wastewater Servicing Master Plan
Water Servicing Alternatives Evaluation

Evaluation Criteria			A. Do Nothing		B. Limit Growth	C. Water Conservation/ Demand Management		D. 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	<ul style="list-style-type: none"> Ability of Alternative to meet provincial water quality standards and security requirements, having regard to the long-term storage needs and emergency servicing requirements (e.g. fire flows and pressures). 		<ul style="list-style-type: none"> Ongoing water quality/ security / storage/ emergency issues Existing requirements being met Cannot address long term requirements 		<ul style="list-style-type: none"> Reduced security/ storage/ emergency water quality impacts Does not address existing deficiencies wrt system pressures 		<ul style="list-style-type: none"> Increases available supply but does not address security/ storage/ emergency impacts needs 		<ul style="list-style-type: none"> Increases available supply but does not address security/ storage/ emergency impacts needs 		<ul style="list-style-type: none"> 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) 		<ul style="list-style-type: none"> Existing and long term requirements can be met Maintain as single zone easiest to operate and maintain emergency response 		<ul style="list-style-type: none"> Can meet long term requirements System more difficult to operate to meet emergency requirements
	Public Health and Safety Summary														
Natural Environmental Considerations	<ul style="list-style-type: none"> Potential adverse impacts to water resources e.g. stream crossings, groundwater impacts 		<ul style="list-style-type: none"> Potential impacts due to lack of system security in supply 		<ul style="list-style-type: none"> Does not impact water resources 		<ul style="list-style-type: none"> Does not impact water resources Slight decrease in wastewater return 		<ul style="list-style-type: none"> Does not impact water resources Slight decrease in wastewater return 		<ul style="list-style-type: none"> Some water crossings to improve N-S transmission Low potential for adverse impacts to water resources and existing wells 		<ul style="list-style-type: none"> High number of water crossings to improve N-S transmission to maintain single zone 		<ul style="list-style-type: none"> High number of water crossings to improve N-S transmission to maintain single zone; more in-ground storage
	<ul style="list-style-type: none"> Potential adverse impacts to natural heritage features, including provincially significant wetlands (PSWs), environmentally significant areas (ESAs), Areas of Natural and Scientific Interest (ANSIs), and sensitive species habitat 		<ul style="list-style-type: none"> Does not address current natural heritage feature impacts that would worsen 		<ul style="list-style-type: none"> May have natural heritage feature impacts due to intensification 		<ul style="list-style-type: none"> Unlikely to impact natural heritage features 		<ul style="list-style-type: none"> Does not impact natural heritage features 		<ul style="list-style-type: none"> Low to moderate impacts to natural heritage features for new infrastructure (transmission mains) to water system Utilizing Infrastructure already in place. 		<ul style="list-style-type: none"> Moderate to high impacts based on construction activities Significant new infrastructure required 		<ul style="list-style-type: none"> High impacts based on construction activities Significant new in-ground storage required to replace existing elevated tanks.
	<ul style="list-style-type: none"> Environmental management and land use planning considerations 		<ul style="list-style-type: none"> Significant impact to land use planning considerations due to limited capacity 		<ul style="list-style-type: none"> Significant impact 		<ul style="list-style-type: none"> Unlikely to impact land use planning considerations 		<ul style="list-style-type: none"> Does not impact land use planning considerations 		<ul style="list-style-type: none"> Low to moderate land use (booster pumping station between zones) 		<ul style="list-style-type: none"> Increased land use (elevated tower) 		<ul style="list-style-type: none"> Increased land use (need for in-ground storage) at existing facility
Natural Environmental Summary															

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						Unaccounted for Water	Pricing/Controls/ Education	1. Zone 1 - Split in existing PZ 1	2. New Zone 1 elevated tank	3. Zone 1 – change to Closed System					
Social/Cultural Considerations	• Ability to meet municipal and provincial growth targets.		• Cannot meet		• Cannot meet		• Will partially meet growth requirements (very short term)		• Will partially meet growth requirements (very short term)		• Will meet short and long term growth; ability to phase in meets short term growth needs		• Can meet long term needs; does not address short term growth requirements		• Can meet long term needs; does not address short term growth requirements
	• Short-term construction related impacts including dust, traffic, access, and noise.		• Some impacts due to ongoing water/wastewater system degradation		• Some impacts due to intensification		• Little impact		• No impact		• Low to moderate impact for new infrastructure/connections		• Moderate impact for new infrastructure/connections		• Moderate to High impact for new infrastructure/connections
	• Potential land use impacts on agriculture, cultural/heritage (e.g. archaeological) and/or tourist recreational resources.		• Some impacts due to ongoing water / wastewater system degradation		• Little impacts		• Little impact		• No impact		• Low to moderate impact due to land use impacts		• Moderate impact from new elevated tank		• Moderate impact – new facilities at existing PS (expansion into recreational space)
	• Applicability for education program for consumers including Public education of water conservation		• No opportunity		• Some opportunity for demand management		• Good opportunity		• Good opportunity		• Water system optimization utilizing existing infrastructure		• Water system optimization – with need for new elevated storage		• Highest energy alternative – goes against public education objectives
	• Social costs and benefits		• Social cost very high, benefit very low		• Social cost high and benefit low		• Social cost moderate and benefit somewhat low		• Social cost moderate and benefit somewhat low		• Social cost low and benefit high		• Social cost low and benefit high		• Social cost low and benefit moderate
	• Ability to meet “Triple bottom line” test (collectively consider social, economic and environmental impacts and ability to achieve a balanced outcome)		• Cannot meet test		• Can meet test with social and economic impacts		• Can meet test with minimal impacts		• Can meet test with social and economic impacts		• Meets test with minimal impacts		• Meets test with moderate economic and environmental impacts		• Meets test with moderate economic and environmental impacts
	• Compatibility with First Nation Land Uses or Management Plans		• Some potential impacts		• Little impact		• No impact		• No impact		• Minimal		• Minimal		• Minimal
Social/Cultural Summary															

Table 6.2
Guelph Water/Wastewater Servicing Master Plan
Water Servicing Alternatives Evaluation






































Evaluation Criteria		A. Do Nothing	B. Limit Growth	C. Water Conservation/ Demand Management		D. Improvements to Existing System: New Facilities and Watermains					
				Unaccounted for Water	Pricing/Controls/ Education	1. Zone 1 - Split in existing PZ 1		2. New Zone 1 elevated tank		3. Zone 1 – change to Closed System	
Economic/ Financial Considerations	<ul style="list-style-type: none"> Costs Estimated capital costs Estimated operations and maintenance costs 	 <ul style="list-style-type: none"> Low to moderate due to emergencies  <ul style="list-style-type: none"> Low to moderate 	 <ul style="list-style-type: none"> Low to moderate due to intensification  <ul style="list-style-type: none"> Minimal 	 <ul style="list-style-type: none"> Minimal  <ul style="list-style-type: none"> Minimal 	<ul style="list-style-type: none"> N/A N/A 	 <ul style="list-style-type: none"> Moderate to High = \$125M  <ul style="list-style-type: none"> Low 	 <ul style="list-style-type: none"> High = \$142M  <ul style="list-style-type: none"> Moderate 	 <ul style="list-style-type: none"> High = \$146M  <ul style="list-style-type: none"> Very high 			
	<ul style="list-style-type: none"> Ability to avoid or minimize tax increase for residents 	 <ul style="list-style-type: none"> Low to moderate increased cost for ongoing /emergency response 	 <ul style="list-style-type: none"> Some increased cost due to intensification 	 <ul style="list-style-type: none"> Minor increase cost to implement 	<ul style="list-style-type: none"> In essence user rate 	 <ul style="list-style-type: none"> Moderate user rate increase expected 	 <ul style="list-style-type: none"> Moderate to high user rate increase expected 	 <ul style="list-style-type: none"> High user rate increase expected 			
	<ul style="list-style-type: none"> Ability to minimize major infrastructure costs 	 <ul style="list-style-type: none"> Not likely due to increased replacement/ emergency needs 	 <ul style="list-style-type: none"> For most part due only to intensification 	 <ul style="list-style-type: none"> Very good 	<ul style="list-style-type: none"> Excellent 	 <ul style="list-style-type: none"> Significant ability 	 <ul style="list-style-type: none"> moderate 	 <ul style="list-style-type: none"> low 			
	<ul style="list-style-type: none"> Impacts to agricultural operations 	 <ul style="list-style-type: none"> Moderate due to increased use of existing 	 <ul style="list-style-type: none"> Little change from current 	 <ul style="list-style-type: none"> Beneficial due to reduced use 	<ul style="list-style-type: none"> Beneficial due to reduced use 	 <ul style="list-style-type: none"> Limited potential 	 <ul style="list-style-type: none"> Limited potential 	 <ul style="list-style-type: none"> Limited potential 			
Economic/ Financial Summary											

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Water Servicing Alternatives Evaluation

Evaluation Criteria		A. Do Nothing	B. Limit Growth	C. Water Conservation/ Demand Management		D. Improvements to Existing System: New Facilities and Watermains									
				Unaccounted for Water	Pricing/Controls/ Education	1. Zone 1 - Split in existing PZ 1	2. New Zone 1 elevated tank	3. Zone 1 – change to Closed System							
Legal/ Jurisdictional Considerations	• Location inside vs. outside City boundaries and associated jurisdictional issues		• Inside boundaries, no jurisdictional issues		• Inside boundaries, no jurisdictional issues		• Inside boundaries, no jurisdictional issues		• Inside City – no jurisdictional issues		• Inside City – no jurisdictional issues		• Inside City – no jurisdictional issues		
	• Land Requirements		• None		• None		• None		• None		• Likely required for PS and reservoirs. • Easements for transmission main construction		• Required for elevated tank (not City owned land) and PS/ reservoirs • Easements for transmission main construction		• Required for PS/ reservoirs • Easements for transmission main construction
Legal/ Jurisdictional Summary															
Technical Considerations	• Ability to implement alternative		• Status quo resulting in emergency response		• Somewhat difficult to implement given public resistance		• Pilot program in place. Public acceptance needed.		• Relatively simple. Public opposition.		• Moderate		• Moderate to High		• High
	• Maintaining operation during construction		• Difficult given system constraints, stress		• Little impact		• Some impact		• No impact		• Moderate impacts for connection		• Moderate impacts for connection		• High impacts to change to closed system
	• Minimizing disruptions/ downtime		• Potential due to over-taxing of system		• Low amount due to intensification		• Very little		• None		• Minimal		• Moderate		• Moderate to High
	• Constructability		• Emergency response inefficient		• N/A		• Minimal		• N/A		• low to moderate effort to implement		• Moderate effort to implement		• high effort to implement
	• Schedule and Timing		• Status quo emergency response		• Phase in likely over years		• Expand pilot to entire city.		• Subject to public acceptance		• Works can be phased		• Mid-term implementation		• Long term implementation

Table 6.2
Guelph Water/Wastewater Servicing Master Plan
Water Servicing Alternatives Evaluation

Evaluation Criteria		A. Do Nothing	B. Limit Growth	C. Water Conservation/ Demand Management		D. Improvements to Existing System: New Facilities and Watermains						
				Unaccounted for Water	Pricing/Controls/ Education	1. Zone 1 - Split in existing PZ 1	2. New Zone 1 elevated tank	3. Zone 1 – change to Closed System				
Technical Considerations (cont'd)	• Operability		• Emergency response 	• N/A 	• N/A 	• N/A 	• Increase in operational requirements due to additional zone 		• Single zone 1 open system 		• Complicated control system – all emergency requirements pumped 	
	• Expandability		• No, emergency response 	• No, but should be provided as a contingency measure 		• Yes, leadership target 15%+ 	• Yes, subject to public change 		• Land acquisition probably required 	• Land acquisition probably required 	• Land acquisition probably required 	
	• Ability to respond to change in regulatory treatment and permitting requirements/ standards		• No, emergency response 	• Reduced requirements, little flexibility 		• No, not applicable 	• Yes, funding in place via Bill 175 		• Zone split may result in increased flushing requirements (dead-ends) 		• Potential water quality issues may require re-chlorination at BPS 	• Potential water quality issues at distribution system in south may require re-chlorination
	• Ability of alternative to use existing infrastructure		• Overtaxes system, security issues 	• Minimizes future needs 		• Minimizes future needs 	• Maximizes efficient use 		• Use of existing distribution system; optimization of storage 		• New central storage Existing system modification required 	• New storage and pumping facilities • Existing system modification required
Technical Summary												
Total/Final Evaluation	Least preferred ● ○ Most preferred											

Legend

- WTP – Water Treatment Plant
- GRCA – Grand River Conservation Authority
- WWTP – Wastewater Treatment Plant
- OWRA – Ontario Water Resources Act
- Bill 175 – Sustainable Water and Sewage Systems Act

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















Evaluation Criteria	Alternative A "Do Nothing"	Alternative B Limit Community Growth	Alternative C		Alternative D		
			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 6.4 Guelph Water/Wastewater Servicing Master Plan
Wastewater Conveyance Alternatives Evaluation**

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 Forcemain
				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	
Economic/Financial Considerations							
5. Estimated capital and operating costs.	- no capital/operating costs	- low capital/operating costs	- higher capital/operating costs for re-use options - savings through reduced I/I	- moderate capital/low operating costs Est Capital (without storage) = \$68M Est Capital (with storage in pipe) = \$79M Est Capital (with storage in tanks) = \$75M	- high capital/low operating costs Est Capital (without storage) = \$75M Est Capital (with storage in pipe) = \$85M Est Capital (with storage in tanks) = \$80M	- high capital/low operating costs Est Capital (without storage) = \$76M Est Capital (with storage in pipe) = \$86M Est Capital (with storage in tanks) = \$81M	- very high capital and operating costs Est Capital (without storage) = \$81M Est Capital (with storage in tanks) = \$88M
6. Best Use of Existing Infrastructure	- No, leads to degradation, added costs	- Yes, maximizes existing infrastructure use	- In part, reuses existing facilities, reduces treatment infrastructure, creates need for new conveyance infrastructure	- maximizes use of existing infrastructure	- in part, maximizes use of existing infrastructure	- in part, maximizes use of existing infrastructure	- in part, maximizes use of existing sewers and requires significant new infrastructure
7. Cost impacts to municipal finances (i.e. Water/Sewer Rates and DC's)	- no impact except under emergency conditions, then high	- low	- high in short and long term, potential for federal funding	- moderate in short term	- moderate to high in short and long terms	- moderate to high in short and long terms	- moderate to high in short and long term
SUMMARY							
Legal/Jurisdictional Considerations							
8. Complexity of Approvals considering Current and Future Regulatory Environment	- no approvals required, except for emergencies	- reduced effort and needs - planning processes to be reviewed - does not meet municipal objectives	- additional approval processes, regulations	- normal process, less complex	- normal process, less complex	- normal process, less complex	- added approvals for new storage and PS
9. Land Requirements	- no land requirements	- reduced land requirements	- land/easements required	- minor additions to current in some cases, within easements/roadway	- minor additions to current in some cases, within easements or roadway; may require additional land within Royal City Park	- minor additions to current in some cases, within easements	- additional land and/or easements required for storage facility and PS
10. Administrative Functionality	- will require emergency response to failures	- revisions required to facilitate	- added requirements for land and approvals	- standard approach	- standard approach	- standard approach	- additional requirements re: land purchase and approvals
SUMMARY							

LEGEND	Lowest Impact (Most Preferred)	Low to Moderate	Moderate	Moderate to High	High (Least Preferred)
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**Table 6.4 Guelph Water/Wastewater Servicing Master Plan
Wastewater Conveyance Alternatives Evaluation**

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 Forcemain
				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							
<p>1. Potential effects to the natural environment including effect on air, land, water and biota</p> <p>Siting considerations or constraints, (where applicable) including displacements or disruption to natural features:</p> <ul style="list-style-type: none"> - Stream crossings, construction timing - Wetlands - Valley slopes - Floodplains - Terrestrial environment (e.g. woodlands/ground flora) - Soils and geology - Odour issues/air quality - City Environmentally Sensitive Policy Areas (ESPAs); Environmentally Sensitive Areas (ESA's); Areas of Natural and Scientific Interest (ANSIs) - Sensitive species habitat (e.g. vulnerable/threatened endangered or locally/regionally rare amphibians, birds and other wildlife) - Potential effects on environmental management planning considerations (e.g. GMS) 	<p> - little to no impact to waterways, wetlands, slopes, floodplains, wells/aquifers, terrestrial environment, soils/geology, ESPA's, ESA's, ANSI's, sensitive species</p> <p>- inconsistent with current City planning considerations</p> <p>- spills from existing trunks and sewers in poor structural condition an increasing risk</p>	<p> - reduced impact to waterways, wetlands, slopes, floodplains, wells/aquifers, terrestrial environment, soils/geology, ESPA's, ESA's, ANSI's, sensitive species</p> <p>- inconsistent with current City planning considerations</p> <p>- repairs required to existing collection system to mitigate risk</p>	<p> Re-use:</p> <ul style="list-style-type: none"> - potential impacts with respect to waterways, slopes, terrestrial environment, wells/aquifers, soils/geology, ESPA's, ESA's, ANSI's and sensitive species - impacts to floodplains in most instances requiring flood protection/mitigation <p>I/I Reduction:</p> <ul style="list-style-type: none"> - improvements to WWTP performance - reduction in infrastructure capacity requirements - repairs also reduce potential contamination of environment 	<p> - limited land available for replacement of trunk sewers in adjacent land (to keep existing operational)</p> <ul style="list-style-type: none"> - some impacts to waterways, wetlands, slopes, wells/aquifers, terrestrial environment, soils/geology, ESA's, ANSI's - consistent with City planning considerations - impacts to floodplains in some instances requiring flood protection/mitigation - close proximity to Speed River 	<p> - limited land available for replacement of trunk sewers in adjacent land (to keep existing operational) - installation of larger diameter York trunk will result in major disruptions to Royal City Park including loss of vegetation and habitat</p> <ul style="list-style-type: none"> - some impacts to waterways, wetlands, slopes, wells/aquifers, terrestrial environment, soils/geology, ESA's, ANSI's - consistent with City planning considerations - impacts to floodplains in some instances requiring flood protection/mitigation - close proximity to Speed River 	<p> - limited land available for replacement of trunk sewers in adjacent land (to keep existing operational) - installation of larger diameter trunk along Wellington will minimize environmental impact</p> <ul style="list-style-type: none"> - some impacts to waterways, wetlands, slopes, wells/aquifers, terrestrial environment, soils/geology, ESA's, ANSI's - consistent with City planning considerations - impacts to floodplains in some instances requiring flood protection/mitigation - close proximity to Speed River 	<p> - limited land available for replacement of trunk sewers in adjacent land (to keep existing operational) - forcemain installation will minimize disruption to Royal City Park; will require construction of storage and pumping station</p> <ul style="list-style-type: none"> - some impacts to waterways, wetlands, slopes, wells/aquifers, terrestrial environment, soils/geology, ESA's, ANSI's - consistent with City planning considerations - impacts to floodplains in some instances requiring flood protection/mitigation - close proximity to Speed River - some odour issues to be addressed given future residents/business proximity to PS
SUMMARY							

LEGEND	 Lowest Impact (Most Preferred)	 Low to Moderate	 Moderate	 Moderate to High	 High (Least Preferred)
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**Table 6.4 Guelph Water/Wastewater Servicing Master Plan
Wastewater Conveyance Alternatives Evaluation**

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 Forcemain
				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	4. Pumping and Storage of York Trunk
Social Cultural Considerations							
2. Potential effects on short term and long-term community growth including conformity with municipal and provincial planning policies.	- does not facilitate growth - inconsistent with City/Provincial planning policies	- facilitates some short term growth, not long term - inconsistent with City/Provincial planning policies	- facilitates some short term growth, and some long term in future	- facilitates short and long term servicing using existing infrastructure for most part - consistent with City/Provincial planning policies	- facilitates long term servicing using existing infrastructure to some extent - consistent with City/Provincial planning policies	- facilitates long term servicing using existing infrastructure to some extent - consistent with City/Provincial planning policies	- facilitates long term servicing using existing infrastructure to some extent - consistent with City/Provincial planning policies
3. Potential land use impacts (i.e. displacement or disruption) and siting considerations including: - Temporary disruption during construction (i.e. dust, noise, vibrations, traffic management, and pedestrian movement, detours, access to property and maintain existing services; - Potential impacts to sensitive land uses - First Nations considerations - Archaeological/heritage resources - Tourist/recreational resources; and - Agricultural resources	- no temporary construction impacts and to adjacent land uses - will require ongoing repairs - unplanned disruptions - no First Nations issues - no archaeological, tourist/recreational and agricultural impacts	- reduced temporary construction impacts and to adjacent land uses for most part - low potential First Nations issues - reduced archaeological, tourist/recreational and agricultural impact potential	- added construction impacts, and to adjacent land uses given conveyance and end user needs - low potential First Nations issues - potential archaeological, tourist/recreational impacts due to new conveyance and end user needs	- temporary construction impacts and to adjacent land uses - little to no impact on archaeological/heritage, tourist/recreational and agricultural resources.	- temporary construction impacts - major impacts to full extent of Royal City Park - little to no impact on archaeological/heritage, tourist/recreational and agricultural resources.	- temporary construction impacts and to adjacent land uses - disruption to Wellington Rd (Hwy 24) with installation of major Speed River Trunk - little to no impact on archaeological/heritage, tourist/recreational and agricultural resources.	- less temporary construction impacts and to adjacent land uses with forcemain construction; PS will displace community use of part of Royal City Park - possibly sports field - little to no impact on archaeological/heritage, tourist/recreational and agricultural resources.
4. Potential Effects to Public Health & Safety - Safety and movement of pedestrians/vehicles - Effects on ground/surface water quality - Effects on air quality	- no safety/movement impacts - ground & surface water/air quality degrades	- little to no safety/movement impacts - maintains current ground water/air quality	- short term construction safety/movement impacts and long term for new conveyance/end user works - improved ground/surface water quality	- short term construction safety/movement aspects only; coordinated with road reconstruction - little ground water quality and air quality impacts	- short term construction safety/movement aspects only; disruptions to park use - little ground water quality and air quality impacts	- short term construction safety/movement aspects only; disruptions to park use; major disruption to Hwy 24 - little ground water quality and air quality impacts	- short term construction safety/movement impacts with added impact for Speed River crossing - minimal ground water and air quality impacts
SUMMARY							

LEGEND	Lowest Impact (Most Preferred)	Low to Moderate	Moderate	Moderate to High	High (Least Preferred)
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**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 Forcemain
				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 - 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)
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6.4. 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 water quality requirements for effluent re-use for targeting consumers, a pilot program to identify large scale users, public consultation, the infrastructure needed to service these users and how this would have to be integrated into future development policies and requirements should be reviewed.

6.4.1. Preferred Water Servicing Alternative

The preferred alternative for the water distribution system was Alternative 1, as described in Section 5. In summary 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 areas. The proposed boundary split is located approximately along Kortright Road from east to west. The existing Verney and Clair tanks would service 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. Additional piping would also be required would be piping to split zones and minimize deadends and new booster pumping stations and reservoirs (potential locations shown on Victoria Road and Edinburgh Road) to pump water from Zone 1A to Zone 1B.

- Reinforce existing mains in City’s downtown core (Zone 1A): proposed transmission main loop around downtown area
- New East-West and North-South transmission mains in Zone 1A to improve water supply transmission from Woods PS.
- Creation of a new Zone 3 south of Clair Road with a new storage facility and booster pumping station; additional transmission mains are required to create this zone.
- New East West transmission main across Zone 2 (along Speedvale) and additional Zone 2 storage in the vicinity of the Clythe Reservoir.
- Robertson BPS upgrades and expansion
- Guelph Lake storage and BPS
- Modifications to pressure zone boundaries to address high and low elevation issues

In addition to the above proposed upgrades, the model indicates that there are headloss and possible capacity issues in numerous pipes spread throughout the system. A systematic approach to prioritize these based on headloss and pipe diameter was undertaken in order 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 confirm C-factors to undertake assessment at this level of detail.

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

6.4.2. Preferred Wastewater Servicing Alternative

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 in the City. Proposed improvements include the following:

- Trunk Sewer 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 its 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.

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 with an actual to theoretical flow ratio (q/Q) over 0.95. The majority of these are in the downtown area. 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.

Alternative 1 offered the following advantages over the other alternatives:

- Addresses deficiencies in the existing system and the reported 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

6.5. Public Consultation

The following discussion summarizes public consultation activities undertaken through this Master Plan. Further details and reference documents, such as newspaper notices and mailouts, can be found in Appendix G.

6.5.1. Stakeholders

A list of stakeholders was developed which initially included federal and provincial agencies, first nations groups, surrounding municipalities, institutions, utilities, and other interest groups and associations in the City. Through the process after each point of public contact, those who requested to be included on the mailing list for the project were included. Those who attended the Public Information Centres were added to the list for subsequent contact.

Reference Appendix G for the stakeholder contact list, and copies of sample letters mailed at each phase of public consultation.

6.5.2. Project Initiation

Project initiation notices were issued for the water/sanitary 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.

6.5.3. Public Meeting No. 1

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.

The first Public Information Centre 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.

6.5.4. Public Meeting No. 2

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. 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.

6.5.5. 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.