

A decorative graphic consisting of four overlapping, rounded rectangular shapes in blue, green, orange, and purple, positioned above the main title banner.

CANADIAN CONSULTING
ENGINEERING AWARDS
2012

WATER RESOURCES

**SUSTAINABLE HALTON WATER
AND WASTEWATER MASTER PLAN**

SUBMITTED BY AECOM CANADA LTD.



THE ONLY
WAY TO DISCOVER
THE LIMITS OF THE
POSSIBLE
IS TO GO BEYOND
THE IMPOSSIBLE

-Arthur C. Clark, Author

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3. Project Highlights

As part of the Sustainable Halton planning and engineering process, Halton Region hired AECOM to develop an integrated Water and Wastewater Master Plan that provides the framework and vision for long-term water and wastewater servicing to meet population and employment needs to the year 2031. The study area included the South Halton systems in Burlington, Oakville, Milton and the Halton Hills 401 Corridor, as well as the urban systems in Georgetown and Acton. The Sustainable Halton Water and Wastewater Master Plan is the fourth generation of long-term infrastructure planning reports for Halton Region dating back to 1995. Previous approaches were based on area-specific servicing needs. Historical master planning in South Halton was focused on servicing Burlington, Oakville, Milton and the Halton Hills Hwy 401 Corridor, all of which were primarily Lake Ontario-based servicing. In previous studies, the servicing needs in the urban systems in Georgetown and Acton, which were groundwater/stream-based servicing, were reviewed under separate stand-alone studies.

The Master Plan is a critical component in the integrated planning process of the Sustainable Halton program. The expectations were to develop the long-term servicing strategies, produce a capital implementation program and satisfy the Class Environmental Assessment (EA) process for master plans.

The Halton master planning process culminated in the first Region-wide study incorporating all urban service areas and balancing lake-based, ground water and stream-based servicing considerations.

Innovative + Sustainable Methods

AECOM's experts applied technical expertise, innovation and sustainable approaches at each stage of the project. In particular, the goals and expectations of the project were met through the following methods:

1. A very unique and comprehensive master plan document was developed and included a separate Class EA Schedule B volume dedicated to specific file information for each project. This innovative approach presents very clear, concise and detailed information to satisfy the Schedule B projects.

It provides a clear benefit to the public and stakeholders who are reviewing and using the master plan because it synthesizes the information for them, streamlines access, and provides improved clarity and detail.

2. The team was instrumental in developing an updated spatial approach to planning by establishing Small Geographic Units (SGUs), as opposed to using Traffic Survey Zones. The SGUs, would better match existing and future water pressure zones, service areas and wastewater drainage areas. This approach provided more efficient analysis of planning data and better accuracy in projecting water demands and wastewater flows.
3. This master plan undertook a much higher level of detail for intensification analysis including a detailed review of planning allocation within the boundary, hydraulic modeling to analyze the systems, and identification of specific local projects. In order to complete this level of analysis, full pipe models of the water and wastewater systems were used. This approach allowed Halton to review intensification at a local infrastructure level that would never have been possible under typical master plan approaches.
4. In developing the master plan, the team analyzed design criteria, historical water and wastewater use, and appropriate current state of available capacity in each of the lake-based, stream-based and groundwater systems to establish sustainable service areas.
5. AECOM's innovative approach to developing servicing strategies proved to be a successful means of working from concepts to a long list of alternatives, then to a short list of alternatives, to ultimately the preferred solution. AECOM first finalized the preferred growth option/land use plan, and used this planning data as the foundation for developing the servicing needs.

AECOM, in close partnership with Halton Region staff, effectively crafted and delivered an enhanced master plan that provides comprehensive documentation – a “one stop” reference – to convey background information and enhance decision making and the development of the long-term water and wastewater strategies across the Region.

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As evidence of AECOM’s innovation and technical excellence, the Ontario Public Works Association (OPWA) honored this master plan with its 2011 OPWA Management Innovation Award. In a letter supporting another recent award submission, Mitch Zamojc, Commissioner of Public Works at Halton Region said:

“We believe that this innovative plan provides a comprehensive framework and vision for the water and wastewater servicing needs for Halton Region to the year 2031. AECOM’s technical expertise, leadership and innovation proved invaluable in developing a cost-effective strategy that will provide safe, reliable potable water, as well as sound wastewater collection and treatment, to residents and employers of Halton Region for many years to come. The infrastructure included in this master plan will provide benefits to the quality of life for Halton Region’s citizens for the foreseeable future.”

As evidence of AECOM’s innovation and technical excellence, the Ontario Public Works Association (OPWA) honored this master plan with its 2011 OPWA Management Innovation Award.

Terms of References

- The unique terms of reference for this master plan included:
- Review and analysis of water and wastewater servicing requirements
- Review best planning estimates for Growth
- Co-ordinate with numerous local municipalities and review agencies
- Consult extensively with affected citizens and stakeholders
- Address operational considerations
- Perform complex water and wastewater hydraulic modeling
- Complete detailed analysis of design criteria as well as integrated water conservation and efficiency measures
- Balance unique local considerations such as groundwater and lake-based water supply as well as stream and lake-based wastewater treatment
- Perform a detailed level of analysis for servicing intensification areas within the Region’s built boundary
- Update capital cost estimates
- Update infrastructure status, capacity and cost estimates
- Establish a complete and implementable water and wastewater capital program
- Consolidate all project information into comprehensive Master Plan documentation



Burloak Water Purification Plant

4. Project Description

4.1 New application of existing techniques, originality, innovation + creativity that challenges the status quo resulting in a better outcome.

AECOM's professionals applied an innovative and comprehensive approach to provide Halton Region with a plan to effectively implement a very large and diverse capital program. AECOM showed innovation in its approach to:

- Meeting the Municipal Class Environmental Assessment (EA) Master Planning process
- Co-ordinating planning requirements
- Developing the servicing strategies

Technical excellence and innovation in meeting the municipal class EA master planning process

The Municipal Class EA process clearly defines four approaches for completion of Master Plans within the Class EA context, ranging from broad level planning which does not satisfy Class EA Schedule B or C projects (Approach 1) to comprehensive planning documents that satisfy all Class EA projects (Approach 4).

Master planning in Ontario has evolved over the last 10 years from broad level planning documents generally meeting Approach 1, to scopes of work with the intent to meet Approach 2.

While many master plans have been completed under Approach 2, the level of detail available for the full list of Schedule B projects has sometimes been limited. AECOM's approach to the Sustainable Halton Water and Wastewater Master Plan was innovative, unique and comprehensive in that it provides very clear, concise and detailed information to satisfy the Schedule B projects. In fact, the final master plan documentation included a full volume dedicated to Class EA project file information. This documentation format provides direct benefit to the public and stakeholders reviewing and using the master plan because it synthesizes the information, streamlines access, and provides improved clarity and detail.

Technical excellence and innovation in co-ordinating the planning requirements

The basis for the long-term planning requirements for the master plan are the Best Planning Estimates (BPEs) provided by Halton Region. The BPEs are the result of a co-ordinated effort between Regional planning and local municipality planning to establish yearly residential and employment growth targets consistent with the Ontario Government's Places to Grow Act. The Sustainable Halton Water and Wastewater Master Plan team demonstrated leadership and innovation in utilizing these planning projections. The team was instrumental in developing an updated spatial approach to planning through establishing Small Geographic Units (SGUs), as opposed to using Traffic Survey Zones (TSZs), which would better match existing and future water pressure zones, service areas and wastewater drainage areas. This approach provided more efficient analysis of planning data and better accuracy in projecting water demands and wastewater flows.

In addition, this master plan undertook a much higher level of detail for intensification analysis. In order to support the detailed modeling required, the master plan team worked closely with Halton Region planners to further refine the planning data within each SGU. This approach allowed Halton to review intensification at a local infrastructure level that would never have been possible under typical master plan approaches.

This innovation not only benefited the master plan team, but it will also provide ongoing benefit to the planning groups moving forward. This defined approach will streamline future processes and will ensure that formatting of critical planning data will be available on a go-forward basis. This improves the efficiency and cost of future work – a key benefit to the Region and stakeholders.

Technical Excellence and Innovation in Developing the Servicing Strategies

AECOM's innovative approach to developing servicing strategies proved to be a successful means of working from concepts to a long list of alternatives, then to a short list of alternatives, to ultimately the preferred solution. AECOM first finalized the preferred growth option/land use plan, and used this planning data as the foundation for developing the servicing needs. AECOM then evaluated and selected the preferred servicing strategies by:

1. Generating a long list of water and wastewater concepts for the lake-based, groundwater-based and stream-based systems
2. Evaluating the long list of concepts to short-list preferred servicing concepts
3. Generating specific servicing alternatives from the short-listed concepts by determining specific infrastructure needs, locations and capacity for each alternative
4. Evaluating the servicing alternatives using Triple Bottom Line evaluation criteria
5. Establishing the preferred water and wastewater servicing strategies, including the capital and implementation programs

This approach proved innovative compared to typical master planning approaches because:

1. It provided servicing input to the decision making of "where to grow" early in the process
2. It presented servicing concepts simply, which garnered positive responses from the public and interested stakeholders as they could easily understand the strategies
3. It provided a straight-forward, easily followed evaluation process for the long list of alternatives
4. It provided detailed evaluation processes for the short-list of alternatives

The servicing concept maps for the water (page 4) and wastewater (page 5) were established as the foundation for developing the ultimate servicing needs.

LEGEND:

- CONCEPTUAL ZONE BOUNDARIES
- EXISTING BOOSTER PUMPING STATION
- EXISTING RESERVOIR
- EXISTING WATER TREATMENT PLANT
- EXISTING ELEVATED TANK
- EXISTING STANDPIPE
- EXISTING WELL
- PROPOSED BOOSTER PUMPING STATION
- PROPOSED RESERVOIR
- PROPOSED WATER TREATMENT PLANT
- PROPOSED WELL
- EXISTING WATERMAIN
- PROPOSED WATERMAIN
- WILTON OFF-LAKE WATER
- LAKES, RIVERS & CREEKS
- AIB
- ESA
- PROVINCIAL SIGNIFICANT WETLANDS
- REGIONAL WETLANDS
- NAGRA ESCARPMENT
- GREENBELT
- GREENLANDS
- 2021 SERVICING
- 2031 SERVICING
- 2031 SERVICING ALT

Water 1A – Georgetown & Milton East / HH 401 Corridor fed from Zone 4 Reservoir

Milton Z4 W - Extend WM off Britannia Rd W. / Tremaine Rd

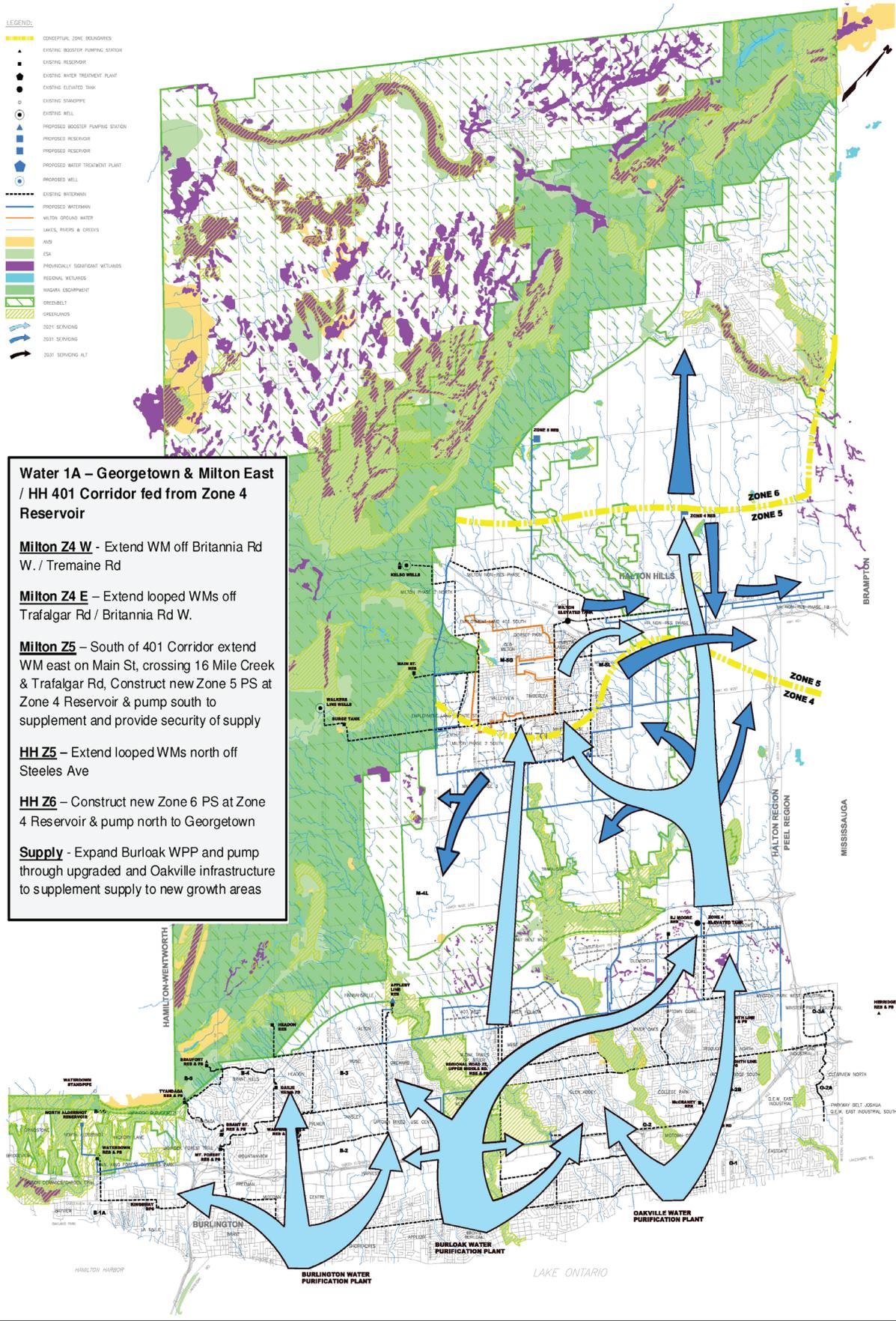
Milton Z4 E – Extend looped WMs off Trafalgar Rd / Britannia Rd W.

Milton Z5 – South of 401 Corridor extend WM east on Main St, crossing 16 Mile Creek & Trafalgar Rd, Construct new Zone 5 PS at Zone 4 Reservoir & pump south to supplement and provide security of supply

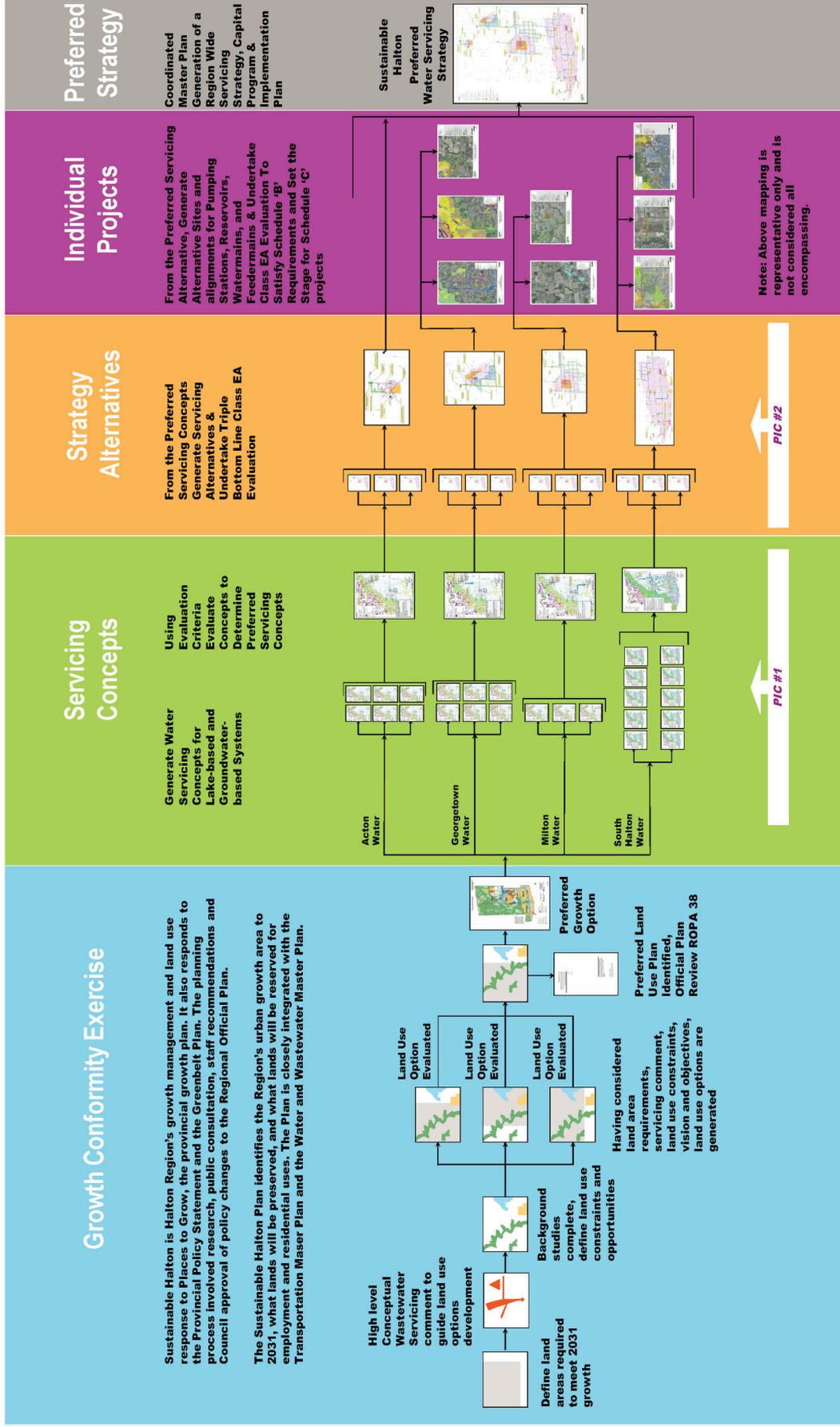
HH Z5 – Extend looped WMs north off Steeles Ave

HH Z6 – Construct new Zone 6 PS at Zone 4 Reservoir & pump north to Georgetown

Supply - Expand Burloak WPP and pump through upgraded and Oakville infrastructure to supplement supply to new growth areas



Water



AECOM's approach to developing the preferred service strategies was innovative + comprehensive

4.2 Complexity

AECOM and the master planning team addressed many complex challenges throughout the duration of this project, including the development of the Class EA project file documentation and the intensification analysis.

Complexity in the Class EA Project File Documentation

AECOM provided very clear, concise and detailed information to satisfy the Schedule B criteria to meet the Class EA master planning process. For each project, a file was established that provided:

1. A project tracking sheet to describe the scope and summarize the rationale and decision making for the project
2. A Class EA evaluation matrix for the alternatives considered
3. Alternative solutions mapping to easily depict the options considered
4. Preferred solution map to easily depict the project including location, alignment and sites
5. Preliminary plan and profile drawings for water main or sewer projects as well as flow calculations
6. Detailed site maps for new and expanded facilities

The comprehensive nature of this documentation proved very complex, but resulted in an easily understandable document with improved clarity and sufficient detail for decision making in the future.

Complexity in the Intensification Analysis

A fundamental component of the Places to Grow Act is providing growth within the existing built boundary of Halton Region. The Province's Growth Plan identifies that by 2015 and for each year thereafter, Halton Region must have a minimum of 40 percent of all residential development occurring annually within its year 2006 built boundary. The approach for the intensification analysis under the master plan was two-fold:

1. Complete a Region-wide review of the existing systems, both trunk and local, and identify high-level opportunities and constraints to support intensification
2. Perform detailed hydraulic modeling to identify specific projects related to the proposed intensification

The first stage provided an innovative and comprehensive approach to quick review of the impact of intensification. This also provided constructive feedback to the Region and local municipality planners to refine their intensification plans. The analysis was further refined, including detailed review of planning allocation within the built boundary, hydraulic modeling to analyze the systems, and identification of specific local projects.

In order to complete this level of analysis, full pipe models of the water and wastewater systems were used. This leveraged the complex work completed by Halton Region and AECOM to develop, update and calibrate the 48,000-pipe water model and 26,000-pipe wastewater model. This level of analysis within the local distribution and collection systems as part of a master planning exercise has not typically been provided in past master plans and is indicative of Halton's commitment to a comprehensive Sustainable Halton Water and Wastewater Master Plan document.



Mid-Halton Wastewater Treatment Plant

4.3 Contribution to Economic, Social or Environmental Quality of Life

The AECOM team successfully crafted a master plan that will help maintain the financial well-being of Halton Region for its citizens and provide for the efficient staging of development to the year 2031. In developing the Sustainable Halton Water and Wastewater Master Plan, AECOM was able to leverage previous servicing strategies and develop new strategies without creating a cash flow imbalance and without impacting the timing of any existing or future capital programs.

Additionally, the capital programs will be used as the baseline for the Region's capital budgets and will form the foundation for the water and wastewater components of the Region's Development Charges By-Law. The implementation and financing program is unique to Halton Region and provides economic benefit as it ensures sustainable delivery of a very large capital program. Using the master plan as the foundation document, the Region engaged its Finance department as well as the development community to ensure that the infrastructure "supply" will meet the development "demand." This approach minimizes financial risk to the Region, and focuses on the appropriate allocation of resources since the master plan recommendations are only constructed to the areas of need. This is a perfect example of theory in infrastructure planning meeting the reality of the needs on the ground.

Key elements to the success of establishing the long term capital plan, meeting the unique servicing needs of each service area, and providing for efficient staging of development include:

- Extended servicing for Greenfield areas from currently planned 2021 infrastructure such as adding a future pumping station to a planned reservoir site
- Incorporated water treatment plant optimization at the Oakville Water Purification Plant (WPP) which provided opportunity to defer major expansion at the Burloak WPP
- Staged new water feedermain installation in Zones 1, 2 and 3 to make use of available capacity in the Burlington WPP which also provided opportunity to defer major expansion at Burloak WPP
- Allowed for interim use of sewage pumping station capacity in order to defer construction of future trunk sewers and new sewage pumping stations
- Maximized the groundwater service area in Milton to reduce need for increased lake-based capacity
- Introduced a future delineation of groundwater and lake-based service area for Georgetown which will allow for continued infill on groundwater and ultimate phasing of new lake-based supply
- Allowed for focused strategic oversizing on only key trunk infrastructure and allowed for future infrastructure corridors to support long term servicing beyond 2031

The direct benefit and effect on the provision of services to the public is that the Sustainable Halton Water and Wastewater Master Plan has provided the most cost-effective and sustainable capital program for the Region. A cost-effective master plan has direct impact on Development Charges — minimizing the cost for development ultimately translates to minimizing the cost of housing. A sustainable plan also minimizes the long-term costs of the systems, which translates to minimizing water and sewer bills for the homeowners.

The public can also be assured that the Sustainable Halton Master Plan incorporated all key background studies, including those on the Natural Heritage System, groundwater sustainability and significant environmental features, as part of the evaluation process and selection of infrastructure alignments and sites. This provides a long-term plan which balances environmental protection, mitigates environmental impacts and minimizes impact on quality of life with respect to enjoying the natural environment.

This process also resulted in maximizing the groundwater service areas in Milton and Georgetown in specific response to public interest.

The Sustainable Halton Water and Wastewater Master Plan is at the very root of providing safe, reliable potable water to the residents and employers of Halton Region and ensuring safe wastewater collection and treatment. Infrastructure planning has direct benefit to quality of life.