THE REGIONAL MUNICIPALITY OF YORK

Environmental Services Committee
February 9, 2011
Report of the
Commissioner of Environmental Services

INFLOW AND INFILTRATION REDUCTION STRATEGY

1. RECOMMENDATIONS

It is recommended that:

1. Regional Council endorse the Inflow and Infiltration Reduction Strategy (the Strategy), subject to minor adjustments to the final drafts arising out of the pre-submission consultation with the Ministry of the Environment. Through development and endorsement of the Strategy, York Region and local municipalities commit to:
   - Develop and maintain this Strategy including the programs, goals and inter-agency and regulatory reporting requirements for staged reduction of inflow and infiltration over the next 20 years
   - Recommend to future Councils that they commit funds for inflow and infiltration reduction that is economically justified by the avoidance of future treatment and conveyance costs
   - Measure wastewater flows before and after carrying out construction/rehabilitation works on sewers and to document inflow and infiltration expenditures and flow reduction measures
   - Continue to work together in a collaborative manner over the life of the Strategy and to commit the appropriate staffing and financial resources toward implementation of the Strategy based on a business case analysis
2. The Regional Clerk circulate this report to the Clerks of local municipalities.
3. The Regional Clerk forward a copy of this report to the Ministry of the Environment, Central Region Office.

2. PURPOSE

The purpose of this report is to present the Strategy developed in accordance with the current Inflow and Infiltration Reduction Program and pilot projects and requirements of the Conditions of the Minister of the Environment as part of the approval of the Southeast Collector Trunk Sewer Individual Environmental Assessment. York Region is the first Regional Municipality required by the Ministry of the Environment to meet such unique and stringent conditions related to inflow and infiltration in Regional and local sewer systems.

The Strategy provides an overview of current inflow and infiltration and describes the targets, activities, timelines and milestones of future objectives and programs being considered by the Region and local municipalities to manage inflow and infiltration.

3. BACKGROUND

Reducing inflow and infiltration has been an integral part of servicing considerations by the Region since the first Water and Wastewater Master Plan was developed in 1997. The 2001 York Durham Sewage System Master Plan update specifically identified water conservation and extraneous flow reduction as a significant design consideration for all York Durham Sewage System projects. In combination with alternatives considered during the Southeast Collector Trunk Sewer Individual Environmental Assessment, inflow and infiltration reduction efforts across the Region were increased in 2007 with Regional Council approving a commitment of $23 million in the 10-year Capital Plan with ongoing efforts by both Regional and local municipal staff to control inflow and infiltration.

Although advances in inflow and infiltration reduction measures have been significant, a considerable amount of additional work is now required to meet the Minister's conditions. In summary, approval of the Southeast Collector Trunk Sewer is subject to stringent conditions based upon the following overall directions:

- A compliance, monitoring and reporting program is to be established
- York Region is required to establish a stakeholder advisory committee consisting of representatives from local and regional municipalities, agencies, environmental groups and residents
- A review of best in class inflow and infiltration reduction strategies are to be completed in conjunction with the Region and the local municipalities and an independent peer review of the Strategy is to be presented to the advisory committee, and submitted to the Ministry of the Environment
- A performance management plan is to be developed and then submitted to the advisory committee and the Ministry of the Environment

To date, York Region and local municipal inflow and infiltration reduction pilot programs have focused on identifying and reducing flows originating from public infrastructure. However, inflow and infiltration flows from private sources are common in the local municipalities within the Region. Based on similar systems across North America and the findings of the Industry Practice Scan, it is estimated that 50%–70% of all inflow and infiltration comes from private property sources.

Inflow and infiltration is inherent in York Region's sewer system

As sewer systems age, infrastructure tends to deteriorate and the likelihood that inflow and infiltration will enter the sewer tends to increase and consume additional sewer capacity. Poor construction practices and guidelines can also contribute to the amount of inflow and infiltration in the system. This extra volume of water can potentially overload the sewage collection system pipes causing back-ups. Raw sewage overflows can also occur during storm events posing risks to public health and the environment. Additional costs are incurred to convey and treat these extraneous flows.

2011-2031 inflow and infiltration reduction strategy developed in partnership with local municipalities

The purpose of the Strategy is to document and describe the recommended program and the implementation sequence for the Region and local municipalities to reduce flows from sewer systems within the Region.

The Region formed an Inflow and Infiltration Task Force in April 2010 to successfully develop a comprehensive Strategy that addresses the Minister's Conditions. The Task Force is comprised of representatives from all nine local municipalities and the Region and is responsible to review inflow and infiltration issues and formulate an overall direction for development and implementation of the Strategy.

The Strategy outlines efforts required to reduce flows and addresses the conditions as described above. The resulting action plan is based upon previous project experience, input from the Task Force and findings from the Industry Practice Scan and Peer Review Process. Throughout development of the Strategy, York Region and the local municipalities have worked collaboratively to identify the various activities and roles of their respective organizations to help support program implementation.

4. ANALYSIS AND OPTIONS

Establishing inflow and infiltration goals and targets is key to program success

The Southeast Collector Trunk Sewer Individual Environmental Assessment contained a detailed evaluation of the effectiveness of water conservation and inflow and infiltration reduction measures across several municipalities. An instantaneous peak flow reduction of 10% within the Southeast Collector during a 25 year storm event was the target outlined in the Southeast Collector Trunk Sewer Individual Environmental Assessment. This amount of instantaneous peak reduction corresponds to a volumetric reduction of approximately 71 megalitres over a 24 hour period under a 25 year storm event. Reducing this volume will be accomplished through the combined efforts of the Long Term Water Conservation Strategy and the Inflow and Infiltration Reduction Strategy. The 10% peak reduction is approximately a 15% reduction in 2031 average day flows.

Preliminary assessment indicates that the Long Term Water Conservation Strategy will contribute 40%-50% of the overall reduction required, leaving approximately 41 megalitres per day targeted for inflow and infiltration reduction. The Long Term Water Conservation Strategy is defined in a separate report on the Environmental Services Committee February 9, 2011 agenda.

Through development and endorsement of the Strategy, York Region and local municipalities commit to:

- Develop and maintain this Strategy including the programs, goals and inter-agency and regulatory reporting requirements for a staged reduction of inflow and infiltration over the next 20 years
- Recommend to future Councils that they commit funds for inflow and infiltration reduction that are economically justified by the avoidance of future costs to treat and convey inflow and infiltration
- Measure wastewater flows before and after carrying out construction/rehabilitation work on sewers and to document inflow and infiltration expenditures and flow reduction measures
- Use the information for future inflow and infiltration reduction processes.
- Continue to work together in a collaborative manner over the life of the Strategy and to commit the appropriate resources towards the implementation of the Strategy

Inflow and infiltration reduction program timelines span a 20 year period and beyond

The schedule and timeline for achieving inflow and infiltration reduction goals are preliminary and will be updated as progress is made through implementing the Strategy. Final timing of activities is contingent upon successful implementation of preceding activities.

A series of short term and ongoing activities is required to ensure that adequate planning activities are conducted and that resources are available to implement the Strategy. The Strategy will be submitted to the Ministry of the Environment on March 31, 2011. Annual performance management plans will be developed and submitted. Subsequent Strategy updates will be developed with the Region and local municipalities and submitted every five years.

Investigating and mitigating inflow and infiltration sources will ensure program success

Sanitary sewer system investigations are key in determining where critical areas of inflow and infiltration are occurring due to direct storm water connections, degrading infrastructure or improper installation.

Sanitary sewer investigation techniques include:

- Smoke testing
- Closed circuit television mainline inspection

- Closed circuit television lateral inspections (in many cases both private and public laterals)
- Manhole inspections
- Flood/dye testing
- Household drainage inspections

In February 2008, the York Region and local municipal Inflow and Infiltration Reduction Program started as a cooperative effort between the Region and the nine local municipalities. Approximately 25% of the entire wastewater system was monitored through 121 flow monitoring locations. A total of 77 locations were indentified as having inflow and infiltration. These were prioritized to 26 locations in which inspections were conducted. Data collected during the program was used to identify specific defects that could be targeted for inclusion as potential remediation pilot projects.

A total of 1,585 manholes were inspected and analysed. More than half of the manholes did not appear to have structural defects. None of the manholes inspected demonstrated catastrophic failure. Twenty-two manholes had significant infiltration occurring at the time of inspection. Closed circuit television inspections were completed and analysed for 84 kilometres of mainline pipes in the local municipalities. Defective joints and encrustation were the most predominant defects. As the target area for the original flow monitoring was focused on older clay and concrete mains, this trend was expected. Two-thirds of the pipes were assigned a low inflow and infiltration potential with the remaining third having a high inflow and infiltration score.

Closed circuit television lateral inspections were analysed for approximately 80 kilometres of pipes. The majority of the laterals inspected did not have significant service defects. Minor defects were encountered in 200 inspections, moderate defects were found in 33 laterals inspected, and none of the pipes were deemed to be in detrimental repair. The most frequently encountered defects were defective joints, roots and encrustations. The majority of the pipes inspected were assigned a low inflow and infiltration score.

Asset management condition assessment programs are used to identify system deficiencies

Recognizing that the Region and local municipalities each conduct ongoing condition assessments as part of their asset management programs, any procedures utilized should recognize inflow and infiltration as a system deficiency. Ongoing condition assessment and any future inspections specific to inflow and infiltration reduction should complement this Strategy.

Appropriate inflow and infiltration investigation methods must be used to locate sources of inflow and infiltration. Standardized inspection procedures will lead to the development of a rehabilitation plan which includes the appropriate and cost-effective rehabilitation techniques that should be implemented to resolve inflow and infiltration related problems.

Bylaw enforcement for sewer inspections will help reduce inflow and infiltration from private property

To ensure access to the private portion of the sewer network, the Region and local municipalities will ensure that their respective sewer use bylaws include provisions such as right of entry or inspection that will allow for inspection access by the municipality or their contractors.

These bylaws can be used to access the property for all related work, including installing cleanouts, liners or new pipe as well as conducting closed circuit television work on laterals.

Currently, the City of Vaughan, Towns of Markham and Georgina have bylaws which stipulate access be given to staff into areas where wastes or storm waters are discharged for the purpose of inspection and examination of processes, private sewer connections and other works.

A best in class review of private access bylaws will be conducted with Regional and local municipal staff to formulate common language and direction for Region wide adoption.

Communication and education of inflow and infiltration reduction program is necessary

Communications, education and advocacy have been identified as necessary components required to achieve inflow and infiltration reduction in York Region. A coordinated team of Regional and local municipal staff will oversee the creation of clear and consistent messaging with a consistent brand identity for use both internally and externally with various stakeholder groups. The communications and advocacy staff team will work closely with other members of the program team to create a communications plan that will meet the needs of the evolving program.

Communications and advocacy will play a strong support role in working with technical staff to deliver key messages to various stakeholders. Key focus areas are:

- Internal communication for Steering Committee and staff
- External communication for council, public and other agencies
- Development of consistent and appropriate messaging (for council, public, other agencies)
- Coordination with leadership and advocacy to identify stakeholders
- Development of communication plan (timing, media, based on communication template, etc.)

York Region and municipal staff will work in collaboration to develop materials, workshops and tools required to assist staff in meeting the goals and objectives of the inflow and infiltration reduction program. The communications and advocacy team will liaise with regulatory compliance and policy staff to ensure that current and future works comply with all applicable regulations.

Continued industry communication and outreach will help build strong program and construction standards

The Inflow and Infiltration Reduction Program will consult with industry stakeholders on a regular basis to ensure that developing policies and standards meet the needs of inflow and infiltration reduction and the building/construction industry. Ongoing communication through an industry advisory committee could engage the various stakeholders. Stakeholders that will be included in this type of consultation are: building inspection officials, product and equipment manufacturers, engineering and design consultants, sewer and water contractors, developers and local homebuilders associations, environmental regulators, conservation authorities and trade groups.

The communications and advocacy staff team will identify opportunities to promote the ongoing inflow and infiltration reduction work to the water and wastewater industry through conferences, workshops, webinars, trade magazines and seminars. Continuous improvement efforts, partnerships for research, innovation and demonstration projects will be explored.

These relationships will ensure integrity of program and construction standards and will create support from industry practitioners for implementation of these standards in new development and construction.

Best in class practice research study shows York Region's strategy is leading edge

As part of the Strategy development, a comprehensive best in class practice research study of 16 International and North American agencies was conducted. The agencies selected for the best in class review had current strategies, were indentified as leading practitioners within other industry program reviews, and had a reputation among practitioners as being progressive with well documented programs. The selected agencies shared similar problems and approaches to inflow and infiltration as experienced within York Region. Each agency had well documented components of a strategy, a similar governance structure, and was considered progressive in reducing inflow and infiltration and had similar goals and objectives to the Regional program.

Of the 16 agencies where the highest level of research was completed:

- Four were International (Greater Dublin – Ireland, Mullumbimby-Australia, Auckland – New Zealand and North Shore City –New Zealand)
- Five were Canadian (Metro Vancouver and Capital Regional District - British Columbia, Halifax Regional Municipality - Nova Scotia, the Region of Niagara and Region of Waterloo in Ontario)
- Seven were American (Metropolitan Council-St. Paul Minnesota , Western Lake Superior Sanitary District, Renewable Water Resources-South Carolina, Milwaukee Metropolitan Sewerage District, Wisconsin, King County, Washington Metropolitan Sewer District of Greater Cincinnati, and Massachusetts Water Resources Authority

Peer review provided positive feedback and suggested increased flow monitoring and private property rehabilitation

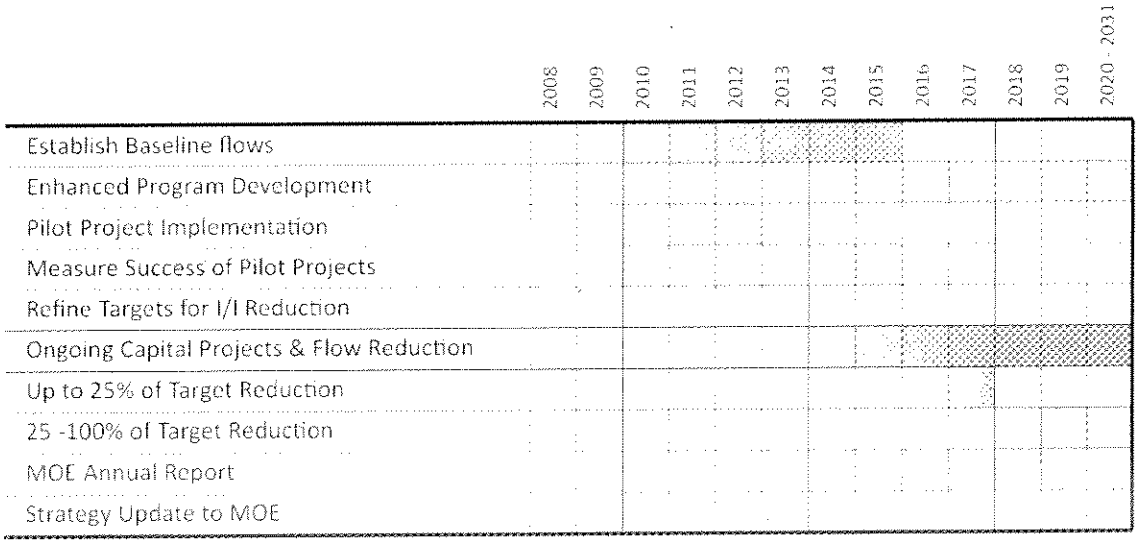
A peer review of the Strategy was completed along with the best in class practice scan. Metropolitan Council, St. Paul Minnesota; Milwaukee Metropolitan Sewerage District, Wisconsin; King County, Seattle; and Metropolitan Vancouver all took part in the Peer Review and provided comments and recommendations on the Strategy, timelines, deliverables and program components.

In general, participating agencies endorsed the Strategy and confirmed that the document was well presented, comprehensive and met and often exceeded industry practice. Key comments include:

- A more robust flow monitoring program across the Region and local municipalities to accurately set a baseline
- Stronger and earlier consideration for private property rehabilitation and renewal in the Strategy
- The Task Force approach was felt to yield a more consistent focus for the program's longevity
- The Strategy lays good foundation to help the Region and local municipalities begin the infancy action plan to successfully build a sound asset management program

Table 1 provides a breakdown of the inflow and infiltration reduction program and component timelines based on continuing the current program and implementing new tactics.

Table 1
Inflow and Infiltration Reduction Region and Strategy Timelines



5. FINANCIAL IMPLICATIONS

The objective of the funding component is to develop a sustainable source of funding to support the long term implementation of the Strategy that is equitable to the partners and community while addressing inflow and infiltration reduction targets.

Being a two tier system, local municipalities currently have responsibility for ensuring that the local sanitary collection system is maintained and operating effectively. Programs are funded at the municipal level with each municipality determining annual capital requirements based on asset condition. Funding sources for these programs are primarily derived from user rates calculated based on water consumption flows. Alternate funding has also been made available from time to time from various Provincial and Federal infrastructure programs.

The Region is responsible for transmission of sewage from the local systems to final treatment facilities as well as final treatment. Funding for the Regional system is provided through wholesale user rates incorporated into the local water/sewer billing and Development Charges Rates. The Region applies this funding primarily to the Regional infrastructure with some contribution towards infrastructure studies that benefit the local municipalities. Studies typically recommend improvements which are then implemented by the local municipalities. Until recently, there has been limited capital investment from the Region for improvement of the local systems. With the Region's recent 2007 program for flow monitoring and associated pilot projects, a significant investment of $23 million was approved for the local systems across the Region.

Proposed system wide collaborative funding model will sustain inflow and infiltration reductions over the long term

The Inflow and Infiltration Reduction Strategy will be supported by a collaborative long term funding model based on a cost shared approach between the two tiers of local government. The key funding principles are:

- A set rate will be collected at both the local and Regional level as identified through the needs of the Strategy and as agreed to by the municipal partners
- The amount collected at the local level will be used to address priorities identified both through the Strategy and as determined by each local municipality
- The amount collected at the Regional level will be used to address Regional inflow and infiltration priorities both at the Regional and local level
- The allocation of Regional funds intended for use in the local systems will be managed and allocated by a joint team with staff representatives from each municipality and the Region. Funding will be granted based on the most effective application to achieve the desired inflow and infiltration improvements as quickly as possible

In the absence of a full program scope and based on staff estimates, an initial funding target of $100 million over a 20 year period was used to assess the proposed funding requirements. This equates to an annual investment of $5 million per year across the

Region. The proportionate share based on an average cost of $0.04 per cubic meter of water sales ($0.02 of the local municipal rate and $0.02 on the Regional rate). Where system improvements can be made to create an overall standing reduction in inflow and infiltration and thereby increasing system capacity, Development Charges Funding will be used.

From the $23 million that Regional Council approved in 2007 as part of the 10 year Capital Plan:

- $5 million has been spent in 2008-2010 on flow and rainfall monitoring and analysis
- $10 million will be spent in 2011-2012 on nine local municipal high priority pilot projects for inflow and infiltration rehabilitation
- The remaining $8 million will be spent in 2013 and beyond as part of Inflow and Infiltration Reduction Strategy

Strategic financial action plan to ensure funding model adapts to program findings

Short Term (1-5 Years) – Actions on the financial plan include the following:

- Develop preliminary cash flow plan to establish interim funding requirements
- Establish reserves where necessary to maintain funds
- Investigate other funding strategies used in governments with successful inflow and infiltration reduction programs
- Review funding and financing options to address private side inflow and infiltration reduction
- Establish process to identify and apply for alternative external funding sources
- Investigate development charge collection for equitable proportion of funding
- Establish appropriate governance and coordination model to manage overall funding and prioritization exercise effectively
- Initiate governance meetings
- Implement early phases of capital projects to achieve long term objectives

6. LOCAL MUNICIPAL IMPACT

Local municipal endorsement of the Inflow and Infiltration Reduction Strategy required to fulfill conditions of approval

Local municipal staff have been involved in the development of the Inflow and Infiltration Reduction Strategy through participation in the Water and Wastewater Steering Committee. Local municipal staff have committed to bring reports to local Councils to seek endorsement of the Inflow and Infiltration Reduction Strategy by March 31, 2011 to fulfill conditions of approval for both the Southeast Collector Trunk Sewer Individual Environmental Assessment.

Successful implementation of this program will require access to private property

Private property infrastructure generally refers to sewer service laterals, which connect building plumbing to the municipality's sanitary sewer systems. In some cases the private property infrastructure might also include collection pipes, pump stations, and/or treatment plants. Potential sources of inflow and infiltration from private property include: broken sewer laterals, root intrusions into laterals, uncapped sewer cleanouts, and cross connections from roof drains and/or foundation drains. Sump pump cross connections are an additional source of inflow and infiltration. The total length of the wastewater collection system in the York Durham Sewage System service area is approximately 7,000 kilometres. Of this total, approximately 300 kilometres is owned by York Region, 3,000 kilometres is owned by local municipalities, and 3,700 kilometres is owned privately.

Eliminating infiltration from the public mains while ignoring the private infrastructure will compromise the Region's efforts to reduce infiltration into the Southeast Collector Trunk Sewer short of the overall program goals. Reducing inflow and infiltration on private property is required for success of the Strategy and program. Access to private property is critical to achieving continued inflow and infiltration reductions over and beyond the Regional and local municipal systems.

As revealed in the Industry Practice Scan, the first step in addressing private infiltration is to ensure each municipality's sewer use regulations, specifications or bylaws establish guidelines for "acceptable" levels of infiltration and establish the municipality's authority to inspect private plumbing for infiltration and order repairs. A more thorough effort to reduce private infiltration will require direct internal inspection of private lines.

To successfully address inflow and infiltration from private property the long term Strategy must include the following:

- Establish legal authority to enter private property under municipal bylaws or other binding agreements
- Create a strong program of communication and technical assistance to help homeowners design an alternative discharge method for the flows
- Establish a clear policy regarding responsibility for the cost of repairs including subsidy or grant programs
- Establish municipal authority to order the remediation of the problem by the property owner, even if the municipality plans to cover the cost of disconnecting the flows itself
- Include a program of follow up inspections after repairs are made and periodically inspect repairs/disconnections thereafter
- Establish a strong public outreach and education component so that the public is aware of the problem and the benefits of inflow reduction

How extraneous flows from private property can be addressed

The industry has identified a broad range of options to address extraneous flows from private property. The Region and local municipalities should consider the following options within the coming years:

- Household plumbing and drainage inspections
- Downspout disconnection by Region, municipality or property owners
- Foundation drain disconnection programs by Region, municipality or property owners
- Lateral rehabilitation programs by Region, municipality or property owners
- Time of re-sale inspections and/or lateral inspection or certification programs

7. CONCLUSION

York Region and local municipalities will take joint overall responsibility to implement the Inflow and Infiltration Reduction Strategy. The Region and local municipalities will also be required to further define and implement the requisite activities necessary to ensure that the Strategy is continually maintained, enhanced and implemented. This process will commence in April 2011 and is anticipated to continue as a sustained program. The Strategy will be updated as required as data is collected, new information is learned and new technology becomes available.

Review and update of the overall Strategy will require the sustained commitment of Regional and local municipal resources over the life of the program. Updates and revisions to the Strategy will be presented to the Ministry of the Environment annually and in five-year update reports. York Region will submit to the Regional Director and the Southeast Collector Advisory Committee an annual report detailing its progress on implementing the Strategy including inflow and infiltration reduction. In addition to the first report that will be delivered to the Minister on March 31, 2011, the Region is required to update the Strategy, to the satisfaction of the Regional Director, at least once every five years until the Strategy is finalized or until otherwise directed by the Ministry of the Environment.

For more information on this report, please contact Lucas Cugalj, Director, Strategy and Business Planning at (905) 830-4444, Ext. 5041.

The Senior Management Group has reviewed this report.

Recommended by:	Approved for Submission:
Erin Mahoney, M. Eng. Commissioner of Environmental Services	Bruce Macgregor Chief Administrative Officer

January 17, 2011

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Attachment

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