TORONTO

STAFF REPORT
ACTION REQUIRED

Emergency Repair to the Coxwell Sanitary Trunk Sewer

Date:	January 6, 2009
To:	Public Works and Infrastructure Committee
From:	Acting Deputy City Manager and Chief Financial Officer General Manager, Toronto Water
Wards:	Ward 29
Reference Number:	P:\2009\Cluster B\TW\pw09001

SUMMARY

To report on damage found to a section of the Coxwell Sanitary Trunk Sewer, the need to undertake emergency repairs, the emergency measures taken by staff to date and to seek Council authorities necessitated by this emergency.

RECOMMENDATIONS

The General Manager, Toronto Water and the Acting Deputy City Manager and Chief Financial Officer recommend that:

1. The General Manager, Toronto Water, be authorized to retain the various professional and engineering consultants and to procure the various goods and/or services identified below, either on a sole source basis or by such other means of procurement, in consultation with the Director of Purchasing and Materials Management, and on such terms and conditions, as he considers appropriate in the circumstances, to:

    a) undertake technical assessments of sewer performance and ground subsidence inclusive of geotechnical review and analysis; and to further procure any goods and services necessary to satisfy compliance with any regulatory approval requirements;
    b) undertake the engineering design, general office administration, site supervision and the construction of physical works to support the implementation of emergency by-passes;
    c) provide engineering services for the preparation of any design/build procurement documents; to oversee engineering design and provide general office administration and site supervision services during

construction and post construction services, all associated with the temporary and/or permanent by-passes;

d) implement the design/build for a permanent by-pass option, including in conjunction therewith, the construction of temporary by-passes;
e) provide spill containment and waste disposal services associated with any by-passing of flows from the Don Sanitary Trunk Sewer System;
f) provide the legal, valuation, negotiation, surveying and other services required to obtain the temporary and permanent interests in real estate needed for the construction, operation, maintenance, repair and replacement of temporary and permanent by-passes and any ancillary works;
g) provide public consultation and communication services associated with providing regular updates and briefings to the local community and City Council; and
h) provide any other goods, services or professional services necessary to complete the emergency repairs.

2. Subject to the adoption of Recommendation (1) above, the General Manager, Toronto Water, be authorized to negotiate, enter into and execute any one or more agreements or related documents to give effect thereto on terms and conditions satisfactory to the General Manager, Toronto Water, with the approval of the City Manager, and in a form satisfactory to the City Solicitor;

3. Subject to the adoption of Recommendation (2) above, the General Manager, with the approval of the City Manager, in consultation with the Deputy City Manager and Chief Financial Officer and City Solicitor, be authorized to negotiate, enter into and execute on behalf of the City any indemnity agreements and/or limitations of liability as may be required in favour of such consultants, as identified by the General Manager, Toronto Water, and their respective subsidiaries, subcontractors, consultants, agents, officers, directors, and employees, to secure the performance of the necessary emergency repair or replacement work or services in relation to the Coxwell Sanitary Trunk Sewer, such agreements and/or limitations of liability to be on such terms as deemed necessary by the General Manager, Toronto Water and the City Manager without limitation;

4. Subject to the adoption of Recommendations (1), (2) and (3), above, authority be delegated to the General Manager, Toronto Water, with the approval of the City Manager, in consultation with the Deputy City Manager and Chief Financial Officer and City Solicitor, to authorize the acquisition of the temporary and permanent interests in real estate needed for the construction, operation, maintenance, repair and replacement of temporary and permanent by-passes and any ancillary works including negotiating, entering into and executing on behalf of the City all necessary agreements and other documents, on terms and conditions satisfactory to the General Manager and in form satisfactory to the City Solicitor;

5. Toronto Water's 2009 Capital Budget and 2010-2013 Capital Plan be increased by up to $30 million to include a new sub-project entitled CWW472-04 - Emergency Repair to Coxwell Sanitary Trunk Sewer to fund the recommended additional expenditures as contemplated in Recommendations (1), (2), (3) and (4) requiring a cashflow of $10 million in 2009 and $20 million in 2010, to be funded from the Wastewater Capital Reserve Fund XR6004;

6. the General Manager, Toronto Water, report back to the Public Works and Infrastructure Committee, on progress made in advancing the necessary repairs to the Coxwell Sanitary Trunk Sewer, and the outcome of steps taken pursuant to Recommendation (1) above; and

7. the appropriate City staff be authorized and directed to take the necessary action and to execute any documents necessary to give effect to the above recommendations.

FINANCIAL IMPACT

The financial implications arising from this report are unknown at this time. However, it is estimated that the costs for the procurement of related goods and services such as: technical assessments of sewer performance and ground subsidence inclusive of geotechnical review and analysis; development of environmental damage mitigation and sewer repair strategies; implementing a settlement site monitoring program; engineering services for the preparation of any design/build procurement documents; and obtaining external legal services, could range from $5 to $10 million (exclusive of the design and construction cost as noted below).

While staff, at this time, do not yet have the benefit of information such as a geotechnical analysis of the soil conditions involved in construction and other factors which may impact design and construction criteria, it is also estimated that the design and construction costs for the implementation of a permanent by-pass option could range between $12 and $20 million. The actual cost for all final goods and services will be dependant upon the complexities and length of any necessary emergency work undertaken and routing of final permanent by-pass solutions.

Funding for the goods and services associated with the above have not been included in Toronto Water’s approved 2009 Operating Budget and 2009 Capital Budget; but can be accommodated from the Wastewater Capital Reserve Fund XR6004.

The Acting Deputy City Manager and Chief Financial Officer has reviewed this report and concurs with the financial impact statement.

DECISION HISTORY

City Council at its meeting of September 25, 26 and 27, 2006, approved the undertaking of a comprehensive Class Environmental Assessment Study, known as the Don and Waterfront Trunk Sewers and Combined Sewer Overflow Control Strategy EA Project

(the "Don EA Study"), which among other matters, was intended to address the issue of twinning the Coxwell Sanitary Trunk Sewer (the "CSTS"); identifying system upgrades necessary to service future growth within the Don Sanitary Trunk Sewer System; and to provide wet weather flow control, in accordance with the City's Wet Weather Flow Master Plan, within the Lower Don River. A copy of the Council Decision Document can be found at:

http://www.toronto.ca/legdocs/2006/agendas/council/cc060925/wks6rpt/cl039.pdf

The Don EA Study includes the condition assessment of trunk sewers tributary to the Ashbridges Bay Treatment Plant (the "ABTP") including the CSTS, using new technology capable of inspecting the entire length of the trunk sewer.

ISSUE BACKGROUND

During the carrying out of work associated with the Don EA Study, significant damage was discovered to approximately 60 metres of the CSTS, located just east of Taylor-Massey Creek, and north of Coxwell Avenue and O'Connor Drive. While an inspection of the sewer shows that it is working as it should, with no backups or flow restrictions, given the nature and extent of the damage discovered, the potential for a blockage in future cannot be ruled out. Staff is concerned about the potential for a blockage to develop within the sewer should there be further deterioration or a collapse of the sewer: particularly, given that there are no existing alternative sewers through which flow could be diverted.

Currently, given the high flow of wastewater serviced by the CSTS and site constraints with limited access, regular maintenance and inspection has not been possible, and wastewater flows cannot be redirected to facilitate repairs or reconstruction of any section of the sewer.

Given the magnitude of the situation, Toronto Water has already undertaken a number of emergency measures as described in this report. In addition, staff is seeking from Council the additional recommended authorities, as set out in this report, necessitated by this emergency situation.

COMMENTS

The CSTS

The CSTS is arguably the most critical trunk sewer section in the City, servicing about 35 percent of the City (approximately 750,000 residents), within the Don Sanitary Trunk Sewer System, with dry weather flows estimated at 6 cubic metres per second, about three times the Don River's dry weather flow. The 4.8 kilometre CSTS is located beneath Coxwell Avenue extending from approximately O'Connor Drive, to the ABTP, south of Lakeshore Boulevard.

The large 2.7 metre diameter CSTS, with 56 centimetre thick concrete pipe wall, was hand dug as a tunnel in the late 1950s to depths reaching 40 metres, with maintenance hole spacing extending to distances of about 1.5 km, well over today's design standards. Given the trunk sewer's depth, exceptionally long maintenance hole spacing, and high flow velocities, detailed inspections and condition assessments have not been possible. This critical sanitary trunk sewer section has no redundancy to allow for re-routing of flows in the event of an emergency such as a significant blockage or catastrophic collapse of the sewer.

The Discovery of Damage to a Portion of the CSTS

The MMM Group Limited ("MMM"), in conjunction with its sub-consultants Andrews Infrastructure, Golder Associates Ltd. ("Golder") and BPR, was retained by the City to conduct the Don EA Study, as the result of a competitive bid process. The Don EA Study began in July 2008. While the primary objective of the Don EA Study, in relation to the CSTS, was to evaluate options to twin the sewer and to provide redundancy of operation for this sewer, as part of that work, MMM was tasked with determining the condition of the CSTS. While performing this task, the damage to a portion of the CSTS was discovered.

In order to obtain further details regarding the nature and extent of the damage and the condition of the CSTS, MMM was retained on an emergency basis to assess the feasibility, logistics, costs and timelines associated with (i) completing an investigation into the damaged section of the sewer, (ii) developing and implementing an emergency response and (iii) developing a permanent repair or diversion for the damaged section. Part of this retainer also included some preliminary geotechnical assessment of subsurface conditions for which MMM utilized Golder.

Notification Given to Various Regulatory Agencies

Upon initial discovery of the suspected damage, Toronto Water notified and engaged various regulatory agencies including the Ministry of the Environment (the "MOE"), the Toronto and Region Conservation Authority (the "TRCA"), the Ministry of Natural Resources and the Department of Fisheries and Oceans with the view to seeking any assistance they could offer the City in this situation, including the development and implementation of mutually satisfactory mitigation measures and a by-pass plan. These communications are ongoing and efforts have been taken by staff to update the appropriate regulatory authorities as events have unfolded.

The Preliminary Findings and Recommendations of MMM

MMM has conducted a preliminary screening analysis of the damaged section of the CSTS and has recommended that further testing be conducted to fully understand the condition of the sewer. MMM has made additional recommendations to address the emergency circumstances if the sewer were to collapse. Specifically, the emergency measures recommended by MMM relate to further settlement monitoring and

geotechnical investigation. Additional site inspection and monitoring is considered prudent at the site to further assess whether ground settlement has taken place and to measure/observe any changes at the site that might reflect deterioration of the sewer and/or ground loss into the sewer that could possibly result in damaging surface settlements.

The elements of the recommended program of additional inspection and monitoring are as follows:

- Preliminary visual inspection of pavements and houses;
- Condition survey of houses above and adjacent to distressed areas;
- Survey monitoring points on buildings;
- Survey monitoring of shallow in-ground monitoring points;
- Installation/measurement of probe extensometers; and
- Extensometer readings and data plotting.

The elements of the recommended additional geotechnical investigation are as follows:

- Complete the field work (borehole drilling) required to prepare a Geotechnical Data Report that will present the factual field and laboratory measurement activities; and
- Prepare a Preliminary Geotechnical Design Report that will discuss preliminary design parameters and feasible construction methods.

However, MMM was not prepared to take any further steps to implement these recommendations without the City providing the consulting team with an indemnity for potential liability arising from the pre-existing condition of the damaged sewer. It is MMM's position that these additional recommended emergency services are required due to the pre-existing condition of the CSTS which has experienced severe cracking, distortion and disrepair through no fault of the consultant.

In order to assess the exact condition of the damage to the CSTS, intrusive investigations are required the natural consequences of which, even if carried out to the appropriate standard of care, and with prudent diligence, may aggravate existing conditions. For this reason, MMM had insisted on an indemnity from the City before proceeding with any additional settlement monitoring and geotechnical investigation. Similar concerns were expressed to staff by other industry consultants who had been contacted. Accordingly, since City staff has no authority to give an indemnity on behalf of the City and a meeting of City Council was not otherwise scheduled until late in January 2009, staff requested a meeting of the City's Control Group as reported below.

Steps Taken by Staff to Implement the Recommendations of MMM

Since the damage to the CSTS was identified, Toronto Water has undertaken the following monitoring actions:

- Daily checking of the sewer flow rates upstream and downstream of the affected section of the damaged sewer to determine if there is any indication of blockage in the sewer that could be the result of further deterioration or a collapse of the pipe; and,
- Periodic surveying of the ground surface in the general area above the sewer to determine if any ground surface settlement is occurring.

In addition, steps have been taken to notify homeowners in the vicinity of the damaged sewer and arrange to conduct inspections of the nearby homes to check for any visual structural damage which might constitute early warning signs of soil settlement and sewer blockage and to install appropriate monitoring devices.

Based on the information currently available to staff and with the full implementation of a detailed monitoring program, it is expected that before any severe failure of the sewer occurs, there would be warning signs evident through the monitoring to allow for any necessary appropriate action to avoid damage or injury.

The Meeting of the Control Group

Given the nature and urgency of this situation, a meeting of the City's Control Group was called and, subsequently, held on December 31, 2008 in accordance with the provisions of Chapter 59, Emergency Planning, of the Municipal Code.

At its meeting, the Control Group authorized the following:

- The City Manager, in consultation with the Deputy City Manager and the Chief Financial Officer and the City Solicitor to negotiate, enter into and execute on behalf of the City any indemnity agreements in favor of such consultants, as identified by the General Manager, Toronto Water, as may be required to secure the immediate performance of the necessary emergency monitoring and geotechnical assessments required in relation to the CSTS;

- The Office of Emergency Management (OEM) to coordinate a meeting of the Emergency Management Working Group and other stakeholders such as the TRCA, MOE and the Port Authority to discuss contingency planning with respect to the CSTS. All division heads will be informed of the calling of this meeting; and

- Notification, as soon as possible, to all Councillors and affected homeowners of the status of the CSTS.

Communications with Local Residents

On January 2, 2009, the General Manager, Toronto Water personally attended the homes of several of the properties located near the damaged section of the CSTS for the purpose

of delivering to residents letters notifying them of the situation and to explain the matter and answer any questions that they might have. Concurrently, letters were delivered to other residents in the general vicinity alerting them to the situation and informing them of steps that the City is taking to deal with the matter.

All residents were provided with a telephone contact at the City to enable them to further speak directly to a City staff representative should they need to do so.

A Summary of the Additional Emergency Steps and Procurements Taken to Date

The following emergency Purchase Orders in the total amount of $657,680.00 have been issued to obtain professional engineering and legal services to secure the immediate performance of necessary emergency work required in relation to the discovery of damage to the CSTS:

a) a sole source Purchase Order was issued to MMM in the amount of $400,000.00, net GST, to develop appropriate mitigation and repair procedures;
b) a sole source Purchase Order was issued to Andrews Infrastructure in the amount of $9,680.00, net GST, to determine the extent and severity of the distressed section of the CSTS;
c) a sole source Purchase Order was issued to D. M. Robichaud Associates Limited in the amount of $148,000.00, net GST, to use a robotic crawler equipped with sonar, video, and laser to complete the CSTS inspection work; and
d) a sole source Purchase Order was issued to the law firm of Borden Ladner Gervais LLP in the amount of $100,000.00, net GST, to provide external legal assistance in connection with the remedial work related to the CSTS.

It is contemplated that Borden Ladner Gervais LLP will continue as the City's external legal service provider in this matter.

At the time of preparing this report, the following additional emergency Purchase Orders are in the process of being finalized and issued:

a) a sole-source Purchase Order in the estimated amount of $350,000.00, net GST, to provide the implementation of an emergency settlement site monitoring program related to the damaged portion of the CSTS; and
b) a sole-source Purchase Order in the estimated amount of $500,000.00, net of GST, to provide emergency geotechnical engineering services regarding an investigation of subsurface conditions relating to proposed alignments of a permanent relief sewer to the CSTS.

In addition to the measures taken as already set out in this report, in the event of a failure, Toronto Water staff has also developed an emergency contingency plan to redirect flows into Taylor-Massey Creek and the Don River which would serve to avoid any potential upstream flooding of private property. According to this contingency plan, options are being assessed to intercept the diverted flows at another sanitary trunk sewer location

further downstream to limit the flow from entering the harbour and Lake Ontario and maximize the capture and treatment of sewage flows at the ABTP.

Staff Recommendations Related to Further Necessary Steps and Procurements

As noted above, emergency work has been undertaken to assess the potential impact of a failure of the CSTS; and to develop and assess various temporary and permanent flow by-pass options. Additional technical work is required to refine and develop detailed designs for these by-pass options; and the implementation of measures to help contain and direct the sewage flows in the event of such a failure. In regards to the latter, several measures, subject to regulatory approvals, must be designed and constructed as expeditiously as possible to help minimize the sewage back-up in the trunk sewer system, upstream of the damaged section; channel the flows in a controlled way; and maximize the capture and treatment of sewage flows, while minimizing the potential for any environmental damage to Taylor-Massey Creek, the Don River and the waterfront.

As well, staff has explored and evaluated a number of temporary and permanent by-pass options. Given the site constraints and high flow conditions, construction of a temporary by-pass for partial treatment of flows has been estimated to take six to nine months to complete at a cost of $6 to $12 million depending on which option is selected. Construction of a temporary by-pass for full treatment of flows has been estimated to take eight to eighteen months at a cost of $13 to $30 million depending on which option is selected. Construction of a permanent by-pass system to handle all the current flows, depending on the alignment and soil conditions, could take an estimated twelve to eighteen months and an estimated $12 to $20 million to construct.

In the circumstances, staff is recommending that a permanent by-pass be designed and constructed as expeditiously as possible. Any permanent by-pass sewer must be constructed via tunnelling. At this time, while staff has narrowed the choice of tunnelling to three viable strategies, further geotechnical investigation along with some preliminary design is required in order to choose the preferred tunnelling method.

Staff intends to conduct a competitive bid process for the design and construction of the permanent by-pass. However, given that it is possible the condition of the CSTS may deteriorate, staff is recommending that it be given flexibility in regards to procurement of the design and construction services of the permanent by-pass and any related work. In view of the critical nature of this situation, it may be that the circumstances will require the immediate or expedited delivery of goods and services thereby preventing the Director of Purchasing and Material Management to acquire in the usual procurement process the necessary goods and services in the time required.

In addition, while it is recommended that the permanent by-pass proceed as expeditiously as possible, several issues have been identified by staff related to design details and the potential alignment for the construction of a permanent by-pass including the potential need to acquire subsurface and surface easements and/or property acquisition, on an emergency basis so to facilitate the necessary work.

For this reason, staff is also recommending that Council delegate to staff the necessary authority to proceed in such a manner should the circumstances require it. Lastly, staff is seeking the necessary Council authority to permit staff to proceed with any necessary physical alterations to existing City infrastructure to provide for the emergency by-pass of flows from the CSTS in advance of the completion of the permanent by-pass and to notify and seek any necessary approvals from the appropriate regulatory agencies.

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