

1

YDSS 16TH AVENUE TRUNK SEWER PROJECT "POST-CONSTRUCTION" ENVIRONMENTAL MONITORING PROGRAM TOWN OF MARKHAM, PROJECT 74030

The Transportation and Works Committee recommends the adoption of the recommendations contained in the following report, December 13, 2005, from the Commissioner of Transportation and Works:

1. RECOMMENDATIONS

It is recommended that:

1. The current scope of independent audit services being performed by Gartner Lee Limited be expanded to include the post-construction monitoring services.
2. The current contract be increased by \$1,469,000, excluding GST, to provide post-construction monitoring and constructive engagement services for the first year of a three-year program in order to satisfy the terms and conditions of the Permit to Take Water for the 16th Avenue Trunk Sewer, Phase 2.
3. Staff report back to Council in January 2007 on the status of the post-construction monitoring program following year one of the three-year program.

2. PURPOSE

This report has been prepared to provide an update to Council regarding the 16th Avenue Trunk Sewer project status and to outline the initiation of the post-construction environmental monitoring program. As such, the services of a suitable consultant to implement post-construction environmental monitoring and messaging will be required for the duration of the monitoring timeline (January 2006 to December 2008) as mandated by the Permit to Take Water (PTTW). Accordingly, authorization is being requested to increase the scope of services for Gartner Lee Limited for the first year of this post-completion monitoring phase.

3. BACKGROUND

3.1 Construction Status

There are two phases to the 16th Avenue Trunk Sewer. Phase 1 begins at Ninth Line and ends approximately 150 metres west of Stone Mason Boulevard, while Phase 2 continues west from this point to Woodbine Avenue (*see Attachment 1*) and will connect to the 404 Trunk Sewer. Phase 1 was completed, inspected and placed into full service on March 19, 2004. The Phase 2 portion was scheduled for completion in August 2007. If the

tunnelling operations continue to proceed without any problems, current projections are that completion could be as early as Spring of 2007.

The overall tunnel length of the Phase 2 portion of the sewer is 7,169 metres long, spanning the distance between Stone Mason Boulevard to Woodbine Avenue. Two tunnel boring machines (TBM's) are currently operational. The portion between Stone Mason Boulevard and Kennedy Road is approximately 3,500 metres and has a tunnel diameter of 3.5 metres to accommodate a sewer diameter of 2.6 metres. As of January, 2006, the section between Stone Mason Boulevard and McCowan Road is complete and fully operational. Tunnelling is recommencing from about 500 metres west of McCowan towards Kennedy and is expected to be complete by the end of summer 2006. The second section, between Kennedy Road and Woodbine Avenue, is 3,669 metres and as of January 2006, is 66% complete. The tunnel diameter along this stretch is 2.8 metres to accommodate a sewer diameter of 2.1 metres.

Six shafts have been excavated along 16th Avenue and are situated on the sewer alignment. The locations, depths and completion status are as follows:

Table 1
16th Avenue Shaft Details

Street Name	Compound Name	Depth (metres)	Status
Stone Mason Boulevard	C8	33	Complete
McCowan Road	C10	42	Complete
Longwater Chase	C11	26	Complete
Kennedy Road	C12	17	Complete
Warden Avenue	C13	35	Complete
Woodbine Avenue	C14	8	Complete

3.1.1 Schedule

The original completion of the dewatering for the construction of the sewer was anticipated to be April 2007. However, during construction, it became evident that the construction of an additional shaft at McCowan Road would result in the cessation of dewatering at Stone Mason (C8) thirteen months ahead of schedule. Approximately 75% of the current water-taking occurs at the Stone Mason compound. Upon decommissioning this compound by January 2006, total water-taking is expected to decrease by approximately 15,000 litres per minute (L/min) from the current 20,000 L/min to approximately 5,000 L/min. This will significantly reduce the risk of environmental impacts along the sensitive Robinson Creek watershed and will allow for the recovery of the groundwater earlier than originally anticipated.

This will lessen the public concerns associated with the dewatering and will be beneficial to all stakeholders of this project.

3.1.2 Dewatering and Discharge

As of January 2006, the cumulative dewatering rate is expected to be approximately (5,000 to 8,000) litres per minute (lpm) which is well below the maximum allowable dewatering rate of 38,244 lpm, as outlined in the PTTW issued by the Ministry of the Environment (MOE).

The groundwater from this dewatering activity is currently being dispersed to the following locations as outlined in the following Table 2.

Table 2
Groundwater Redirected to the Environment

	Up To End 2005		2006 - 2007	
	%	l/min	%	l/min
Robinson Creek	11%	2266	22%	1980
Eckardt Creek	11%	2266	25%	2250
Bruce Creek	5%	1030	12%	1080
For irrigation purposes:				
Angus Glen	8%	1648	18%	1620
York Downs Golf	4%	824	10%	900
Berczy Creek	1%	206	1%	90
Little Rouge	5%	1030	12%	1080
YDSS	55%	11328	0%	0
Total	100%	20597	100%	9000

3.1.3 Commissioning of the 16th Avenue Trunk Sewer

The sewer will be commissioned in phases. The first phase from McCowan Road to Stone Mason Boulevard is commissioned. The second phase, from Kennedy Road to McCowan Road, is scheduled for commissioning in the Fall 2006 while the third and final phase from Woodbine Avenue to Kennedy Road will be commissioned in the Spring 2007.

After the sewer is commissioned, various obligations must be maintained in accordance with the Permit to Take Water (PTTW). These include:

- Continual groundwater recovery monitoring up to 80% of pre-construction levels.
- Continual environmental monitoring (includes streams, wetlands and forests) during the groundwater recovery period.
- Maintaining the reactive well mitigation program during the recovery period.
- Producing monthly monitoring reports to the agencies.
- Maintaining the constructive engagement stakeholder program.

In addition to these activities, the project team must prepare and implement an aquatic habitat improvement plan for all streams that received water from the dewatering activity during construction.

As the sewer has been commissioned from McCowan Road to Stone Mason Boulevard, and the dewatering of Stone Mason Boulevard is discontinued the obligations under the PTTW for post-construction groundwater recovery monitoring must commence for this section of the 16th Avenue Trunk Sewer.

3.2 Environmental protection

One of the key steps that York Region has taken to mitigate impacts to the natural environment is to constantly monitor the appropriate areas for any changes. There are two “Governing Environmental Principles” for this project:

1. The proactive management of stress to the natural environment.
2. A mitigation plan that incorporates comprehensive monitoring and adaptive management.

These governing principles are the cornerstone of an unprecedented \$20 million Environmental Management Plan (EMP) which went through two years of extensive review by all of the Regulatory Agencies (MOE, Ministry of Natural Resources, Toronto and Region Conservation Authority and Department of Fisheries and Oceans). This plan incorporates extensive monitoring of streams, wetlands and forested areas within a 100 square kilometre area and is managed by professionals with specialized expertise in the areas of fish and fish habitat, wetland, forestry and groundwater.

The EMP identifies all temporary effects of dewatering on groundwater recharge of streams and wetlands, erosion of streams from discharge and temperature impacts of the discharge on cool or warm water fisheries as well as the potential effects of dewatering on the trees and vegetation. The EMP then outlines proactive mitigation measures for the safeguarding of the groundwater resources, wetlands, fish and fish habitat and forestry.

This EMP is currently being independently audited by the firm of Gartner Lee Limited. Thus far, their assessment of the plan indicates that the dewatering activity is not impacting the environment adversely and the EMP is being effectively implemented.

3.3 Well Mitigation

Nearly two years into Phase 2, the private well mitigation program which began with the over-arching objective of ensuring that residents’ water supply needs are met continues to deliver positive results.

In anticipation of any impact to resident wells as a result of the “dewatering” or pumping of water from the underground aquifers, Phase 2 initiated a proactive well-mitigation program designed to predict and mitigate impacted wells. The program also included a 24-hour reactive response plan to handle any unexpected well troubles.

To date, 156 of the approximately 2,200 wells have been impacted. This is roughly 8% of all the wells in the geographical area. InspecSol/CRA, the environmental engineering

firm that was engaged to conduct the well mitigation portion of the plan, has been very busy implementing the plan.

Since the start of the project through January 2006, the team has investigated nearly 500 wells through either proactive outreach or in response to calls received by the Project Call Centre. A high number of the calls to the Call Centre were either requests for information or determined to be a mechanical failure of the well unrelated to the project.

Of the 156 calls which required mitigation, the following table summarizes the steps taken.

Table 3
Well Mitigation Summary

Mitigation Activity	Number of Mitigations
Connection to the Municipal Supply	11
Currently Remain on an External Tank	21
Had a Water Tank but is No Longer Required	17
Replacement Well	39
Well Modification	68

Following the cessation of dewatering at the Stone Mason Compound in January 2006, full water recovery will commence. The return of flow to the artesian Spring Creek well is anticipated in late 2006. Water level recoveries have been realized as planned at other sites where construction has ended, including the Boxgrove area, the construction site where the first phase of construction took place.

4. ANALYSIS AND OPTIONS

The construction of the 16th Avenue Trunk Sewer project was anticipated to be complete in August of 2007. Construction is progressing well and it is currently anticipated that the project could be complete by Spring 2007. An additional shaft is being constructed at McCowan to facilitate the completion of the first section from McCowan Road to Stone Mason Boulevard by January 2006. The construction of the McCowan shaft will contribute to significant environmental benefits by reducing the water-taking for this project by 75% one year ahead of schedule. Accordingly, the “Post-completion monitoring” program must commence sooner for the project. As the project approaches overall completion, currently anticipated in Spring 2007, the environmental management program for this project will transition in stages, from the proactive environmental monitoring to the post-construction recovery and reactive environmental monitoring program. This transition must be carried out as seamlessly and cost-effectively as possible without compromising the integrity of the program.

4.1 “Post-Construction” Environmental Monitoring Program

The MOE Permit to Take Water (PTTW) requires that monitoring for groundwater recovery including the health of streams, wetlands and forested areas within the project zone of influence currently within the project zone of influence be maintained for three years following construction. This monitoring program has to be comprehensive enough to assure the MOE that the groundwater has recovered to 80% of the pre-construction levels with a continuing improving trend. The proposed post-construction monitoring program will take place over a three-year period.

The post-construction monitoring program must be administered by a firm with both the knowledge and familiarity of the 16th Avenue Trunk Sewer project. This firm must also be independent of the project team implementing the current environmental management and well mitigation programs. In addition, the firm undertaking this post-construction monitoring program must have credibility with the regulatory agencies.

Under normal circumstances, a competitive process would have been employed to select a consulting firm to implement this program. In this special case, circumstances require an approach that considers the following:

- sensitivities surrounding public awareness
- credible response to unprecedented regulatory compliance requirements
- seamless transition that protects the environment at all times
- science-based optimization of monitoring program
- optimization of costs from the current monitoring program to the post-construction program.

For these reasons, we are recommending extending the current scope of work of Gartner Lee Limited, an industry leader in environmental audits with intimate knowledge of the regulatory process and a proven track record with the agencies to develop and implement the post construction monitoring program. Gartner Lee, through its current role as independent auditors for the environmental management program, is positioned strategically to provide an objective and credible evaluation of the recovery of the environment following the completion of the project.

4.1.1 Implementation Team

Regional Council originally approved the retention of Gartner Lee Limited (GLL) to provide the independent audit function for the construction phase at its meeting on May 20, 2004 (Clause 7 of Report No. 5). GLL was to rigorously conduct a comprehensive review of the daily, weekly and monthly monitoring carried out by McNally International Inc./Aecon Civil (Joint Venture) as outlined in the Environmental Management Plan (EMP). GLL has since been reviewing the practices and record-keeping as mandated by the EMP. Any and all corrective action taken to mitigate adverse impacts to the environment has been reviewed for compliance to the EMP.

GLL's current role as an independent auditor can be expanded to undertake the post-construction monitoring as it will provide for a seamless transition from auditing the project from its current construction phase into its post-completion phase. As the construction of the sewer is intended to be completed in sections, GLL's knowledge of the project in conjunction with their established credibility with the regulatory agencies positions them favourably for a seamless and cost-effective transition into the next phase of monitoring.

GLL can implement a monitoring program built on a streamlined and rational approach. Integral to this approach will be the current project information which incorporates the state of the environment prior to project initiation and monitoring data gathered as part of the current Environmental Management Plan. GLL can then utilize their intimate knowledge of the project thus far, and rely on their reputed integrated environmental team of specialists in the areas of groundwater, wetlands, fisheries and fish habitat as well as forestry, to gauge the recovery of the ecosystem in an unbiased manner. They will synthesize and interpret the information, then report on the health of the environment and the effectiveness of the groundwater recovery to pre-construction levels.

In order to undertake this assignment, GLL has coordinated an effective inter-disciplinary team of qualified professionals with extensive regional knowledge. Team members have specialized knowledge in ground and surface water interaction and the effects of the water balance on aquatic habitat and terrestrial environments including woodlots and wetlands. Data and information from the monitoring will be fed in a streamlined and comprehensive fashion from the data management system to the Region and eventually to the constructive engagement facilitator. The constructive engagement facilitator, an integral part of the team, will make the information available to the community and other stakeholders based on the constructive engagement plan prepared as part of the recovery monitoring project. The attached figure (*Attachment 2*) illustrates the integrated team structure that will be applied to the post-construction monitoring.

4.1.2 Post-Construction Monitoring Approach

The post-construction monitoring program's mandate is to review the recovery of the groundwater levels and continue to monitor the environment, namely, the streams, wetlands and forestry within the project zone of influence. The area of monitoring will generally cover approximately 100 km², within the boundaries of 19th Avenue to the north, Woodbine Avenue to the west, Highway 7 to the south, and Reesor Road to the east. Within this area, of significance will be the approximately 20 monitoring wells that will be used to gauge the groundwater recovery, eight streams that will be monitored at to ensure continued sustainability of fish habitat and a series of wetlands and woodlots that will be used to gauge the overall health of the Rouge River ecosystem.

The 16th Avenue Trunk Sewer is currently anticipated to be totally complete by Spring 2007. However, it is important to note that the sewer will be completed in three sections as follows:

- Section one, McCowan Road to Stone Mason Boulevard, complete
- Section two, Kennedy Road to McCowan Road (Fall 2006)
- Section three, Woodbine Avenue to Kennedy Road (Spring 2007)

As the sections are completed, the dewatering for the associated section will be terminated and this in turn will initiate the groundwater recovery. As such, the “Post-Construction monitoring” program must be initiated in January 2006 for Section one of the project.

When the program shifts into the post-construction period, the timing is excellent to review the entire program with an eye to environmental protection, effective and accurate communication as well as project optimization. Optimization of the process will reassign the “what, where and how often” of monitoring, on a risk basis to best make use of available resources. The assessment will be done on a scientific basis that examines the original reason for each monitoring component, the measured results to date, and an examination of the risk of making a change to the program. As part of this, consideration will be given to the Region’s own objectives and due diligence, as well as agency needs and public concerns. Optimization will refocus resources to the most important and direct monitoring needs.

The objectives for the post-construction monitoring program include:

- 1) Protection of the environment.
- 2) Demonstration of watershed recovery.
- 3) Compliance with the PTTW including the Department of Fisheries and Ocean letter of advice.
- 4) Continuation of environmental and well mitigation where needed, until deemed unnecessary.
- 5) Provision of defensible scientific data for phasing out of monitoring/mitigation where no adverse impacts have occurred or where mitigation is no longer required; and,
- 6) Demonstration of cost effectiveness of the post construction monitoring activities.

The transition of monitoring from the existing “Environmental Management Team” to the “Post-Construction Monitoring Team” will be done in a way that maintains permit compliance, and demonstrates a net cost saving to York Region. Monitoring will be most intensive in 2006, decreasing significantly over the proposed three-year period. The transition of monitoring will begin upon completion of the McCowan Shaft and cessation of dewatering from the Stone Mason wells in January 2006. Recovery of the aquifer and environment will then commence. Recovery monitoring will continue as required under the permit until 80% of the aquifer water level is achieved with an upward trend. All monitoring within the Little Rouge Creek, Mount Joy Creek, and Robinson Creek (East of the McCowan shaft) will be turned over to the post-construction monitoring team in February 2006. In addition, monitoring within the Apple Creek and Rouge River sub-

watersheds will also become the responsibility of the post-construction monitoring team, as it is anticipated that these sub-watersheds will not be impacted by construction dewatering activity at that time. Bruce, Berczy and Eckardt Creeks are expected to be eventually incorporated into the recovery monitoring on or before December 2006. This will coincide with the completion of the overall project.

The post-construction monitoring is anticipated to continue over a three-year period, with the first year (2006) being used to monitor the transition from construction to eco-system recovery. Year two will be the first year of full post-construction monitoring and is expected to demonstrate a significant level of recovery. Finally, full recovery is anticipated within the third year (2008).

The monitoring program includes the collection of groundwater levels from the existing observation well network, piezometers, and selected private wells. Approximately ten wells will be monitored on a continuous basis using automatic water level measuring transducers. For these wells, data on the state of groundwater recovery will be available on an instantaneous access basis through individual telemetric systems linked to the main database. Other selected wells will be monitored on a monthly basis to evaluate and demonstrate aquifer recovery, and an upward/stable trend. Monitoring includes the following activities:

- collection of groundwater levels
- recording of levels and input of the water levels into a database
- evaluation/interpretation of data to determine the area of recovery
- monthly reporting.

Once dewatering has ceased and recovery begins, interference complaints are anticipated to decline, and as such, the monitoring program can be reduced and simplified. For example, reduced recovery monitoring in the Phase 1 area (Box Grove) to improve efficiency and reduce costs has already commenced.

The field investigation is designed to show compliance with the Minister's letter from the MOE dated October 1, 2004, PTTW and the DFO letter of advice. The monitoring frequency utilized by the current Environmental Management will be optimized for post-construction monitoring. Post-construction monitoring will focus on critical areas needed to determine the health of the environment and to demonstrate recovery where applicable. If no adverse impacts have occurred, Gartner Lee will ensure that defensible data are effectively presented to the agencies and monitoring will be discontinued in those areas. This iterative process will continue until full recovery has been achieved throughout the study area. This adaptive management approach will permit us to modify the monitoring program as appropriate to address areas of additional concern and to reduce or terminate monitoring where recovery has been achieved.

The ecological field investigations are divided into aquatic and terrestrial environments:

Aquatic Environment

Monitoring of the aquatic environment will include:

- Benthic organisms (up to 17 sites)
- Shallow groundwater monitoring - upwelling (up to 100 monitors)
- Stream flow data with time (up to 35 sites)
- Water Quality (up to 15 sites)
- Stream erosion (up to 14 sites)
- Temperature impacts resulting from mitigation (up to 17 sites)
- Winter ice conditions (up to 17 sites)

Terrestrial Environment

The health of the wetlands and woodlots throughout the study area will primarily be determined using:

- shallow groundwater gradients (up to 30 monitors),
- soil moisture content (up to 8 sites),
- amphibian surveys (up to 8 sites), and
- detailed vegetation surveys (up to 8 sites).

The monitoring team will continue to monitor wetlands and woodlots to ensure that impacts are mitigated if necessary and that monitoring sites are decommissioned if no impacts have occurred.

4.2 Stream Net Improvement Plan

The post-construction monitoring team will be responsible for producing and overseeing the aquatic habitat net improvement plan for selected reaches of each stream which received water from the dewatering activity for the project. These streams include Robinson Creek, Little Rouge Creek, Eckardt Creek, Bruce Creek, Berczy Creek and Mount Joy Creek. Restoration and improvement to the upstream portion of Robinson Creek at 16th Avenue have already occurred as part of the construction project. A variety of habitat improvement techniques will be considered and presented to the agencies for each stream reach to be restored at the selected reaches.

4.3 Constructive Engagement of Stakeholders

Complementing this post-construction monitoring program will be a comprehensive public information program that will ultimately ensure that the independent monitoring program of the 16th Avenue Trunk Sewer project is communicated effectively to keep all stakeholders advised of the state of the environment during the recovery period.

Communicating the science to the public and agencies will be an ongoing challenge throughout the post-construction monitoring. The “backbone” of this communication process will be strong, defensible science.

To optimize communication, the team will utilize the existing project web site. This web site will be refined to provide all stakeholders with appropriately controlled access to data (including maps, imagery, reports and documents.) This will then contribute to effective and timely communication of the health of the environment. GLL will collaborate with the public facilitator and provide virtual and seamless links to the project web site operated for the constructive engagement process.

All data collected during the monitoring program will be assessed and reported on a monthly and yearly basis through the constructive engagement process. In addition, a monthly summary report (the “Monitor”) (see *Attachment 3*) will be produced as part of this process to demonstrate the health of the environment to both the public and government agencies. Emphasis will be based upon reporting in a meaningful and readily understandable, plain language manner. The report will feature graphics, figures and photographs illustrating both successes and issues and will identify actions if these are required.

As well, it is proposed that the constructive engagement process will continue to effectively communicate the recovery of the environment to the stakeholders. This communication will involve the continuation of the current constructive engagement process for the public while providing the agencies with up-to-date interpreted data that can be used to assess the overall recovery.

The aforementioned approach will result in full compliance with the MOE’s requirement for a complete public engagement program for the 16th Avenue Trunk Sewer project during the “Post-Construction” phase of the project.

5. FINANCIAL IMPLICATIONS

Implementing the post-construction monitoring and stakeholder management programs by increasing the scope of services for Gartner Lee Limited will be the most prudent way of achieving cost efficiencies that will take advantage of a consultant positioned to provide an impartial assessment of the groundwater and associated environmental state during the period following cessation of dewatering activities. Tangible savings to York Region include Gartner Lee’s ability to get to work immediately without a requirement to “ramp-up”.

Gartner Lee Limited was originally retained to provide an independent environmental audit function for the environmental management plan during the construction of the 16th Avenue Trunk Sewer. Expanding their scope of work to include the post-construction monitoring from January 2006 till December 2008 will facilitate a seamless transition from the current construction phase to the post-construction monitoring phase of the project. This approach will result in a savings of \$150,000 during the first year (2006) of post-construction monitoring as their current audit role during the construction phase will

have some duplication of services. As a result, although the budget for year one is \$1,619,000, the net cost after the projected savings is \$1,469,000.

The budget for this three-year post-construction monitoring is summarized in Table 4 below.

Table 4
“Post-Construction Monitoring” Budget

Budget Item Description*	Year 1	Year 2	Year 3
Groundwater recovery monitoring	\$220,000	\$145,000	\$80,000
Monitoring of Streams, Wetlands and Woodlots	\$680,579	\$372,330	\$103,927
Data management and interpretation	\$130,073	\$31,985	\$48,380
Reporting (monthly and annual)	\$346,267	\$142,024	\$108,604
Meetings and technical presentations to stakeholders	\$45,971	\$53,661	\$54,089
River reach net improvement plan	\$92,111	\$0	\$0
Production and distribution of compliance reports(The Monitor)	\$25,000	\$40,000	\$40,000
Management of project web site	\$18,000	\$20,000	\$20,000
Production of annual reports	\$20,000	\$20,000	\$20,000
Constructive engagement program	\$41,360	\$25,000	\$25,000
Total (not including GST)	\$1,619,000	\$850,000	\$500,000

In order to ensure accountability and further optimization of costs, it is proposed that the post-completion budget be approved annually. Accordingly, at this point, authorization will only be sought for the approval of year one of the post-construction monitoring budget. The program will be reviewed on an annual basis with a report to Regional Council that will outline the state of the environment and the performance of GLL in undertaking this assignment.

The overall project costs for the 16th Avenue Trunk Sewer, Phase II is \$75,790,000. The funding for this project is derived from wastewater development charges and wastewater user rates allocated 80% and 20% respectively.

6. LOCAL MUNICIPAL IMPACT

The 16th Avenue Trunk Sewer and associated integrated components form an integral link to the continued development of The Regional Municipality of York in both the short and long term.

7. CONCLUSION

As portions of the 16th Avenue Trunk Sewer project near completion, it is now time to position the post-construction recovery team to plan and implement the monitoring and reporting of the groundwater recovery and the health of the environment.

As the monitoring and reporting is governed by the conditions imposed by the Permit to Take Water and the importance placed on impartial and independent assessment; expanding the already independent audit function of Gartner Lee Limited is the preferred approach to seamlessly transitioning into the recovery monitoring phase.

Although the recovery monitoring is projected to take place over three years beginning in January 2006, it is expected that the recovery will take place sooner. Accordingly, the post-construction monitoring program proposed will be reviewed annually with Regional Council and at this time only the year one budget is recommended for Regional Council approval.

The Senior Management Group has reviewed this report.

(The attachments referred to in this clause are attached to this report.)