TO:	CHAIR AND MEMBERS BUILT AND NATURAL ENVIRONMENT COMMITTEE MEETING ON AUGUST 15, 2011
FROM:	RON STANDISH, P. Eng. DIRECTOR, WASTEWATER AND TREATMENT PLANNING ENVIRONMENTAL AND ENGINEERING SERVICES
SUBJECT:	FOX HOLLOW DEVELOPMENT AREA STORMWATER MANAGEMENT FACILITY #2 DEPRESSURIZATION WELLS AND GROUNDWATER WORKS

RECOMMENDATION

That, on the recommendation of the Director, Wastewater and Treatment, Planning, Environmental and Engineering Services, the following action **BE TAKEN** with respect to the Fox Hollow Development Area Stormwater Management (SWM) Facility #2 depressurization works:

a) that the unexpended funds and remaining contingency from the SWMF #2 site preparation contract (Tender T11-13) **BE TRANSFERRED** to the Construction Contract for the Fox Hollow Development Area SWM Facility #2 (Tender T11-40) for the construction of depressurization wells.

PREVIOUS REPORTS PERTINENT TO THIS MATTER

BNEC – May 2, 2011 – Contract Award – Tender No. T11-40 Fox Hollow Development Area Stormwater Management Facility No. 2 Construction (ES3019)

BNEC – Feb 14, 2011 – Contract Award – Tender No. T11-13, Fox Hollow Development Area Stormwater Management Facility No. 2 Site Preparation Contract (ES3019)

ETC – May 10, 2010 – Appointment of Consulting Engineer for Engineering Services for Functional and Detailed Design of Fox Hollow Community Storm/Drainage, Stormwater Management and Sanitary Trunk Sewer Servicing Works.

ETC – April 12, 2010 – Schedule C Municipal Class Environmental Assessment Addendum for Storm/Drainage, Stormwater Management and Sanitary Servicing for the Fox Hollow Development Area

PC – October 19, 2009 – Storm/drainage, stormwater management and sanitary Trunk Sewer Servicing Works for Fox Hollow Development Area

ETC – June 1, 2009 - the appointment of a consultant for the Functional Design of Fox Hollow Community Storm/Drainage, Stormwater Management (SWM) and Sanitary Trunk Sewer Servicing Works (ES3018 ES5236) Fox Hollow Trunk Sanitary Sewer.

ETC – September 11, 2006 – Municipal Class Environmental Assessment Report Recommendations for Proposed Storm/Drainage and Stormwater Management Servicing Works for Fox Hollow Development Area

ETC – June 13, 2005 – Approval of the Appointment of the Consulting Engineer for the Municipal Class EA, Schedule 'C' Study for Storm/Drainage and SWM servicing works for Fox Hollow Development Area

ETC – March 25, 2002 – Approval of the Completion of the Functional Drainage and SWM Master Plan for Fox Hollow Community Plan

ETC – February 26, 2001 – Approval of the Appointment of the Consulting Engineer for Functional Drainage and SWM Master Plan for Fox Hollow Community Plan

BACKGROUND

Purpose:
To report on the implementation of clay cut-off walls, dewatering requirements and depressurization wells associated with the additional cost for construction of the Fox Hollow SWM Facility #2 (location map attached), due to encountering complex geotechnical and groundwater conditions within the Fox Hollow Development Area.

Context:
In October 2009, the City engaged Stantec to complete an Addendum to the Fox Hollow Municipal Class Environmental Assessment (EA) Study, Schedule 'C' for Storm/Drainage, Stormwater Management (SWM) and Sanitary Servicing Works for the Fox Hollow Development Area.

The main objectives of this study were to:

- evaluate the proposed relocation of approximately 670 lineal metres of the Heard Drain channel up to 100 metres north from its existing location in coordination with the proposed storm/drainage, SWM and sanitary servicing works;
- to review and confirm or modify the original Class EA proposed Storm/Drainage, SWM and Sanitary Servicing Works for the Fox Hollow Development Area; and
- to review and incorporate the updated information and design criteria/requirements.

The EA Addendum's recommendations with respect to the impacts to the groundwater table in relation to the servicing works were based on the preliminary report (information report #1) compiled by Golder Associates in 2009, which recommended that further monitoring of private water wells and assessment of groundwater conditions prior to undertaking construction of these works would be undertaken.

At the Public Meetings (PMs) for this study, the public, interest groups and the Councillors expressed concerns regarding the implications specifically related to the following issues:

- the dewatering requirements associated with the suggested high groundwater conditions (headwater);
- evaluations of pre-development and post-development groundwater conditions and potential mitigation measures to deal with possible adverse impacts;
- an evaluation of required mitigation measures to deal with the water balance requirements for the Fox Hollow Development Area; and
- preservation of the baseflow conditions of Snake Creek in order to protect the ecological/environmental health of the system.

At these meetings, the Consulting Team (Stantec and Golder) assured the City and the public that specialized mitigation measures would not be required and additional costs for the dewatering procedures for constructing the proposed storm/drainage, SWM and sanitary sewer infrastructure works would not be incurred based on the information available at the time.

In July 2010 upon completing the Class EA Addendum for all proposed SWM works, Stantec proceeded with the functional and detailed design based on the existing geotchnical report (information report #1). In November 2010, a more detailed comprehensive groundwater conditions assessment (information report #2) was undertaken. Furthermore, the reconfiguration in the location of the proposed Fox Hollow SWMF No. 1 has warranted an additional geotechnical investigation and boreholes that were installed this spring within the proposed Fox Hollow SWMF # 1.

This 2010/2011 geotechnical investigation (information report #2) revealed that:

- sand and gravel soil deposits are present across the subject lands and will be present in the locations of the proposed works; and
- perched groundwater conditions within the sand and gravel soil deposits on the subject lands will likely be encountered during the construction of the SWM works.

Based on these findings, specialized construction measures such as clay cut off walls, depressurization wells and an extensive dewatering procedure to mitigate the impact of groundwater that would compromise functional and operational requirements of the proposed SWM infrastructure works. These measures were discussed and accepted by the MOE.

Specifically, it was determined that a portion of SWM facility #2 is located in an area of saturated surficial granular (sand and gravel) soil deposits. In addition, it was found that the groundwater elevation in the area of the SWM facility #2 is at an elevation of approximately 270 metres, which is approximately 3 m higher than the permanent pool elevation of 266.9 metres. Therefore, the Fox Hollow SWM facility #2 (3m deep) will be located completely within the groundwater table elevations and extensive dewatering works will be required. In order to separate SWM facility #2 from the groundwater, while maintaining efficiencies in constructability and on-going maintenance, clay cut-off walls were recommended to be installed in the areas where the surficial saturated granular materials are encountered.

Also, it should be noted that these clay cut-off walls will be required not only for the Fox Hollow SWM facility #2, but will likely be required as part of the construction of SWM facility #1 and may be required for other Fox Hollow SWM Works (Heard Drain channel/linear SWM facility and Fox Hollow SWM facility #3).

Based on the identified groundwater levels within the vicinity of Fox Hollow SWM facility #2 works and to facilitate the installation of the clay cut-off walls to mitigate adverse impacts of groundwater on the proposed infrastructure, a Category 3 Permit to Take Water under the Ontario Water Resources Act was obtained from the MOE.

The construction costs associated with the clay cut-off walls for SWM facility #2 are approximately $97,000 and the dewatering measures for SWM facility #2 are approximately $70,000, both of these measures were included in the awarded tender for SWM facility #2. However, should the dewatering be required to be done undertaken during wet weather conditions the dewatering costs required for the construction of SWM facility #2 may be tripled.

Discussion:
Due to the thin layer of clayey cover and the high groundwater level in the underlying silt at the base of the facility an uplift pressure of as much as six metres of water may be present. As such, there is a high risk that if excavation to the design grade were to occur without groundwater pressure relief in the silt layer, the overlying clay layer would heave or "float" during excavation resulting in a disturbance to the base of the excavation and creating trafficability problems for construction equipment and a non-constructible condition. Alternatively, if the base of the facility were to heave following construction, the floor of the facility would be disrupted, the design grade raised, resulting in loss of storage volume and uncontrolled silt migration into the facility. Should either of the above events occur, remedial works would be extensive and costly and prolonged construction delays would be experienced.

As a result of the conditions described above, it has been the recommendation of the geotechnical engineer that depressurization wells be installed from the base of the partially completed excavation to prevent "basal heave". Problems related to basal heave are not typical for London, however, there are known cases where effective proactive depressurization was not carried out and basal heave occurred resulting in substantial additional construction costs and delays for remedial work. Similarly, in instances where this problem was identified and proper installations were carried out in advance of excavation, basal heave was prevented. These conditions have not been previously experienced in the existing facilities designed and constructed in London.

The additional costs associated with the depressurization wells included in the awarded tender for SWMF No. 2 was a lump sum item in the amount of $50,000. This amount was recommended based on the Consultant's experience of depressurization work that was not related to the SWM works. After the closure of the City's tender for this project, the geotechnical engineer's cost estimate for depressurization works was upgraded by the Consultant Team and the Contractor. The cost estimate by the contractor and independent contractors to carry out the SWM Facility #2 depressurization works required as part of the current contract are approximately $325,000 including engineering.

It is recommended that in addition to the $50,000 allocated for depressurization wells, the unexpended costs from the SWM Facility #2 site preparation contract (approximately $120,000 including contingency) and the remaining contingency allowance in the SWM Facility #2 construction contract (approximately $120,000) be used to cover the majority of costs associated with the depressurization works.

The total budgeted cost for SWM Facility #2 (including construction, engineering and land) in the Growth Management Implementation Strategy (GMIS) is $ 2.02M. The costs associated with SWM Facility #2 are $1.75M for construction, $357,362 for land and approximately $400,000 for engineering. However, if construction occurs during wet weather conditions the total cost for dewatering, depressurization wells and clay cut-off walls may increase substantially and staff will provide an update on the status of these works and may request to approve additional costs depending on how works progress.

Conclusions:
During the completion of the Class EA Addendum for the Fox Hollow Development Area, it was reported by the Consulting Team (Stantec and Golder) that groundwater would not significantly impact the construction of the storm/drainage, SWM and trunk sanitary infrastructure. During the functional design a detailed geotechnical investigation established that specialized measures including clay cut-off walls, depressurization wells and Category 3 dewatering will be required as part of the construction of SWM Facility # 2 infrastructure in order to mitigate the groundwater impacts on the infrastructure. It is recommended that the unexpended funds and contingencies from the SWMF #2 site preparation and construction contracts be approved for the installation of depressurization wells as required to complete the Construction Contract for the Fox Hollow Development Area SWM Facility #2 and that staff be directed to provide a status update of these works that may include a request to approve additional costs depending on the progress of the work.

Acknowledgements:
This report was prepared by Berta Krichker Manager M. Eng, F.E.C., P. Eng., Manager of Stormwater, Stormwater Management Unit and the issue has been reviewed with the Financial Policy and Planning Division.

SUBMITTED BY:	RECOMMENDED BY:
B. Krichker	Ron Standish
BERTA KRICHKER, M.Eng., F.E.C., P. Eng. MANAGER OF STORMWATER STORMWATER MANAGEMENT UNIT	**RON STANDISH, P.ENG. DIRECTOR OF WASTEWATER AND TREATMENT, PLANNING ENVIRONMENTAL AND ENGINEERING SERVICES**

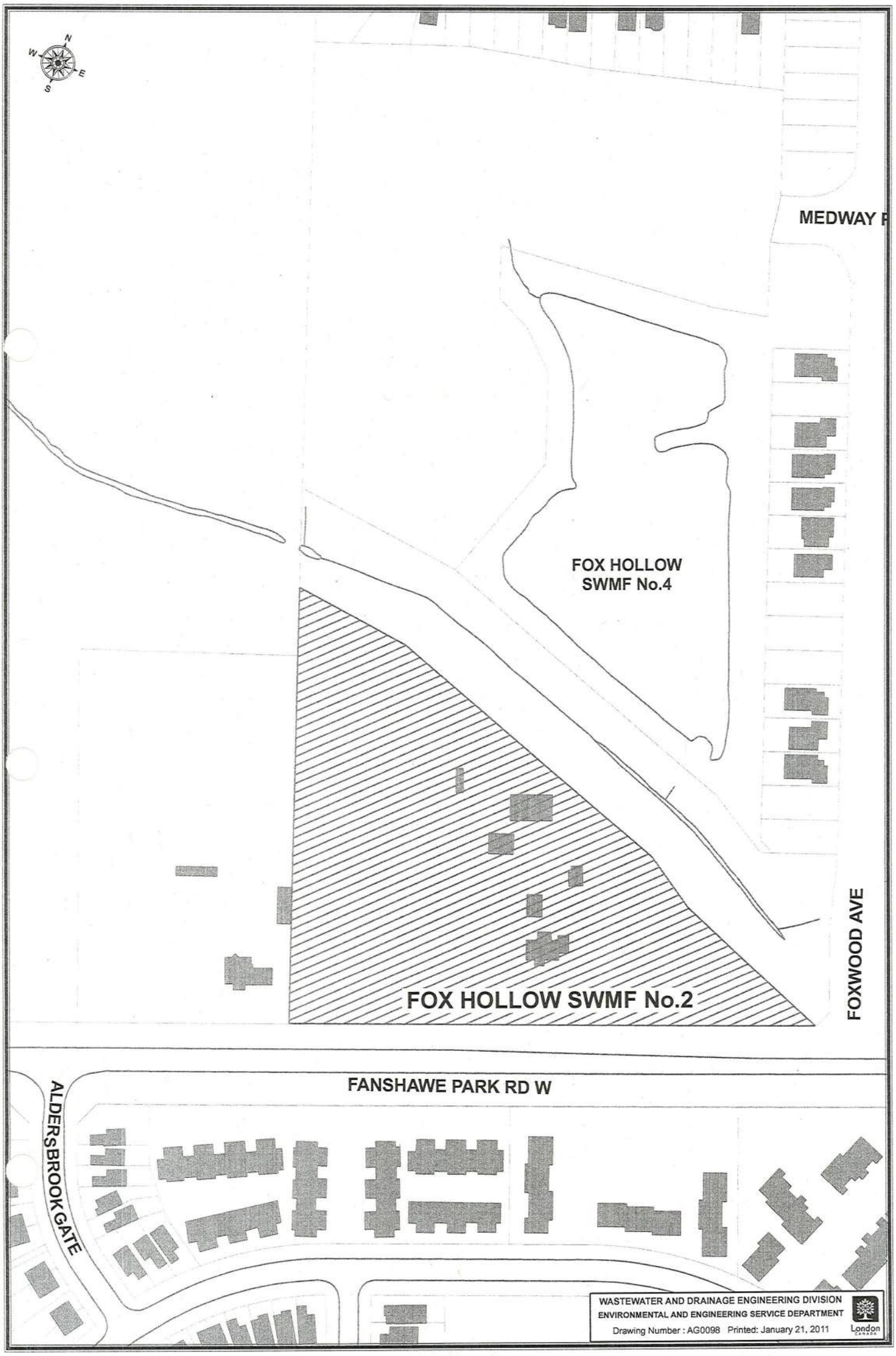
REVIEWED & CONCURRED BY:
Pat McNally
PAT MCNALLY, P.ENG. EXECUTIVE DIRECTOR OF PLANNING, ENVIRONMENTAL AND ENGINEERING SERVICES

August 5, 2011

Attach: Appendix "A" – Location Map

C.c. John Braam – Director of Water and City Engineer
Carolyn Malott – Budget Analyst

APPENDIX - "A"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WASTEWATER AND DRAINAGE ENGINEERING DIVISION
ENVIRONMENTAL AND ENGINEERING SERVICE DEPARTMENT
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