

June 29, 2018
File: 121621999

Attention: Mr. Brian Lima
Middlesex Centre
10227 Ilderton Road, RR#2
Ilderton, ON N0M 2A0

Dear Mr. Lima,

**Reference: Peer Review – Hydrogeological Assessment
Proposed Residential Development
45 Springer Street
Komoka, Ontario**

Middlesex Centre requested Stantec Consulting Ltd. (Stantec) to conduct a peer review of the hydrogeological assessment for the above noted proposed development, prepared by EXP Services Inc. (EXP) on behalf of Springer Pond Developments Ltd. The subject property is 6.8 ha in size and mostly consists of a pond that was created from below water table aggregate extraction. The pond is bounded by Springer Street to the west, Glendon Drive to the south, Queen Street to the east and residential development to the north. The current proposed development plan includes eight residential lots on the east side of Springer Street, with plans for additional lots west of Queen Street and commercial lots north of Glendon Drive. The current development plan includes partial filling of the existing pond along the shoreline to square off the proposed lots. The proposed plan is for the development to be serviced with municipal water and sewer.

A hydrogeological assessment is required by the Upper Thames River Conservation Authority (UTRCA) as a condition of subdivision approval. The UTRCA provided comments related to the proposed development in letters dated March 25, 2013 and January 9, 2017. The UTRCA noted that the proposed development is situated within a vulnerable groundwater area and as such, Section 2.2.1 and Section 2.2.2 under the Provincial Policy Statement (2014) apply to the site, as follows:

Section 2.2.1 – *“Planning authorities shall protect, improve or restore the quality and quantity of water by: e) implementing necessary restrictions on development and site alteration to:*

1. *protect all municipal drinking water supplies and designated vulnerable areas; and*
2. *protect, improve or restore vulnerable surface and ground water features, and their hydrological functions”*

Section 2.2.2 – *“Development and site alteration shall be restricted in or near sensitive surface water features and sensitive ground water features such that these features and their related hydrologic functions will be protected, improved or restored.”*

The UTRCA (March 25, 2013) letter identified several specific issues that the hydrogeological assessment should address, including:

**Reference: Peer Review – Hydrogeological Assessment
Proposed Residential Development
45 Springer Street
Komoka, Ontario**

- A characterization of any surface water connections to or from the site.
- A characterization of the groundwater in the area and current water quality of the aquifer.
- Details on how the aquifer may be impacted by the filling and on-site development.
- Details of the potential impact of the land use and activities that may occur in the proposed development, which may impact the water quality of the aquifer (i.e. gas station in the commercial lots, etc.)
- Information on how the filling can be achieved without impacting the water quality.
- Details of the long-term water quality monitoring plan, how the monitoring would be handled and how future complaints would be dealt with.

The UTRCA further recommended that the hydrogeological assessment address how the infill development might effect hydrostatic flows and water levels of the regional groundwater system and that it specifically include:

- Details on the potential for hydrostatic concerns to any development on the lots or potential issues with groundwater level rise and falls.
- The impact of the filling on adjacent uses of the aquifer in the area.
- The potential for displacement of the water (from the pond infilling and lot development) to neighbouring basements.

INVESTIGATIONS AND FINDINGS

EXP conducted a background review and several investigations, including:

- Desktop review
- Borehole drilling and monitoring well installation
- Water level monitoring
- Groundwater and surface water sampling

Reference: Peer Review – Hydrogeological Assessment
Proposed Residential Development
45 Springer Street
Komoka, Ontario

SITE CONDITIONS

The Site topography slopes gently upward toward the north and east with elevations ranging from 240.0 m AMSL to 243.5 m AMSL. Surface drainage is either directed to the roadway ditches or the central pond. There are no current or planned inflows or outflows from the central pond.

The geology of the site is found to consist of highly permeable sand/sand and gravel, underlain by a relatively low permeability clayey silt till. Of note was the amount of fill encountered, which extended anywhere from 0.8 m to 5.9 m below ground surface. The fill typically consisted of silty sand with some gravel with variable compactness. Additional filling of the pond is planned to extend and square off the lots.

Bedrock was not encountered during the site investigations and not a factor in the proposed development.

GROUNDWATER CONDITIONS

The report describes four aquifer systems in the area including three overburden aquifers and one bedrock aquifer. The shallow aquifer is unconfined and consists of glaciolacustrine or glacio-fluvial sands. All onsite investigative work focused on shallow aquifer conditions. Intermediate and deep aquifers consisting of sand and gravel deposits are discontinuous in the area and may, or may not be, present beneath the site. Several local domestic wells were found to be completed in the shallow overburden aquifer. Local shallow groundwater flow is expected to move in a southern direction towards the Thames River.

Groundwater level measurements from four shallow onsite monitoring wells were recorded on five occasions from February 2017 to January 2018. The groundwater levels on May 29, 2017 (presented in Table 1 below) represent the highest groundwater levels recorded over this period and likely represent a reasonable approximation of the high groundwater table conditions.

Table 1: Summary of Groundwater Levels on May 29, 2017.

Well ID	Ground Surface (m AMSL)	High Groundwater Table (m AMSL)	Groundwater Depth (m BGS)
BH101/MW	240.6	238.9	1.7
BH102/MW	240	238.6	1.4
BH103/MW	243.6	238.6	5.0
BH104/MW	243	239	4.0

Monitoring wells BH101/MW and BH102/MW are situated along Springer Street and most relevant for the current proposed development. As shown in Table 1, the high groundwater table along Springer Street is relatively elevated.

Reference: Peer Review – Hydrogeological Assessment
Proposed Residential Development
45 Springer Street
Komoka, Ontario

EXP estimates that the horizontal hydraulic conductivity of the soils to be 10^{-3} to 10^{-5} m/s and suggests that the high hydraulic conductivity around the pond should allow water to displace rapidly when infilling occurs allowing groundwater levels to stabilize quickly following infilling activities.

Groundwater quality is interpreted to be quite good, with cobalt being the only analyzed parameter exceeding the Ontario Regulation 153 Table 2 potable water criteria at one of the two groundwater sampling locations. Total phosphorus was the only parameter exceeding the Provincial Water Quality Objectives (PWQO) in the surface water sample collected from the central pond.

EXP completed a review of the source water protection mapping and found that the Site is situated within a Significant Groundwater Recharge Area (SGRA) and a Highly Vulnerable Aquifer (HVA) area.

IMPACT ASSESSMENT

EXP completed an impact assessment for potable wells, surface water features and shallow groundwater features. With respect to potable wells, EXP notes that the proposed development will be on municipal services and that the central pond will not be incorporated into any stormwater management strategies. As such, no water quality concerns are anticipated in shallow wells located near the proposed development. EXP noted that potable wells completed in the intermediate and deeper aquifer systems are unlikely to be impacted by the development because of the presence of confining clayey strata that presumably provides some natural hydraulic separation from the proposed development activities. Monitoring programs to monitor imported fill quality and groundwater quality were recommended to mitigate risk.

For the central pond, EXP indicated that the pond is vulnerable to short term construction activities. To minimize impacts to surface water, EXP proposed the use of several mitigation strategies including: sedimentation control, a program to monitor the quality of imported fill, best management practices and spill contingency plan for fuel handling and storage, re-establishing the vegetative cover, and limiting the use of commercial fertilizers and road salt.

EXP noted that significant groundwater inflow may be anticipated for excavations extending below depths of 2.5 m and that a PTTW or EASR may be required. To minimize impact on the shallow groundwater table, EXP recommended that native soils be reused as service trench backfill. Any impacts associated with construction dewatering would be short-term duration and coincide with the time of active pumping. Similar best management practices were identified for mitigation of impacts to groundwater as were recommended for surface water.

WATER QUALITY MONITORING

In addition to the baseline water quality monitoring already completed, EXP provided a list of future water quality considerations, including:

Reference: Peer Review – Hydrogeological Assessment
Proposed Residential Development
45 Springer Street
Komoka, Ontario

- Analytical testing of imported fill material should be considered to ensure that any material brought to the Site meets the applicable standards under Ontario Regulation 153 for residential lands.
- Contractors working at the Site should ensure that construction equipment is in good working order and equipment operators should have spill-preventions kits available.
- Chemical application in landscaped and grassed areas should be limited.
- Consideration should be given to carrying out additional water quality testing during construction.
- Monitoring stations to assess post-development changes to water quality may be considered.

STANTEC RESPONSE

In the report that Stantec reviewed, there were no conclusion or recommendation sections provided, making it difficult for the reader to understand what the opportunities and constraints are with respect to the proposed development as it relates to the hydrogeology of the site. Stantec's comments are as follows:

1. In the final report, please add conclusion and recommendation sections to make it clear to understand how the objectives of the hydrogeological assessment, as presented in the introduction of this letter, have specifically been addressed.
2. The high groundwater table is shallow along Springer Street ranging from 1.4 m to 1.7 m below ground surface. This is likely to be an issue for basement construction and/or the installation of servicing at the site, requiring the lots be raised up to a higher elevation using more fill material. Construction dewatering will also likely be required for the installation of site servicing and some effort should be made to quantify the dewatering volumes that may be required to complete this work and to understand how potential impacts to local groundwater receptors from this dewatering might be mitigated. The report should specify an appropriate groundwater level monitoring program to be completed during construction dewatering activities, which should include the onsite monitoring wells and potentially offsite shallow domestic wells if there are any in the anticipated zone of pumping influence.
3. The location of potential groundwater receptors have not been investigated and a door-to-door survey of domestic well users should be completed to identify where the shallow wells are located with respect to the proposed development activities.
4. The hydrogeological assessment does not address how the hydrological function of the Site will be protected or improved. As a minimum, we would expect to see a pre-development water balance, a post-development water balance, and proposed mitigation measures to address the groundwater recharge deficit under post-development conditions.

Reference: Peer Review – Hydrogeological Assessment
Proposed Residential Development
45 Springer Street
Komoka, Ontario

5. The report suggests that the backfill for site services should be native material. This would be fine for site services within granular material; however, if the site services extend into the underlying clayey silt unit, encountered at the base of borehole BH1, then clay cut-off collars will be required to avoid the preferential movement of groundwater within the servicing trenches.
6. The report should identify any Source Water Protection policies related to Significant Groundwater Recharge Areas or Highly Vulnerable Areas that may constrain development, if any.
7. The report should highlight the need to develop a Fill Management Plan, with this plan at a minimum discussing: 1) the type of fill that will be used to infill the pond and where this material will be sourced, 2) a description of the sampling/testing protocols that will be used to confirm that this fill meets Ontario Regulation 154/04 Table 8 Site Condition Standards and, subsequently, is deemed suitable for use as engineered fill, and 3) if the fill is to be stockpiled onsite prior to infilling the pond, provide mitigation measures to be employed to prevent the potential migration of sediment from these stockpiles to offsite receptors. In addition, the Fill Management Plan is to be accompanied by a surface water and groundwater quality monitoring program to demonstrate that water quality of the pond and local groundwater system has not been adversely impacted by the filling operation.
8. A water quality monitoring program should be developed, which includes baseline (pre-development) monitoring, monitoring during construction, and post-construction monitoring. The monitoring program should detail the frequency and duration of sampling, identify an appropriate parameter list, identify the appropriate criteria to compare data, and include a protocol for resolving any well interference complaints.
9. The potential for hydrostatic concerns related to filling of the pond have not been adequately addressed. Stantec agrees that the placement of fill in the pond is unlikely to have any long-term impact on groundwater levels; however, there needs to be a monitoring strategy in place to demonstrate that it won't be an issue. The monitoring strategy should identify approximate basement elevations of existing residences adjacent to the central pond so that an appropriate trigger groundwater level can be determined. Groundwater level monitoring should be completed in the existing monitoring wells during the filling operation to ensure that levels remain below the trigger level. In the event of a trigger level exceedance, filling operations would be suspended until groundwater levels normalize.

CLOSURE

Based on the discussion presented above, it is Stantec's opinion that additional information is required before this proposed development can proceed.

June 29, 2018
Mr. Brian Lima
Page 7 of 7

Reference: Peer Review – Hydrogeological Assessment
Proposed Residential Development
45 Springer Street
Komoka, Ontario

I trust these comments present our concerns. Please do not hesitate to contact the undersigned if you have any questions.

Regards,

STANTEC CONSULTING LTD.



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