TECHNICAL MEMORANDUM

DATE June 30, 2022 **Project No.** 21451149

TO Ron Clarke, Pam Whyte
Parsons Corporation

CC Chris Hendry, WSP Golder

FROM Caitlin Cooke **EMAIL** caitlin.cooke@wsp.com

PRELIMINARY GROUNDWATER INFLOW ESTIMATE
OTTAWA HOSPITAL EXPANSION

This memorandum contains preliminary estimates of groundwater inflow to the excavations for the Ottawa Hospital Expansion. These estimates are based on information contained in the following:

- Master site plan, grading concept dated May 14, 2022 indicating a Level B finished floor elevation (FFE) of 70.36 metres (m) for the main hospital building and a FFE for the Central Utilities Plant (CUP) of 73.54 m.
- Groundwater elevation measurements and hydraulic conductivity estimates as described in the June 2022 Golder report titled “Geotechnical and Hydrogeological Investigation, New Ottawa Hospital (Phase 2)”.

Groundwater levels at the south end of the hospital building were typically found to be 75 metres (m) to 76 m elevation. Further to the north, the measured groundwater levels appear to drop and were found to be in the range of approximately 72 m to 73 m elevation. Based on our current understanding of the required excavations and the existing sub-surface conditions, it is expected that the excavations for the main hospital building will be below the existing groundwater levels in predominantly silty and sandy soils. It will be necessary to temporarily lower the groundwater table below the depth of excavation during construction. A simplified analytical solution was used to estimate the potential groundwater inflow into the basement excavation, assuming that the initial groundwater level was 0.5 metres higher than the values measured in the monitoring wells and that they would need to be lowered to 1 metre below the Level B FFE during construction. The amount of dewatering needed for the excavation is estimated to be between about 400,000-900,000 litres per day (L/day) (steady-state inflow) and 5,000,000-7,000,000 L/day (initial inflow).

Groundwater levels in the area of the CUP were found at about 76 m elevation, therefore, it is expected that the excavation for the building will be below the existing groundwater levels in predominantly silty and sandy soils. It will be necessary to temporarily lower the groundwater table below the depth of excavation during construction. A simplified analytical solution was used to estimate the potential groundwater inflow into the basement excavation, assuming that the initial groundwater level was 0.5 metres higher than the values measured in the monitoring wells and that they would need to be lowered to 1 metre below the CUP FFE. The amount of dewatering needed for the excavation is estimated to be between about 180,000 L/day (steady-state inflow) and 1,900,000 L/day (initial inflow).

The estimated radius of influence (ROI) of the dewatering was estimated to range from about 25-75 m for the main hospital building, and about 40 m for the CUP as shown on Figure 1. The estimated ROI does not intersect the heritage buildings located southeast of the CUP. It does, however, intersect the heritage building located west of the CUP. Note that the ROI is the distance at which 0 m of drawdown is estimated to occur. As such, the amount of drawdown estimated at the heritage building located west of the CUP is minimal.

The slope of the water levels measured at the site was not able to be represented within the analytical model, so the maximum value of the water table in the area of the building footprint was assumed for the inflow estimates. This assumption results in a potential overprediction of inflow by the model in areas with less groundwater drawdown. As such, the previously presented estimates are likely to be conservative. No factor of safety was used, and incident precipitation is excluded from these calculations.

In addition to the temporary dewatering, in areas where the grade is being permanently lowered below the groundwater level, permanent drainage works will be required. The volume of groundwater to be handled in the permanent drainage system is anticipated to be similar to the steady-state inflow amount, depending on the design of the drainage system.

These groundwater estimates are preliminary in nature and include several simplifying assumptions. Depending on the needs of the design team, it may be advantageous to use a numerical model to refine the groundwater inflow estimates and ROI. A 3-dimensional numerical model can better represent the complex geometry of the excavation, the variability in the overburden deposits and the sloping water table at the site, and can also be used for analysis of transient groundwater conditions. We would be glad to provide a cost estimate for the scope of work to develop such a model if needed.

Golder Associates Ltd.

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https://golderassociates.sharepoint.com/sites/140130/project files/6 deliverables/hydrogeology/preliminary inflow/21451149-rev0-tm-preliminary groundwater inflow-2022jun30.docx

Attachments: Figure 1 – Site Plan

LEGEND

- APPROXIMATE BOREHOLE LOCATION
- PREVIOUS BOREHOLE LOCATION (STANTEC 2020)
- PREVIOUS ENVIRONMENTAL BOREHOLE OR MONITORING WELL LOCATION (STANTEC, 2017)
- PREVIOUS ENVIRONMENTAL BOREHOLE OR MONITORING WELL LOCATION (PATERSON, 2017)
- HISTORICAL TESTHOLE LOCATION
- PATERSON REMEDIATION AREA
- ESTIMATED RADIUS OF INFLUENCE - MAIN BUILDING
- ESTIMATED RADIUS OF INFLUENCE - CUP
- STUDY AREA

REFERENCE(S)

1. PROJECTION: TRANSVERSE MERCATOR, DATUM: NAD 83, COORDINATE SYSTEM: MTM ZONE 9, VERTICAL DATUM: CGVD28

0 25 50 100

1:2,500 METRES

CLIENT
PARSONS INC.

PROJECT
GEOTECHNICAL INVESTIGATION
OTTAWA HOSPITAL NEW CIVIC CAMPUS

TITLE
SITE PLAN

CONSULTANT
WSP GOLDER

YYYY-MM-DD	2022-06-22
DESIGNED	----
PREPARED	JEM
REVIEWED	BB
APPROVED	CH

PROJECT NO.	CONTROL	REV.	FIGURE
21451149	0012	0	1

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: 25mm 0

Path: N:\Active\Spatial_IM\Ottawa_Hospital\New_Civic_Campus\99_PRO\21451149_Parsons_Expansion\0012_Prelim_GW_Inflow_Main\Campus\21451149-0012-CH-0001.mxd