Ministry of the Environment, Conservation and Parks
Eastern Region
1259 Gardiners Road, Unit 3
Kingston ON K7P 3J6
Phone: 613.549.4000
or 800.267.0974

Ministère de l'Environnement, de la Protection de la nature et des Parcs
Région de l'Est
1259, rue Gardiners, unité 3
Kingston (Ontario) K7P 3J6
Tél: 613 549-4000
ou 800 267-0974

Ontario

M E M O R A N D U M

April 27, 2023

TO: Gary Muloin
Environmental Officer
Ministry of the Environment, Conservation and Parks
Peterborough District
Eastern Region

FROM: Eric Martin
Hydrogeologist
Technical Support Section – Water Resources Unit
Eastern Region

RE: Leahy Excavations Inc., County Road 4, Peterborough

I have reviewed the following documents:

"Hydrogeological Assessment County Road 4, Peterborough, Ontario
Leahy Excavations Inc." dated January 30, 2023 and authored by GHD environmental.

I offer the following comments and recommendations for your consideration:

Background

An ECA is proposed for the construction of a soil bank on what will be referred to as "the Site". An existing hydro-vac slurry receiving operation is already located on Part of Lot 3, Concession 9 in the Township of Douro-Dummer in Peterborough, Ontario. It is located on the south side of County Road 4, in a rural-residential area that is also home to agriculture. The Site is reported to be approximately 35.7 hectares (ha) in area and to the east is an Environmental Conservation Zone (EC) which includes Meade Creek.

Historically, the pit on the Site was used for construction of County Road 4 and is now used to receive topsoil and other soils from construction projects as well as asphalt and concrete material. In addition to this, the site receives slurry unloaded from hydro-vac

work associated with underground utilities daylighting. When the slurry arrives at the Site, it is transferred to a settling pond.

The area is serviced by private water supplies, forty-one (41) of which are located within a 250 m radius of the site. Ten (10) of these are overburden wells, one (1) with dug construction and nine (9) drilled. The remainder are installed into the bedrock.

Geology

Regionally, the subsurface is composed of: Sand and gravel with minor silt and till that is ice stratified; underlain by coarse textured sand and gravel with minor silt and till that are glaciolacustrine; underlain by coarse textured sand and gravel with minor silt and till that are glaciofluvial; underlain by what is described as stone-poor, sandy silt to silty sand-textured till on Paleozoic bedrock formation.

The information provided approximates an overburden thickness of 3 m and a depth to bedrock as 3 metres below ground surface (m BGS) to 27 m BGS based on a survey of MECP well records in the area.

Geology specific to the Site was assessed using six (6) boreholes, MW-1-22 through MW-6-22, which experienced auger refusal on assumed bedrock. Based on this, it the estimated overburden thickness is 3.8 m. Geology local to the site is described as gravelly sand with a thickness of 0.8 to 2.3 m; underlain by silty sand with clay and gravel to refusal at 3.8 m BGS.

Hydrogeology

The Site is partially located in within a Significant Groundwater Recharge Area, SGRA along County Road 4 which also has a moderate vulnerability score of 4. The middle to the south of the Site is classified as SGRA and several smaller areas in the north of the site and the entire northeast area is assigned the higher, but still moderate value of 6. The Site is not located in a designated Wellhead Protection Area (WHPA).

As the boreholes were advanced, it is reported that water was encountered in the overburden unit between the depths of 2.0 m BGS in MW2-22 to 3.0 m BGS in MW-6-22. Static water levels were recorded in August and October of 2022 and in both cases, MW1-22 and MW-4-22 were dry. Water levels are slightly higher in October than they were in August, with a maximum range of 1.15 to 3.75 m BGS. Groundwater flow direction is characterised as easterly to southeasterly, towards Meade Creek.

Hydraulic conductivity values were assessed using single well response tests on three monitoring wells (3) using the Bouwer-Rice slug-test method, which is designed for unconfined aquifers but may also be adapted for stratified or confined aquifers, assuming than the bottom of the well screen is some distance from the potentiometric

surface. Although it is not specified in the submitted materials, during the course of the test the water level is not to fall below the screened portion of the well, or an alternative method of calculating the effective radius must be used. This appears to be the case based on the well diagrams but confirmation of this is required.

It is noted that the single well method only characterises the hydraulic conductivity of the subsurface in a small area adjacent to the borehole. Multi well testing is recommended to refine conductivity values over the entire area between the boreholes, however if it can be demonstrated that only clean soil is accepted, this testing may not be necessary. If testing is performed and given the presence of SGWA and HVA designations on site, multi well testing and comparison of the hydraulic conductivity results to the single well slug test is recommended. The horizontal hydraulic conductivity has been estimated as 1.0×10^{-6} m/s and 2.1 m/s $\times 10^{-5}$ m/s for gravelly sand.

The author refers to the hydraulic conductivities to be low, but I disagree with this assessment, and would estimate the conductivity as moderate to high based on the values presented. The borehole logs identify the lower overburden strata as 'dense', however, which could cause it to behave as an aquitard. It is assumed that the relatively low hydraulic conductivity of the overburden will prevent the downward migration of constituents, but it is my opinion that that more must be done to demonstrate this claim. Connectivity between the overburden and bedrock units should be refined, as no lining was mentioned with relation to the holding ponds to act as a hydraulic barrier.

A description of bedrock type, competency and transmissivity are not noted. They are key parameters in transport of dissolved constituents, and I recommend that greater detail be provided.

Background and Downgradient Water Quality

Background water quality at the site was assessed using MW2-22 and MW6-22. Water quality results are compared to the PWQO and Table 2 of The MECP Soil, ground water and sediment standards for use under Part XV.1 of the Environmental Protection Act which has a much larger parameter list than the PWQO. Comparisons should also be made to the ODWS.

The only exceedances reported were Hardness (328-375 mg/L) and Turbidity (17.8 to 211 mg/L). Both of these parameters are likely naturally occurring but the total range in turbidity is very large between MW2-22 and MW6-22. The presence of turbidity is significantly higher upgradient than down while hardness is similar between the two locations. Chloride is higher at MW2-22 than MW6-22, as is nitrate, which may indicate the dilution of dissolved constituents from road salt and nutrients from agricultural operations. A similar but more pronounced trend is noted in phosphorous, which is a non-conservative tracer and should be expected.

The location of MW6-22 also may not be southerly enough to intercept potential contaminants and it is recommended that the installation of a new well downgradient be considered.

Soil Quality

Background soil quality was assessed using one (1) soil sample collected from the site, identified as GS-1, however the location from which the sample was collected is not identified. Results were compared to the MECP Table 1 Standards (Full Depth Background Site Condition Standards for residential / parkland / institutional / industrial / commercial / community property use). This is not the appropriate standard for the geology described in the submitted materials.

I recommend the use of MECP standards that account for both shallow soil in potable water conditions as well as those which account for being within 30 m of a water body (Tables 6 and 8). I recommend that one sample is also not sufficient to characterise the Site as a whole. It is recommended that more samples with locational data be collected to demonstrate the correct representation the soil quality at the Site.

The quality of incoming soil is also not addressed. The owner or operator of a reuse site or qualified person associated with a reuse site must evaluate the potential cumulative impact of soil of various qualities as per. Reg. 406/19 (On-Site and Excess Soil Management) made under the Environmental Protection Act, R.S.O. 1990, c. E.19 (EPA). Further information on the quality of incoming soil that will be accepted by this facility (receiving site) is required.

Monitoring Program

The author recommends that a monitoring programme be implemented at the site to compare future results with historical data. The proposed monitoring programme specifies surface water sampling at both creeks, sampling of all monitoring wells and static water levels, summarised in an annual monitoring report. It is recommended that a more detailed proposal be presented, with sampling schedules and additional monitoring wells.

Further to this, it is recommended that the settling pond that receives hydrovac material is also sampled on a regular basis and that visual / olfactory observation of hydrovac material is undertaken with each load received at the site. If a sheen or odour (e.g. petroleum hydrocarbon sheen or odour) is observed then the material should be contained and appropriate sampling should be undertaken. Further information is also requested on the origin and quality of hydrovac material received at the site and the nature of the settling pond, such as the inclusion of a clay liner to inhibit infiltration to baseflow or if it has an outlet. Any monitoring data / information related to the existing

hydrovac operation should also be compared to the appropriate groundwater or excess soil tables and submitted for review.

Conclusions and Recommendations

Based on the information provided, I offer the following recommendations for your consideration:

- Water quality on site is compared to the PWQO. It is recommended that those comparisons should also be made using the MECP Soil, ground water and sediment standards for use under Part XV.1 of the Environmental Protection Act, with the most appropriate table selection for the site, which includes both thin soils and a waterbody (for areas within 30 m of the water body) in addition to comparing to Ontario Drinking Water Standards, Objectives and Guidelines.

- It is recommended that the settling pond that receives hydrovac material is also sampled on a regular basis and that visual / olfactory observation of hydrovac material is undertaken with each load received at the site. If a sheen or odour (e.g. petroleum hydrocarbon sheen or odour) is observed then the material should be contained and appropriate sampling should be undertaken.

- Multi-well hydraulic testing is preferable to single well methods to determine overall flow characteristics of a geological unit and is the recommended method.

- Incoming soil quality should be specified, in terms of quantity and quality as the level of contamination will drive the risk for potential impacts to receptors. The owner or operator of a reuse site and the qualified person must evaluate the potential cumulative impact of soil of various qualities as per Reg. 406/19.

- It is recommended that a slightly more detailed monitoring plan proposal be presented, with sampling schedules and additional monitoring wells that may be installed downgradient from the soil stock location. Controls and monitoring of incoming material may not require the installation of new wells.

- A description of bedrock type, competency and transmissivity are not included for the Site and I recommend that greater detail be provided on the bedrock unit and its potential flow characteristics. These parameters are key to understanding groundwater flow and transport on site.

"Original Signed By"

Eric Martin, PhD, P.Eng.
EM/em

ec: Victor Castro
Christina Klein
Kyle Stephenson
Dana Cruickshank

c: ECHO # 1-150179722