Technical Memorandum

03 March 2023

To	Norbert Woerns	**Project No.**	010978-MEM-301
Copy to	JART, Kevin Mitchell (CRH), Brian Zeman (MHBC), Ellen Ferris (MHBC), Anthony Goodban (GEC)		
From	Kyle Fritz, Richard Murphy		
Project Name	Dufferin Aggregates Milton Quarry East Extension (MQEE)		
Subject	Evaluation of Passive MQEE Mitigation		

1. Introduction

GHD has undertaken additional analysis of the proposed Milton Quarry East Extension (MQEE) rehabilitation conditions in further response to Joint Agency Review Team (JART) comments and subsequent discussion on February 3, 2023. Related JART comments on the GWRA include: 43, 50, 53, 55. This memorandum provides the additional clarification as requested.

During the discussion it was identified that additional documentation could be provided to support the decision for active management under rehabilitation conditions, as is already required for the existing approved quarry. The discussion focused on the potential to remove all active management from the MQEE under rehabilitation conditions, regardless of the existing approvals or infrastructure that will continue to operate for the existing approved quarry requirements. It is GHD's opinion that the incremental infrastructure required for the proposed MQEE rehabilitation condition represents a small addition relative to the existing approved condition, and when considered as a whole, the site would not materially benefit from the proposed passive measures discussed below.

An evaluation has been made to assess the feasibility of passively supporting groundwater in the vicinity of the MQEE by reducing groundwater flow (recirculation) to the MQEE excavation. The recirculation reduction measures discussed at the meeting were buttressing and bedrock grouting. These measures are identified by GHD as alternative actions in the Part II Section C of the AMP Addendum in the event enhanced permeability is encountered and either diffuse discharges or recharge wells (primary mitigation measures) are not optimally effective. GHD notes that the intent of these measures is to reduce recirculation over an area of the quarry face where enhanced permeability has been identified and are only intended to reduce the permeability to be on the order of 10^{-4} cm/s. None of the measures identified have been required to date and recharge wells and wetland diffuse discharge continue to be the most effective mitigation method.

2. Evaluation

Buttressing and grouting perform the same function (i.e., to reduce recirculation), so a single scenario was simulated with the groundwater flow model. For this scenario, the active WMS components on the MQEE

property were removed and a 30 m wide zone was created at the edge of the quarry face. The hydraulic conductivity of this zone was assigned to $1x10^{-4}$ cm/s to represent either the buttress or grouted rock (note that an actual grout curtain would be much thinner and hence less effective than this simulation).

The base of Wetland U1 is 337.51 m AMSL and proposed target water elevations range from 337.81 to 338.00 m AMSL. The simulated groundwater elevation at Wetland U1 is approximately 335.8 m AMSL for this scenario with the hydraulic buttress or grout curtain in place. The simulated water level is 1.7 m below the base of the wetland and as much as 2.2 m below the spring target elevation. It is also lower than the spring 2020 groundwater level at OW78S/D-20 during a time when Wetland U1 was observed to be dry (refer to GWRA Figure 6.10). Given these results, it is evident that a passive approach would not sufficiently support Wetland U1 to achieve the enhancement to hydroperiod as proposed with active management.

The base of the lower pool at Wetland W36 is 332.36 m AMSL and the proposed target water elevations range from 332.56 to 332.66 m AMSL. The base of the upper pool at Wetland W36 is 332.54 m AMSL and the proposed target water elevations range from 332.86 to 332.99 m AMSL. The simulated groundwater elevation at Wetland W36 is approximately 331.8 m AMSL for this scenario with the hydraulic buttress or grout curtain in place. The simulated water level is 0.5 m below the base of the lower pool and 0.7 m below the base of the upper pool. The difference between the simulated water level and maximum assigned target water elevation is as much as 1.2 m for the upper pool. It is concluded based on these results that the passive measures proposed would not sufficiently support Wetland W36 to achieve the enhancement to hydroperiod as proposed with active management.

To further consider this matter, GHD simulated a second hypothetical condition with an (infeasible) impermeable barrier at the edge of the quarry face. This was achieved in the model by converting the cells at the MQEE boundary to a “no flow” boundary condition. Under this scenario the simulated groundwater elevations for Wetland U1 and W36 did not rise above the base of either wetland. Therefore, it is further concluded that passive measures alone will not sufficiently support the wetlands to achieve the ecological enhancements as proposed.

Furthermore, it should also be recognized that leakage of water pumped to the wetlands, or recirculating water from seasonal recharge well use is not a loss of water or pumping inefficiency as this water will return to the East Cell and MQEE Lake. This returning flow (recirculation) reduces the pumping required for quarry lake top-up. Reducing the amount of recharge to the groundwater flow system in the MQEE will not materially reduce the net pumping requirement and no water would be “saved”.

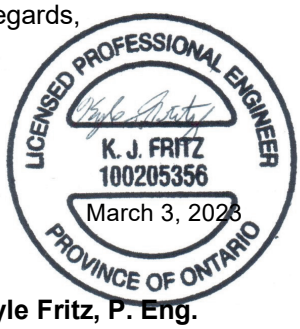
3. Conclusion

The proposed MQEE includes suitable and demonstrated mitigation measures to successfully achieve the mitigation and enhancement objectives of the proposed MQEE. The proposed measures are only a modest extension of the existing approved (and operating) water management system.

The additional analysis described above demonstrates that a fully passive rehabilitation mitigation approach for the MQEE can not be relied on to achieve the planned mitigation and enhancement objectives. Active management measures also provide the flexibility for Conservation Halton to manage water resources in the long term to meet their watershed goals for conservation and streamflow management with increased flexibility

to adapt to climate change effects. Therefore, it is concluded that further evaluation of passive measures is not warranted and the proposed approach is confirmed to be the most suitable approach.

Regards,



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