



April 7, 2020
Project Number: 190615-01

Mr. David Welwood
Principal Planner
Planning, Development & Legislative Services
Region of Waterloo
150 Frederick Street, 8th Floor
Kitchener, ON N2G 4J3

**Re: Shantz Station Aggregate Pit, Township of Woolwich
Hydrogeological Review – Reply to MTE Response**

Dear Mr. Welwood:

BluMetric Environmental Inc. (BluMetric™) was retained by the Regional Municipality of Waterloo to conduct a hydrogeological peer review of the proposed Shantz Station Aggregate Pit near Maryhill in the Township of Woolwich. The review, dated January 7, 2020, was supplied to MTE Consultants who conducted the original hydrogeological investigation. MTE responded to the review in a letter dated February 7, 2020. The Region has retained BluMetric to reply to the MTE response.

As in the MTE response, each comment/response/reply is numbered. For the more detailed responses not all of the text is shown.

BluMetric Comment #1

The MTE study area was 500m from the site. The Region's Guidelines indicate a 1km distance for the door-to-door survey of private wells. Wells within 1km of the site should be identified with justification provided on why a 500m radius for the survey is adequate.

MTE Response #1

As the application is for an above water table pit, there is no potential to generate a zone of influence that may cause interference to nearby domestic wells. As such, MTE is of the opinion that 500 m (from the extraction area) is an adequate distance for the study area.

Tel. 519-742-6685

BluMetric Environmental Inc.

Unit 3B, 209 Frederick Street, Kitchener, Ontario, Canada N2H 2M7

www.blumetric.ca



BluMetric Reply #1

The reasoning for the 500 m radius is satisfactory.

BluMetric Comment #2

The MTE report indicates that fuel will be stored on site. The Region's Guidelines indicate that in such cases, petroleum hydrocarbon monitoring, both baseline and ongoing, should be conducted. This has not been done and is not included in the proposed monitoring program.

MTE Response #2

Prior to extraction, baseline groundwater samples will be collected from one monitoring well on the west (MW3) and one monitoring well on the east (MW5) side of the proposed pit for hydrocarbons (F1-F4 + BTEX). Baseline sampling for these parameters will be added to the Site Plans.

As the proposed pit is above water table and there are no chemicals used in the extraction of aggregate, MTE proposes future sampling only occur in relation to the Spills Contingency Plan and the recommendations of a retained Qualified Person following a spill.

BluMetric Reply #2

The proposed future sampling is adequate if the monitoring plan includes a monthly check of the integrity of the hydrocarbon storage tank/containment. Documentation of this check must be included in the annual report.

BluMetric Comment #3

The monitoring conducted in the MTE report does not include temperature monitoring of the groundwater or surface water as required in the Region's Guidelines. With the removal of material above the water table, there is potential that surface water groundwater flux, could increase. With the increased near surface flux flowing to Hopewell Creek, then there is also a possibility of increasing the temperature in the Creek that is classified as a cold water creek. Baseline and ongoing temperature monitoring of the groundwater and surface water should therefore, be completed.

MTE Response #3

Baseline temperature data from on-Site monitoring wells and Hopewell Creek has been presented on Figure 1 (attached). Temperature monitoring of Hopewell Creek upstream (SW51) and downstream (SW52) took place between November 7, 2017 to December 7, 2017 and May 2, 2018 to November 21, 2018.

Groundwater temperature monitoring of on-Site monitoring wells and surface water temperature monitoring of Hopewell Creek has been ongoing since 2017, and will be added to the monitoring program and Site Plans.

BluMetric Reply #3

It is good to see that temperature monitoring has been historically completed and that it will be added to the on-going monitoring program.

BluMetric Comment #4

Groundwater samples were collected for geochemical analyses from two on-site groundwater monitors in July 2018. The Region's Guidelines indicate that all monitors (5 overburden wells in this case) should be sampled in the spring and later summer on an annual basis. The analyses conducted in 2018 were quite extensive and the parameters to be used as a baseline in all monitors could therefore be reduced. As stated in the Guidelines, the monitoring program may allow for a progressive decrease in monitoring at two to five year intervals as sufficient information is collected to understand the scope of impacts, if any, of extraction.

MTE Response#4

There is a groundwater divide that bisects the Site. Groundwater samples were collected from a down gradient monitoring well on either side of the divide to characterize groundwater quality. MW5 was chosen to represent groundwater quality on the east side of the divide and MW3 was chosen to represent groundwater quality on the west side of the divide. Given the consistent landuse (agriculture), water quality is interpreted to be consistent across the Site. As such, a groundwater sample on either side of the divide is interpreted to be sufficient to characterize water quality, particularly in light of this being an above water table application.

BluMetric Reply #4

The interpretation that groundwater quality is consistent across the site can only be determined once baseline conditions from all groundwater monitors is completed. Once this is established in accordance with the Region's Guidelines, then potential adjustments to on-going monitoring can be made.

BluMetric Comment #5

The removal of material above the water table could affect the potential buffering capacity not only of the temperature during the active life of the extraction operations but also the potential impacts of nutrients if the site is returned to agricultural uses as part of site rehabilitation. Measures to mitigate detrimental nutrient loading to the surface water should be consider as part of the rehabilitation plans.

MTE Response #5

The Site Plan includes a requirement for a grass-legume cover crop to be established immediately following the replacement of soils and to be maintained for up to five years and ploughed under annually in order to promote and increase organic matter without the addition of soil additives. The site plan also requires soil testing and the completion of an Annual Rehabilitation Report, to ensure that any soil amendments are being added appropriately.

Once the pit has been rehabilitated and the agricultural use of the property resumed, the landowner will implement Agricultural Best Management Practices (See OMAFRA Best Management Practices Series) to prevent and mitigate the potential for detrimental nutrient loading.

BluMetric Reply #5

The MTE response satisfies the potential concern.

BluMetric Comment #6

The MTE report indicates that tile drains in the southwest corner of the site will remain in place. Figure 2, Operation Plan, shows proposed culverts under berms in this area as well. There is no mention, however, in the MTE report or the Operation Plan of the tile drain system that feeds into Wetland 1 (part of the Breslau Wetland) Complex in the northwest corner of the site or the tile drain along the east property boundary near MW2 that would drain to Hopewell Creek. The sentence below is from the MTE report:

Following extraction, in the event that tile drains were removed during aggregate extraction, Capital Paving in consultation with the land owner will re-install tile drains in suitable locations as required. (Section 7.5, page 19).

Is this statement in reference to all tile drains on the site or just the system in the southwest corner that was discussed in the earlier portion of the section in the report? Re-installing tile drains post extraction is not related to surface water flow during the extraction. MTE indicated that surface water flow can be maintained during the site life but it is not known if this will be through the tile drains or overland flow.

MTE Response #6

The referenced MTE statement above is applicable to all tile drains encountered during extraction, such that any tile drains removed on-site as a result of extraction will be replaced by Capital Paving in consultation with the land owner as required.

Surface water (overland) flow near the margins of the property will be maintained via tile drains until such a time as the aggregate surrounding these features is extracted. During the extraction period overland runoff will be allowed to accumulate and infiltrate into the local groundwater system through the pit base. MTE's May 20, 2019 Report indicated Wetland 1 and Hopewell Creek both receive groundwater inputs naturally. As such, the reduction in surface water flow resulting from the removal of tile drains should have minimal effect on surrounding surface water features. Following extraction tile drains removed as a result of extraction will be replaced by Capital Paving in consultation with the land owner as required.

BluMetric Reply #6

The MTE response satisfies the potential concern.

BluMetric Comment #7

Appendix F in the MTE report is the Micro Drainage Analysis which also deals with Wetland 1. A small note that the reference to sub-catchment area draining to Wetland 1 in Table 1.1 is 102/202 but in Figures 1.1 and 1.2 it shows these areas as 102 and 201, respectively. The analysis states (page 2):

Pre-development annual infiltration flows do not contribute directly to Wetland 1 according to the groundwater contours developed within the Level 1 and 2 Hydrogeological Investigation (MTE, 2019) and illustrated on Figure 1.2. Groundwater flows appear to travel generally west near Wetland 1, and likely flow north towards downstream portions of the wetland complex as they flow west, eventually forming a tributary to Hopewell Creek.

Do the tile drains in the northwest corner of the site not contribute to Wetland 1? The analysis also states (page 4):

The total area of surface drainage which is being transformed from a direct surface water catchment of Wetland 1 is 21.75ha. This represents a reduction of contributing drainage area to the larger wetland complex of 8.9 %.

It is not clear as this may contradict earlier statements. The next paragraph in Appendix F, states:

Considering the changes to the surface drainage areas in the during/post extraction period, Wetland 1 will observe a decrease in annual surface water contributions of 23,313m³. The lost surface water contributions will be replaced by infiltrated groundwater flows to Wetland 1, which result in an additional 87,782m³ of water contributing to the wetland annually.

But if infiltration does not contribute to the wetland and “Groundwater flows appear to travel generally west near Wetland 1, and likely flow north towards downstream portions of the wetland complex...” then how will there be increased flow to the wetland? Does this consider the wetland as a whole? What will happen to Wetland 1 in the vicinity of MW1, MP6 and MP5?

Overall, clarification on the current surface water drainage and groundwater flow to Wetland 1 and changes during and post- excavation is required including the role or non-role of the existing tile drains, overland flow and infiltration to the groundwater.

MTE Response #7

The reference to catchment areas has been corrected accordingly (i.e. 201 and 202).

Groundwater contours presented on Figure 1.2 of Appendix F were constrained to the extraction boundary. A review of groundwater levels collected in the spring of 2018, and specifically those from MP6 indicates a groundwater gradient between MW1 (329.28 mAMSL) and MP6 (328.04 mAMSL). This information was then used to revise Figure 1.2 (see revised version attached).

Based on the revised Figure 1.2 a portion of groundwater from the Site flows directly to Wetland 1 in vicinity of MP6. As such, Appendix F (Attachment A) of MTE’s May 10, 2019 Report has been revised to reflect this alteration.

To further clarify the current surface water drainage and groundwater flow to Wetland 1, MTE revisited the assumptions made in the water balance calculation presented in the May 10, 2019 Report. MTE revised the evapotranspiration (ET), runoff and infiltration rates of the post-development scenario to better represent an exposed sand/gravel pit floor. Those ET (200mm/yr), runoff (609mm/yr) and infiltration (107mm/yr) values presented in MTE’s May 10, 2019 Report were representative of an impervious surface (i.e. dense till) which would reflect the removal of the aggregate resource in its entirety down to the till surface. However, in order to maintain a 1.5m buffer above the water table, a portion of the sand and gravel resource will remain in place. As such the values for ET, runoff and infiltration were revised to 540mm/yr (ET), 320mm/yr (runoff) and 56mm/yr (infiltration) accordingly (see insert below **not included here**).

Based on these revised values, the initially predicted net change in the amount of water contributing to Wetland 1 has been revised, and decreases from 87,782m³/yr to 6,794m³/yr, while the amount of water contributing to Hopewell Creek has decreased from 167,740m³/yr to 6,854m³/yr. See insert below **not included here**.

The revised results indicate that the water contributing to Wetland 1 and Hopewell Creek will be similar to pre-extraction conditions (8% and 4% increase respectively).

As can be seen above, the reduction in runoff to Wetland 1 and Hopewell Creek is compensated by an increase in the amount of water infiltrating into the groundwater system, which is consistent with the water level data collected as part of MTE's May 20, 2019 Report that indicated Wetland 1 and Hopewell Creek both receive groundwater inputs naturally. With only an 8% and 4% increase in groundwater inputs, surface water levels within these features are not expected to increase. Monitoring of mini-piezometers MP5 and MP6 (three times annually) will be used to track water level trends throughout the operation of the proposed pit and ensure water levels in Wetland 1 are not being impacted. The monitoring of MP5 and MP6 will be added to monitoring program and the Site Plans.

BluMetric Reply #7

The revisions to the water balance are good to see and the potential concern has been addressed.

BluMetric Comment #8

Section 7.1 of the MTE report (page 17) states:

As such, MTE does not anticipate any adverse effects to either Wetland 1 or Hopewell Creek as a result of the proposed pit development.

Please confirm that this statement includes no adverse effects on wetland functions as a result of the increased groundwater flow, if this will be determined solely on water level measurement in MP5 and MP6, or if other means will be used for confirmation.

MTE Response #8

Based on the revised Micro Drainage analysis presented in Attachment A. The water contributing to Wetland 1 and Hopewell Creek will be similar to pre-extraction conditions (8% and 4% increase respectively). As such, the potential for adverse effects to either Wetland 1 or Hopewell Creek are minimal. Water levels in mini-piezometers MP5 and MP6 will be monitored three times annually and will be used to track water level trends throughout the operation of the proposed pit. The monitoring of MP5 and MP6 will be added to monitoring program and the Site Plans.

BluMetric Reply #8

The MTE response satisfies the potential concern.

BluMetric Comment #9

The MTE report indicates that the results of the monitoring (this would need to include both water level and geochemical analyses) be retained by the proponent so it is available if requested by agencies. The Region should require a submittal of this information and interpretation of the data annually, at least initially and potentially at a decreasing frequency if the monitoring is decreased as noted above.

MTE Response #9

Capital Paving agrees to provide an annual report (as required) to the Region of Waterloo summarizing and interpreting groundwater and geochemical data. Reporting requirements will be reviewed on an annual basis and may be decreased pending agreement from the Region of Waterloo. This reporting requirement will be added to the Site Plans.

BluMetric Reply #9

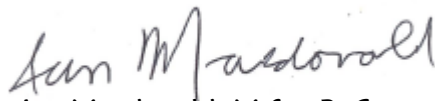
The MTE response satisfies the potential concern.

In summary, it is BluMetric's opinion that the majority of the concerns with the hydrogeological investigation have been adequately addressed with the following exceptions:

- a) The proposed on-going hydrocarbon sampling only if there is a spill is adequate if the monitoring plan includes a monthly check of the integrity of the hydrocarbon storage tank/containment. Documentation of this check must be included in the annual report.
- b) The interpretation that groundwater quality is consistent across the site can only be determined once baseline conditions from all groundwater monitors is completed. Once this is established in accordance with the Region's Guidelines, then potential adjustments to on-going monitoring can be made.

Please do not hesitate to contact the undersigned if you have any questions.

Sincerely yours,
BluMetric Environmental Inc.


Ian Macdonald, M.Sc., P. Geo.
Senior Hydrogeologist



Ref: 190615-01 Shantz repf Apr 2020.docx