Proposed Milton Quarry East Extension
JART COMMENT SUMMARY TABLE – Geology and Water Resources

Please accept the following as feedback from the Milton Quarry Joint Agency Review Team (JART). Fully addressing each comment below will help expedite the potential for resolutions of the consolidated JART objections and individual agency objections. **Additional, new comments may be provided once a response has been prepared to the comments raised below and additional information provided**.

	JART Comments (December, 2022)	Reference	Source of Comment	Applicant Response	JART Response
Report/Date: Geology and Water Resources Assessment Report December **2021**			**Author: GHD**		
1.	No "major" karst features (described as caves, sinkholes or large conduits) have been reported from the site, including following a brief site visit undertaken by Dr. Worthington. There appears to be no direct evidence of karst, however I noted above that I have not yet observed the site. I would point out that some degree of enhanced solution along fractures in and near the MQEE area is apparent from the borehole logs with evidence of clay fines up to 9.07 mBGS in OW70D-20 (and also OW78D/S-20). In addition, several water-bearing fractures were noted in borehole OW70-08 (Appendix B).	General	Daryl W. Cowell		
2.	Section 10.4 in the main report is titled "Cumulative Effects" however, this section is very brief and only speaks to the fact that there are "no known other forms of development identified in the immediate study area". There is no attempt to consider cumulative impacts on groundwater and wetlands associated with other quarries in the immediate area (main and north quarries; west and east cells). Section 1.1, page 2 of the report notes that detailed studies (including monitoring well data) have been underway for "more than 40 years". Cumulative effects resulting from at least the three adjacent quarries should be thoroughly evaluated.	General	Daryl W. Cowell		
3.	*'The potential influence of the proposed quarry on the groundwater is bounded by existing hydrogeologic features (which are hereafter referred to as hydrogeologic boundaries). Therefore, the study area is defined by the limits of these boundaries, including the existing Milton Quarry cells to the north, west, and south. The Niagara Escarpment lies to the southeast the study area.'* The function of the hydrogeological boundaries that bound the potential influence of the proposed quarry should be described as well as how these boundaries will be maintained in the future.	Page 1, 2nd last paragraph – Section 1.1 Report Overview	Norbert M. Woerns		
4.	*'Planning for efficient and sustainable use of water resources.'* What is meant by 'sustainable use'? Clarification is required.	Page 4, Section 1.2 Policy Context, 2nd paragraph, 9th bullet	Norbert M. Woerns		

5.	In the discussion of seasonal groundwater fluctuations, it is not clear whether the discussion is in regard to the previously documented conditions for the existing quarry or for the MQEE? Examples of hydrographs showing the seasonal groundwater level fluctuations should be provided or referenced for the MQEE.	Page 5, Section 2.1, Overview, 5th paragraph	Norbert M. Woerns		
6.	Vertical fracture orientation is described. The significance of these fracture orientations with respect to groundwater movement should be discussed.	Page 7, Section 2.3.2 Bedrock, 5th paragraph	Norbert M. Woerns		
7.	*'The Milton Quarry is not located within any designated Source Water Protection (SWP) areas (i.e., it is outside any Wellhead Protection Areas-WHPAs'* (page 10, 3rd paragraph), Surface drainage through the Dufferin Quarry property contributes to the maintenance of water supply for the Kelso wells indirectly through the Hilton Falls Reservoir Tributary and Kelso Reservoir. Dufferin Quarry provides 700,000m^3 of water to the Hilton Falls Reservoir Tributary which drains into the Kelso Reservoir. Since the MQEE is located within the Hilton Falls Reservoir Tributary drainage area, the potential therefore exists for the Dufferin Quarry to impact both the quantity and quality of the Kelso municipal water supply wells. This should be reflected in the ongoing water quantity and quality monitoring program for the Dufferin Quarry water resources.	Page 10, Section 2.5, Regional Hydrogeology Above the Escarpment (Source Water Protection), 3rd paragraph (Issues list item 1.1)	Norbert M. Woerns		
8.	There should be a discussion of the inter-relationship between surface water and groundwater divides and the impact of changing groundwater divides may have on surface water features. Figure 2.8 shows groundwater elevation contours from which regional groundwater flow can be inferred. Interpreted flow directions are not shown on this figure. As noted on Figure 2.8, groundwater elevations *'are from MOE drilling records extracted for 2000 GWRA'.* An updated version of this figure should be included with recent on-site groundwater elevations to reflect current conditions and the extent of the current zone of influence of the existing quarry. Current groundwater elevation contours are provided for the MQEE area in Figures 6.1, 6.2, 6.3 and 6.4.	Page 11, Section 2.5 Regional Hydrogeology Above Escarpment, 1st paragraph (Issues list item 1.2)	Norbert M. Woerns		
9.	First paragraph on page 11 states that Figure 2.8 Regional Groundwater Flow Map presents bedrock groundwater map prior to extraction of the North Quarry, West Cell, or East Cell. Please clarify what season the map represents and/or if it represents minimum, maximum or average groundwater levels.	Section 2.5 Regional Hydrogeology Above Escarpment, page 11	CH		

10.	*'The study area plan was developed as presented on Figure 3.1.'* Figure 3.1 shows the North Quarry, West Cell and East Cell. Analysis focuses primarily on the MQEE with the majority of data from monitoring locations in and adjacent to MQEE. The focus of this GWRA is therefore on the MQEE and not on the broader study area shown on Figure 3.1.	Page 12, Section 3.1, Topography and Instrumentation, 1st paragraph.	Norbert M. Woerns		
11.	*"There are several historical surface water monitoring locations in the area of the proposed MQEE, including 2 locations in proximity to the south and southeast of the proposed MQEE extraction area (SG5 and SG6, respectively)."* Besides SG5 and SG6, what are the other historical surface water monitoring stations in the area of the MQEE, which would support the MQEE proposal?	Section 3.3, Surface Water Level Monitoring, page 13, 14	CH		
12.	*'Previous assessments have demonstrated the continued suitability of recharge water for mitigation and the proposed MQEE will not alter the water quality. Therefore, further assessment of the suitability of the recharge water for mitigation is not necessary and the assessment focusses herein on the baseline characteristics of water chemistry on the MQEE lands as requested by the Region of Halton.'* (Page 14 last paragraph and page 15, 1st paragraph) As noted above in Comment7 above, there is potential for Dufferin Milton Quarry specifically including MQEE to impact off-site downgradient surface water and groundwater resources. Water quality monitoring should therefore continue to be an integral part of the ongoing monitoring plan. In addition, periodic reassessments of the potential for dissolution of Amabel dolostone should be completed in the event of potential long term progressive changes in recharge water quality. See Comment 38.	Page 14, Section 3.5 Water Quality Data, last paragraph (Issues list item 1.4)	Norbert M. Woerns		
13.	To understand groundwater and surface water interactions within wetlands it would be beneficial to understand thickness and composition of the underlying overburden. Is there any data available to shed some light on it, especially for wetlands U1, W36, W41, W46 and W56?	Section 4.2 Overburden, page 16	CH		
14.	Is there any evidence of erosion of bedrock associated with the proximity of the brow of the escarpment? Any halo effect close to MQEE?	Section 4.3.1 Amabel Formation, page 16, 17	CH		
15.	How was the Groundwater Recharge of 233 mm determined and is this for pre-quarry conditions? Clarification is required.	Page 20, Section 5.2.1 Climate Change Considerations, Last Paragraph Last Bullet Point	Norbert M. Woerns		

16.	Three scenarios were assessed through a water budget analysis to address climate change scenarios. The first water budget scenario is based climate data for the area from Canadian Climate Normals period from 1981 to 2010 representing baseline observed long term average conditions. Two additional water budget scenarios were presented that represent potential future conditions in the latter part of the century representative of the 2050s and 2080s. Both scenarios assumed higher temperatures, higher precipitation, higher evapotranspiration and higher recharge. No scenario was assessed using decreased precipitation. This was explained as follows: *'short term variability (i.e., drought) is not a concern now or in the future due to the substantial body of water in storage at the site. In the event of severe water availability reduction, the lake filling process could be temporarily postponed, and water could be drawn from storage to sustain operation of the mitigation system'*. (Section 10.2.2.1, page 66, 3rd paragraph) This should be supported with a detailed analysis. Consideration should also be given to the downstream off-site water requirements under drier conditions.	Page 21, Section 5.2.1 and page 66 Section 10.2.2.1 Climate Change Considerations (Issues list item 1.5)	Norbert M. Woerns		
17.	This section states that in recent years there has not been any surface water runoff from the MQEE lands. This could be potentially explained by groundwater lowering due to extraction in the east cell and increased infiltration. Is there any historical surface water flow data for MQEE? Alternatively, is there any historical groundwater level data for MQEE, which compared to ground surface elevation could be used to either support infiltration or suggest rejected recharge and surface runoff?	Section 5.3 Hilton Falls Reservoir Tributary, page 23, 2nd last paragraph	CH		
18.	*'Based on observations by GHD and GEC, there has not been any surface water runoff from the MQEE lands in recent years (GEC observations commenced in early spring 2019 and GHD observations commenced in winter 2020).'* The relatively short observation period may not be representative of average surface water runoff conditions. Longer term on-site climate data should be considered to support these observations as well as the impact of the existing quarry operations on the MQEE site. Cross-sections on Figs 4.2 and 4.3 show lower groundwater levels adjacent to existing Phase 3 East Cell and Phase 1 North Quarry Cell. Lower groundwater levels suggest impacts from existing quarry operations extend beneath MQEE between 200 and 350m. The observed surface water conditions on MQEE appear to have most likely been influenced by existing quarry operations and represent impacted conditions. This suggests that the current mitigation measures have not prevented the decline in groundwater levels beneath MQEE from existing quarry operations. Clarification is required.	Page 23, Section 5.3 Hilton Falls Reservoir Tributary, 5th paragraph (Issues list item 1.6)	Norbert M. Woerns		
19.	States that tributary is labeled HS-1 on Figure 5-2, but that label is not on this figure. In general Figure 5-2 is difficult to read (e.g. HS-2), and labels are floating in space (e.g. W42, W40). Suggest this figure is clarified to be easier to read.	Section 5.3 Hilton Falls Reservoir Tributary	CH		

20.	States that the small drainage ditch from U1 to W36 likely had historic flow supported by a higher groundwater regime in the past. Will the flow be re-established as part of the management strategy for these wetlands?	Section 5.3 Hilton Falls Reservoir Tributary	CH		
21.	There is reference to hazard land buffer requirements without stating what these requirements are. These should be identified.	Page 25, Section 5.5 Natural Hazard Lands, 3rd paragraph (Issues list item 1.7)	Norbert M. Woerns		
22.	Staff agrees with the statement that, given the type of the proposed development (i.e., aggregate extraction), karst topography may not be a hazard, however it can have an effect on potential natural features relying on karst topography in the hydrological sense. Mitigation measures should be proposed to deal with this potential karst.	Section 5.5 Natural Hazards, page 25, 26	CH		
23.	The discussion of the groundwater flow system is lacking a discussion of the impact the existing quarry has had on the local and regional groundwater system. The discussion of groundwater flow through the Amabel is as follows; *'Groundwater flow in the Amabel Aquifer occurs primarily through the fractures and minor dissolution features in the bedrock. The Amabel is sufficiently well connected and generally lacks major bedding controls on groundwater flow such as may occur in the presence of marked changes in lithology.'* (Page 27, 2nd paragraph) A discussion is lacking of the impact of the predominant vertical fracture set, as described on page 7, 5th paragraph in section 2.3.2, on the groundwater flow pattern.	Page 27, Section 6.1 Site Hydrogeology – Overview, 2nd paragraph (Issues list item no 1.8)	Norbert M. Woerns		
24.	Based on review of Figures 6.1 through 6.3 it appears that in areas not impacted by the quarry operation the seasonal groundwater fluctuations are between 1 and 2 metres, while in areas most likely impacted by the quarry operation it is between 2 and 7 metres. Groundwater levels under Wetlands U1 and W36 seem to fluctuate between 2 and 7 metres. The pre-extraction groundwater levels under wetlands U1 and W36 are unknown. Based on monitoring well OW78-20 located downstream of U1, the groundwater elevation in the spring of 2020 measured at elevation 336.92 masl, considering the lowest part of U1 has a ground surface elevation just below elevation 337.5 masl and the surface water level was measured at about elevation 337.7 masl, potentially, groundwater discharge was present in the spring of 2020 in U1. It should be noted that the groundwater elevation prior to extraction of the east cell in MW319A-10, OW3-80, OW-3-2-II and OW-3-3II was substantially higher and occasionally above	Section 6.3 Groundwater Elevations, page 28-30	CH		

	elevation 340 masl, which suggests groundwater discharge conditions in U1 were present prior to the east cell extraction and the mitigation system in place for East Cell did not adequately mitigate the quarry impacts to U1. Was this understood as part of the previous application?				
25.	*'Groundwater elevations fluctuate dramatically during the year based on seasonal effects except in some discharge areas where a relatively consistent surface water levels dampen these fluctuations (refer to Figure 6.4, 6.7, and 6.8).'* (Page 29, second last paragraph) For recently installed southern monitoring wells (OW78D/S-20, OW80-20, OW81-20, OW82-20) there are seasonal fluctuations in water levels of 5 to 7 metres. This compares to historical water level fluctuations of 2 to 3 metres in nearby monitors (OW69-08, BH 65, BH66). What are the possible causes and/or significance of this difference? Is the distance from an active quarry face a factor in the seasonal water level fluctuations? Long term monitor BH64, located near the existing main quarry shows seasonal water level fluctuations of between 6 to 7 metres. *'Some of the groundwater elevations in the northern group of monitoring wells exhibit an influence or control from the East Cell recharge system operation (e.g., OW71-08, BH71, OW79S/D-20) or East Cell dewatering (e.g., OW3-80).'* (Page 29, last paragraph) The influence of the East Cell recharge system operation or the East Cell dewatering have on the groundwater levels as shown on the hydrographs requires some discussion and explanation. No hydrograph for OW71-08 and OW79D-20 are provided on Figures 6.7a and 6.7b showing the northern group of wells. The location of BH112, OW68-07 are well removed from MQEE and should be described as they do not appear on most figures except Fig. 3.1 and Fig. A.1.	Page 29, Section 6.3, Groundwater Elevations,2nd last paragraph (Issues list item 1.9)	Norbert M. Woerns		
26.	*'There is no potential for groundwater use interference from the proposed MQEE... the closest private landowner with a water well is more than 1,200 metres from the MQEE'.* (Page 35, last 2 paragraphs). Figure 6.9 shows the location of the nearest wells above the escarpment since the Amabel Aquifer is the source of groundwater for supply wells above the escarpment. Below the escarpment and down-gradient of the existing Milton quarry and proposed MQEE are bedrock formations that, for the most part exhibit hydraulic characteristic of aquitards and are typically not considered groundwater sources of supply due to the lack of water and generally poor water quality. There is no discussion of existing down-gradient groundwater or surface water users below the escarpment and the impact the existing Milton Quarry may have had on possible down-gradient groundwater and surface water users and the possible impact the MQEE may have on these users	Page 35, last 2 paragraphs, Section 6.6 Groundwater Use, (Issue list item 1.10)	Norbert M. Woerns		

28.	The proposed quarry extension appears to be closer to the brow of the Niagara Escarpment than the previous applications. As it is likely bedrock closer to the escarpment brow is more karstic, fractured and permeable, has there been any testing done to characterize bedrock properties near the escarpment brow? Further, are there any contingencies proposed to ensure that the recharge system will be sufficient to maintain groundwater levels between the brow of the escarpment and the quarry? Mitigation measures should be proposed to deal with this potential karst.	Section 6.5, Karst Assessment, pages 34	CH		
29.	*'Influence from quarry dewatering in the absence of mitigation has been observed at distances greater than 500 m in some areas depending upon hydrogeologic conditions.'* (Page 36, section 6.7 1st paragraph). Should provide illustrations of the extent of influence of the existing quarry with figures showing groundwater elevation contours.	Page 36, Section 6.7 Zone of Influence 1st paragraph (Issues list item 1.12)	Norbert M. Woerns		
30.	Influence from quarry dewatering in the absence of mitigation has been observed at distances greater than 500 m. There is a number of wetlands within the MQEE zone of influence: U1, W36, W41, W46 (at least E and D) and W56. These wetlands should be instrumented with groundwater and surface water monitors to ensure no negative impacts and to confirm the effectiveness of the proposed mitigation.	Section 6.7, Quarry Zone of Influence, pages 36, 37	CH		
31.	*'Examination of the available water level information reveals that the wetland had a short hydroperiod in 2020, drying out as early as late April and confirmed to be dry during field inspection on May 13, 2020.'* (Page 37, section 6.8.1, 2nd paragraph) It is not clear that there currently exist any mitigation measures for maintaining water level and hydroperiod in U1 from impacts of the existing quarry operations. Is this considered a normal hydroperiod for a wetland of this type? The short hydroperiod suggest altered conditions. Clarification is required. *'Wetland U1 is located approximately 580 m from the Main Quarry and 440 m from the North Quarry and is interpreted to be within the historic zone of influence of both the Main Quarry and the North Quarry. It is concluded that the Wetland U1 area may have experienced higher groundwater levels and a greater degree of groundwater support and interaction in the past. Such a past interaction with groundwater would help explain the past excavation of the drainage ditch leading south away from the wetland pool as well as the ecological observations reported by GEC in the NETR/EIA". (*Page 38, 1st paragraph) To what extent will the impact of the existing quarry operations be considered in establishing Target water levels within Wetland U1?	Page 37, Section 6.8.1, 2nd paragraph and page 38, 1st paragraph, Wetland U1 (Issues list item 1.13)	Norbert M. Woerns		

32.	*'Wetland W36 is located with the historic zone of influence of the Milton Quarry and the distance from the Main Quarry to the monitored area is 275 m and greater. It is expected therefore to have experienced higher groundwater levels and a greater degree of groundwater support and interaction in the past. Available long-term monitoring data such as at monitoring well MW4 (monitoring extends from 1990 to present at the MW4/4A/4B/4C series of proximal locations as included in Appendix D) at the edge of the Main Quarry to the west of Wetland W36 demonstrate the dewatering influence of the quarry development. The water level available at MW4 (installed in 1990) and BH64 (installed in 1999) indicate that the influence on groundwater support for Wetland W36 had occurred prior to 1999. Such a past interaction with groundwater would also help explain the now dry portion of the wetland and drainage pathway extending to the Main Quarry to the west.' (Page 39, 2nd paragraph)* In recognition of the influence of the Milton Quarry, enhancement of the water levels and hydroperiod in excess of current conditions are proposed. It is not clear whether the proposed mitigation measures will fully address the existing quarry impacts. Clarification is required.	Page 39, 2nd paragraph, Section 6.8.2, Wetland 36, (issues list item 1.14)	Norbert M. Woerns		
33.	Wetland W41 has perennial surface water present and is supported by a small spring near SG61. Based on a number of monitoring wells upstream of the wetland there are groundwater discharge conditions within the wetland. In the east side of the wetland there are potentially downward gradients based on BH66 groundwater levels. Flow out of W41 was observed in July and August of 2021. The groundwater level at monitoring well BH65 is clearly higher than the surface water level indicating groundwater discharge conditions within the wetland during more than half of the year, including winter, spring, summer, and into September. To ensure wetland hydroperiod is maintained trigger levels for W41 should be set and mitigation actions and/or measures proposed.	Section 6.8.3 Wetland 41 and Wetland 46, page 39, 40	CH		
34.	Monitoring well BH66, although useful is not representative of groundwater conditions for W41 nor W46. BH66 is located close to a 3 to 4 metre drop in ground surface at the bottom of which there is a series of wetlands. This drop is most likely responsible for lower groundwater levels in BH66. BH66 is also a considerable distance from wetlands W41 and W46. A groundwater monitor should be constructed on the upstream end of W41 and in the vicinity of W46 and incorporated into the monitoring program. To ensure wetland hydroperiod is maintained trigger levels for W46 should be set and mitigation actions and/or measures proposed.	Section 6.8.3 Wetland 41 and Wetland 46, page 40	CH		

35.	Monitoring wells OW79-20, OW80-20 and OW69-08, although useful are not definitive to assess groundwater conditions at wetland W56. OW79-20 is some 150 metres upgradient of W56, OW80-20 is some 125 metres away and cross gradient and OW69-08 is on the downstream end of W56. Based on Figure 6.1 groundwater level drop under the wetland from the upstream end to the downstream end is at least 1 metre. A groundwater monitoring station adjacent to and on the upstream end of W56 should be installed and incorporated into the monitoring program. To ensure wetland hydroperiod is maintained trigger levels for W56 should be set and mitigation actions and/or measures proposed.	Section 6.8.4, Wetland 56, page 40, 41	CH		
36.	*'Within the MQEE area, the groundwater chemistry results demonstrate that the groundwater is somewhat independent of the groundwater recharge system, even in the area south of the East Cell recharge system where it would otherwise appear to be downgradient of the recharge system.'* (Page 43, 3rd paragraph) How is this difference in water chemistry taken into account with respect to dissolution of bedrock over time?	Page 43, 3rd paragraph, Section 7.1, Water Chemistry Overview,	Norbert M. Woerns		
37.	There is a distinct difference in surface water quality in Wetland W41 between the upstream and downstream end at stations SG61 and SG6, respectively. A discussion of the results and the potential reason should be provided.	Section 7.3 Surface Water Chemistry, Page 44, 45	CH		
38.	*'The results of the geochemical modelling demonstrate that the recharge water is super-saturated with respect to dolomite and would tend to promote the precipitation of dolomite, rather than dissolution. The pH of the recirculation water, generally around 8.3, provides supporting evidence that the recirculation water is in equilibrium with the formation. Dolomite would not dissolve in the recharge water unless the pH drops below 7.5 (maintaining all other parameters the same).'* (Page 46, 2nd paragraph) The majority of recent groundwater and surface water samples have pH values below 7.5 as shown in Table 7.1 and 7.2 respectively. It is also not clear what impact this would have on the dissolution potential of recharge water. Clarification is required. *'Consistent with the existing WMS, each control hut will also incorporate a bag-filter system to provide for removal of possible fine particles from the recharge flow that can arise from precipitation and sedimentation processes in the watermain.'* (Page 8 section 2.3 Water Main Extension and Control Huts-AMP Addendum Part II, Section A, Interim Mitigation Measures and Rehabilitation) It is not clear what the potential for chemical change in the recharge water is, due to chemical precipitation as noted above in the recharge water system. It is also not	Page 46, 2nd paragraph, Section 7.4 Recharge Water Chemistry and Dissolution Potential, (Issue list item1.15)	Norbert M. Woerns		

	clear whether this was considered in the chemical analysis of dissolution potential of the recharge system water. Clarification is required.				
39.	*'The results from samples collected at the Reservoir Outfall (SW52B) have been used to represent the quarry-related and recharge water in the WMS. All available samples collected at SW52B through the end of 2020 were included in the assessment updating the analysis presented in the 5-Year AMP Review. These results were plotted to compare quarry water composition with samples collected from groundwater and surface water in the MQEE, and the results are presented on Figure 7.2.'* (Page 46, last paragraph and page 47, 1st paragraph) Figure 7.2 shows that the Reservoir Outfall water is chemically distinct from groundwater samples taken from East Extension Observation wells. The MQEE observation wells were sampled in 2021. It is not clear to what extent the observation wells on Figure 7.2 have been influenced by the existing WMS (Water Management System). The water quality difference between the Reservoir Outfall (i.e., recharge water) and the MQEE groundwater quality in the MQEE observation wells is therefore uncertain. Clarification is required. *'Concentrations of the major ions in the WMS are similar to the range measured in the Cabot Head Shale Formation (Table 7.3 in the WRA; CRA, 2000), which indicates mixing of groundwater from the Amabel and the Cabot Head Formations (note: water in the quarry cells contacts the shaley beds in the Reynales and Cabot Head as a result of the mining disturbance of the bedrock immediately below the quarry floor).'* (Page 47, 2nd paragraph) The MQEE will be dewatered using a sump in the quarry excavation floor and that this sump will eventually extend into the underlying Cabot Head shales (Section 8.3.1, 3rd paragraph, page 49). The WRA CRA,2000 document referred to above was not provided for peer review comment. It is not clear to what extent the water quality from the Cabot Head shale will affect water quality in the recharge water system. Clarification is required.	Page 46, last paragraph, and page 47, 2nd paragraph, Section 7.5 Water Chemistry Comparison (Issues list item 1.16)	Norbert M. Woerns		
40.	*'Infiltrating groundwater and precipitation water will be collected and diverted into the existing integrated WMS system and rehabilitation program for the Main Quarry, North Quarry, West Cell, and East Cell. Any excess water (i.e., not required for mitigation system storage or pumping) will be handled in an appropriate manner through the WMS to optimize the beneficial use of all available water.'* (Page 49, Section 8.3.1,2nd paragraph) It is not clear how excess water will be handled. Clarification is required.	Page 49, Section 8.3.1, 2nd paragraph, Quarry Dewatering.	Norbert M. Woerns		

41.	The Dufferin Spill Response Plan referred to in the 3rd paragraph in this section was not provided for review.	Page 50, Section 8.5, 3rd paragraph, Fuel/Maintenance Management and Spill Response Plan (Issues list item 1.17)	Norbert M. Woerns		
42.	*'The water resources that have been identified for protection or enhancement by the proposed MQEE mitigation measures, include:* •*Wetland U1 and Wetland W36* •*Wetlands east of the MQEE area, including: Wetland W41 and to a lesser extent, Wetlands W46 and W56* •*Other features beyond the above wetlands, including the HFRT and Speyside Tributary* (Page 51, 5th paragraph) Diffuse discharge of water into Wetland U1 and W36 is proposed utilizing the WMS along with recharge wells to maintain groundwater levels. It is not clear what other mitigation measures if any will be implemented for Wetland 41, W46, and 56. Neither target water levels nor hydroperiods have been established for these wetlands. Clarification is required.	Page 51, 5th paragraph, Section 9.1 Water Resource Mitigation – Overview, (Issues list item 1.18)	Norbert M. Woerns		
43.	*'The primary mitigation design objectives include:* •*Maintaining the existing groundwater regime close to existing conditions during all critical* *periods for the natural features and organisms which are directly dependent on groundwater* *(Refer to NETR/EIA and AMP Addendum).* •*Optimizing the water depth and hydroperiod for Wetland U1 and the upper portion of Wetland W36 to enhance ecological conditions.* •*Maximizing the degree of "passivity" of the mitigation measures.* •*Ensuring the mitigation measures are "adjustable" and responsive, and can be fine-tuned to* *adapt to specific needs over time, based on an integrated monitoring and contingency response program as described in the AMP Addendum.'* (Page 51. Last paragraph with bullets near bottom of page) 'Maintaining existing groundwater regime' suggests that existing quarry impacts have been approved and do not require mitigation beyond what has already been approved for the existing quarry operations. This should be confirmed. It is noted that wetlands	Page 51, Section 9.1 Water Resources Mitigation – Overview, last paragraph and bullets near bottom of page. (Issues list item 1.19)	Norbert M. Woerns		

	U1 and W36 will be enhanced by optimizing water depth and hydroperiod. To what extent is enhancement required? Note that the NETR/EIA report was not included in this peer review. It is not clear what is meant by *'maximizing the degree of passivity of the mitigation measures.'* Clarification is required. What alternatives have been considered and how have they been demonstrated?				
44.	*'Possible seasonal long-term (post-quarrying and lake filling) groundwater recharge system* *operation along the south and east perimeter of the MQEE consistent with the potential* *seasonal recharge approved for the East Cell.' (*Page 52,3rd paragraph,5th bullet) This suggests that seasonal long-term (post-quarrying and lake filling) groundwater recharge system may not be required. The decision-making process with specific procedures and requirements for terminating post-quarrying groundwater recharge operations should be clarified.	Page 52, Section 9.1 Water Resources Mitigation Overview, 3rd paragraph, 5th bullet	Norbert M. Woerns		
45.	*'once lake filling is complete under rehabilitation conditions, the overall groundwater recharge system will largely no longer be required as the lake system will provide the necessary groundwater support. Continued pond-to-pond transfers (pumping of water from the Reservoir to the East Cell Lake with gravity flow to the other lakes) are anticipated to be necessary to maintain the optimum lake levels.'* (Page 53, last paragraph) The above suggests reducing and/or phasing out of the recharge system. What is the anticipated time frame for this to occur? See comment 44 above.	Page 53, Section 9.1 Water Resources Mitigation – Overview, last paragraph (Issues list item 1.20)	Norbert M. Woerns		
46.	This paragraph states that the groundwater recharge system will no longer be needed once lake filling is complete. Considering that the final MQEE lake elevation is 333.0 masl which is lower than at least seasonal groundwater levels, the downstream wetlands W41, W46 and W56 may be impacted. Water level targets for W41, W46 and W56 should be set and these mitigation measures should be left in place if needed post extraction. More details are needed to ensure protection of these features hydrologic functions.	Section 9.1 Overview, page 53, last paragraph	CH		
47.	*'Water quality will not be appreciably changed by quarry activities as evidenced by monitoring of existing quarry operations and mitigation conditions (as discussed in Section 7 and Section 10).'* From applied research findings from Blackport and Golder 2006, page 53 it is noted: *'Potential water quality impacts associated with changes to the physical system, as a result of aggregate extraction include:*	Page 54, Section 9.2, Surface Water, 4th paragraph.	Norbert M. Woerns		

	• *A decrease in the contaminant attenuative ability when the soil layer and unsaturated zone is removed. This results in an increased potential for contaminants to enter and travel through the groundwater system from any surface source of contamination (e.g., surface runoff, future land uses)* • *Water quality changes downgradient of a post-extraction lake as a result of exposure of the water table to the atmosphere. These changes include changes in pH and dissolved oxygen that could impact nutrient and metal concentrations, locally down gradient of the post-extraction lake.* • *Thermal plumes from below water extraction and post-extraction ponds were typically very local. Depending on the hydrogeologic setting, the impact was typically less than 200 m.* • *Potential for an influx of poor-quality water from deeper geologic units, in quarrying operations where lower geologic units, of poor water quality, are breached during extraction operations.'* Comment should be provided on the above water quality considerations.				
48.	*'This existing WMS has been in place and successfully operating to protect water resources since 2007 as described in the 5-Year AMP Review and Annual Monitoring reports.'* [1] Blackport Hydrogeology Inc. and Golder Associates, 2006: Applied Research on Source Water Protection Issues in the Aggregate Industry Phase 1 Findings, November 2006, Prepared for The Ministry of Natural Resources, Natural Resources Management Division, Lands and Water Branch, P.O. Box 7000, 300 Water Street, Peterborough, Ontario, K9J 8M5. 164 p. The 5-Year AMP Review and the 2021 Annual Water Monitoring Report have shown that water levels have been maintained within the three wetlands adjacent to the East Cell. Groundwater levels do not appear to have been restored to pre-extraction levels with the WMS It is however noted that groundwater levels have been maintained above target water levels set for trigger wells.	Page 55, Section 9.3 Interim recharge Mitigation Measures, last paragraph.	Norbert M. Woerns		
49.	*'Further west (downstream) of SG5 in Wetland W36, the groundwater level is well below the base of the wetland and there is no potential for groundwater support or discharge to the wetland. Therefore, direct mitigation protection and associated monitoring is not necessary in this area.'* (Page 57, 2nd paragraph) It is recognized that Wetland 36 is located within the historic zone of influence of the Milton Quarry. (See comment 32, issues list item 1.14 above) Enhancements are proposed for Wetland 36 with the seasonal addition of water with diffuse discharges to 2 pool areas in the upper portion of the wetland. The question remains whether this is sufficient for the restoration of the lower portion of wetland 36 considering the impact of the existing Milton Quarry. Clarification is required.	Page 57, 2nd paragraph), Section 9.3.1 Diffuse Discharge into Wetland U1 and Wetland W36, (Issues list item 1.21)	Norbert M. Woerns		

50.	*'From a water resource perspective, the objective of the rehabilitation plan is to create an end use that is protective of, or enhances, the existing water resource and ecological features with the minimum active management or engineering works necessary to achieve this objective. To best satisfy this objective, the existing Milton Quarry rehabilitation plan includes allowing portions of the North Quarry, West Cell, and East Cell to be filled with water to create three separate lakes. These three lakes will provide passive support to the surrounding groundwater recharge system, minimizing the need for any active (pumped) recharge in the long term.'* (Page 59, Section 9.4, 2nd paragraph) It is not clear how long the active pumping of water will be required after quarry closure and the amount of water estimated to be pumped. See comments 44 and 45. Clarification is required.	Page 59, Section 9.4, 2nd paragraph, Quarry Rehabilitation, (Issues list item 1.22)	Norbert M. Woerns		
51.	*'Consistent with the existing WMS, each control hut will also incorporate a bag-filter system to provide for removal of possible fine particles from the recharge flow that can arise from precipitation and sedimentation processes in the watermain.' (*Page 59, 3rd paragraph) This suggests precipitation of carbonate and water quality change during transmission of recharge water to recharge wells. What impact would this have on pH and dissolution potential of recharge water?	Page 59, 3rd paragraph, Section 9.3.3, Water Main Extension and Control Huts	Norbert M. Woerns		
52.	It is said that after the lake filling is complete, the three lakes will provide passive support to the surrounding groundwater recharge system, minimizing the need for any active (pumped) recharge in the long term. Can the system be scaled back and stay operational with reduced pumping or possibly periods of no pumping and withstand winter freezing conditions? What sections of the recharge system will be left in place in the long term?	Section 9.4 Quarry Rehabilitation, page 59	CH		
53.	*'The lake will include exposed quarry wall areas, particularly in the southeast portion of the extraction area that will serve to support the existing groundwater levels in this area that support the surrounding wetlands.'* Depending upon the local groundwater flow direction and final lake levels, exposed vertical quarry walls, after rehabilitation and lake filling, may contribute to loss of groundwater through seepage into the quarry. In general, it would be advisable to restrict groundwater movement from adjacent areas into the quarry. Therefore, exposed quarry walls, after final rehabilitation, should be minimized. Measures to reduce the loss of groundwater through seepage into the rehabilitated quarry should be undertaken to assist in the restoration of groundwater levels in adjacent areas.	Page 59, Section 9.4, Quarry Rehabilitation, 3rd paragraph.	Norbert M. Woerns		

54.	*'Maintaining the three lakes at controlled elevations (through pumping and gravity flows) will allow the passive mitigation of water resources associated with the Sixth Line Tributary system, private water supply wells, and the western wetland by maintaining the lakes at a higher elevation than these water resources. This control requires seasonal pumping to the East Cell Lake and controlled gravity overflow cascading to the West Cell and then the North Quarry. Any excess water in the North Quarry will be pumped back to the Main Quarry.'* Why the need to pump excess water in the North Quarry to the Main Quarry? Clarification is required.	Page 60, Section 9.4.1, 2nd paragraph, Background on Existing Approved Rehabilitation	Norbert M. Woerns		
55.	*'The created East Cell/MQEE lake will have an elevation of approximately 333 m AMSL.'* (Page 61, 2nd paragraph) What feasible actions or mitigation alternatives such as those outlined in Section 9.5 have been considered for implementation to increase the created East Cell/MQEE lake level such that active pumping in the long term after termination of quarry operations, will not be required for protection of adjacent wetlands?	Page 61, Section 9.4.2, MQEE Rehabilitation, 2nd paragraph, (Issues list item 1.24)	Norbert M. Woerns		
56.	Additional groundwater monitors, thresholds and appropriate contingency actions and/or mitigation measures should be proposed for Wetlands W41, W46 and W56. Please see comments on Sections 6.8.3 and 6.8.4.	Section 9.5 Response Action and Contingency Mitigation Measures, page 61, 62	CH		
57.	*'The effect of the proposed extraction on runoff to Wetlands U1 and W36 would likely be negligible; however, enhancement is proposed for these features so mitigation measures have been included. Therefore, there is not anticipated to be any negative effect on surface water flow from the proposed MQEE.'* (Page 64 1st paragraph) What is the rationale for enhancement measures of the wetlands if impacts to runoff are considered to be negligible? Clarification is required.	Page 64, 1st paragraph, Section 10.2.1, Surface Water Flow (Runoff), (Issues list item 1.26)	Norbert M. Woerns		
58.	The first paragraph states "there is not anticipated to be any negative effect on surface water flow from the proposed MQEE". Please comment if the required annual discharge of 700,000 m^3 into HFRT is to supplement all of the pre-extraction runoff or just baseflow from the HFRT catchment affected by the quarry?	Section 10.2.1 Surface Water Flow (Runoff), page 64, 1st paragraph	CH		

59.	The summary table shows under dry quarry floor and rehabilitation quarry as open water there is no infiltration assumed. In other words, no leakage is assumed through the bottom of the quarry. Water Budget analysis Appendix G Section 3.4.2 Vertical Leakage (page 9) assumes leakage of between 4.7 mm/yr. (quarry floor) to 9.5 m/yr (lakes and wetlands). How were these leakage rates determined what are the vertical hydraulic gradients from below the quarry floor? Clarification is required.	Page 65, Section 10.2.2 Surface Water Balance, Water Balance Summary Table (Untitled)	Norbert M. Woerns		
60.	The water balance summary table on page 65 is very generic and does not account for exfiltration and infiltration in and out of the various rehabilitated ponds. Please comment on what the net effect would be relative to the existing conditions including these flows?	Section 10.2.2 Surface Water Balance, page 64, 65	CH		
61.	*'The evaluation presented above is based on parameters estimated for the Canadian Climate Normals (CCN) period from 1981 to 2010 and is representative of baseline (observed long-term average) conditions. As discussed in Section 5.2.1, assessment was undertaken for the evaluation of changing climate conditions. Two additional climate change scenarios were evaluated that represent potential future conditions representative of the 2050s and 2080s. The parameters applied are representative of a 30-year average (similar to the CCN values) centered on the years identified and are representative of future long-term average conditions.* *The key differences between the current climate scenario and the most distant scenario evaluated (2080's) are an estimated increase in precipitation of 137 mm/year, an increase in evapotranspiration of 82 mm/year, and an increase in lake evaporation of 176 mm/yr.'* Due to uncertainties with regard to future climatic conditions, climate change scenarios should include a scenario with a decrease in precipitation from Canadian Climate Normals. See Comment 16 (Issues list item 1.5) above.	Page 66, first paragraph in Section 10.2.2.1 Impact on Climate Change and page 67, 1st and second paragraphs (Issues list item 1.27)	Norbert M. Woerns		
62.	*'It is noted that short-term variability (e.g., drought) is not a concern now or in the future due to the substantial volume of water in storage at the Site. In the event of severe water availability reduction, the lake filling process could be temporarily postponed, and water could be drawn from storage to sustain operation of the mitigation system. Once rehabilitation is complete, the Reservoir will continue to function as a substantial buffer for the system and provide lake top-up as required.'* Data/calculations to demonstrate that severe drought conditions would not result in adverse down gradient impacts and the required 700,000 m3/yr discharge to the Hilton Falls Reservoir Tributary should be provided. See comment 65 below. What would the downstream impacts be under the various scenarios and what mitigative measures would be required to offset impacts. Do the lakes have sufficient capacity to accommodate major storm events?	Page 66, 3rd paragraph, Section 10.2.2.1, Impact on Climate Change.	Norbert M. Woerns		

63.	*'Groundwater and surface water regimes will be appropriately maintained as part of the proposed implementation of the AMP Addendum for the MQEE. There are no anticipated negative effects on water resources. The water resources of concern are the wetlands to the south and east of the proposed MQEE extraction area. These water resources will be maintained or enhanced by the proposed mitigation, rehabilitation, and monitoring measures described in Section 9 and the AMP. There are no water supply wells that have the potential to be influenced by the proposed MQEE.'* (Page 66 section 10.3.1 2nd paragraph) It is not clear that the proposed maintenance or enhancement of the water resources will adequately address the existing quarry impacts on the groundwater system. Clarification is required as to how the existing quarry impacts on the groundwater system will be addressed by the proposed mitigation measures. There is no discussion on the potential for impacts on downgradient seeps and springs along the Escarpment. Previous comments pertain to upgradient private wells although there is no reference to possible downgradient water users. Also see Comments 31 and 32 above (Issues list items 1.13 and 1.14 respectively). Clarification is required.	Page 66, Section 10.3.1, 2nd paragraph, Overview – Groundwater Assessment, (Issues list item 1.28)	Norbert M. Woerns		
64.	*'The current approved existing quarry extraction and rehabilitation conditions are used as the basis for comparison of proposed future conditions with the MQEE. For the hydrogeologic simulations, this condition is represented using the calibrated model, modified to account for approved full extraction and/or rehabilitation with required mitigation and to reflect long-term average climate conditions.'* This appears to be a reasonable approach for purposes of determining the impact of the MQEE during quarry excavation. It however does not take into consideration the adequacy of the proposed rehabilitated state of the MQEE with respect to the existing quarry impact. It should be noted that the approved rehabilitated state of the existing quarry was beyond the scope of this peer review.	Page 68, 3rd paragraph, Section 10.3.3 Hydrogeologic Assessment	Norbert M. Woerns		
65.	*'Under the existing approved quarry conditions, the calculated available annual water volume within the quarry for storage or discharge/mitigation under existing quarry active extraction conditions is 1,311,804 m3. The calculated available annual water volume within the quarry for storage or discharge/mitigation under existing quarry approved rehabilitation conditions is 788,473 m3. The decrease in water availability between the active extraction and rehabilitation scenarios is attributed to the change in land type and associated increase in evapotranspiration, as discussed in the context of the proposed MQEE area in Section 10.2.'* (Page 68, 5th paragraph) As stated above, active annual water volume within the quarry for storage or discharge (i.e., annual surplus) is 1,311,804 m3 for the approved quarry. It is	Page 68, 5th paragraph, Section 10.3.3, Hydrogeologic Assessment.	Norbert M. Woerns		

	assumed that this includes the Main Quarry, North Quarry, West Cell and East Cell. It is noted that the reservoir in the Main Quarry has a total capacity of 5.5 million m3. (Page 55, section 9.3, 3rd paragraph ,1st bullet). The rehabilitated main quarry reservoir appears to have sufficient storage volume to supply the Hilton Falls Reservoir Tributary for a number of years. Table 10.2, Predictive Site Water Budget indicates that the WMS pumps 5,180,453m3/yr under interim extraction conditions without considering the MQEE. The water budget schematic, Figure 3.1, from Appendix G, Water Budget Assessment, indicates that 95% of the pumped water is recirculated back into the quarry. The recirculated pumped water from the WMS appears to be included as groundwater inflow on Table 10.2. The amount of groundwater inflow available to the approved quarry from external areas is therefore significantly smaller than the total groundwater inflow indicated on Table 10.2. The amount of annual surplus water from the approved quarry is expected to be much smaller than indicated on Table 10.2. This reinforces the need to consider drought conditions in the climate change scenarios. Clarification is required. See Comment 61 (Issues list item 1.27) and Comment 62 above.				
66.	*'The simulated hydrogeologic conditions shown on Figure 10.1 demonstrate that the proposed mitigation of water resources during the interim period will generally maintain or raise groundwater levels in the vicinity of the proposed MQEE area.' (Page 69, second paragraph)* Figure 10.1 shows that groundwater levels are augmented and slightly increased beyond the recharge wells. Between the recharge wells and the MQEE excavation groundwater levels are shown to decrease up to about 10m beneath Wetland U1. This indicates that groundwater levels are not maintained between the recharge wells and the quarry excavation. Clarification is required of the above statement.	Page 69, 2nd paragraph, Section 10.3.3.1 Interim Conditions – Groundwater Assessment (Issues list item 1.29)	Norbert M. Woerns		
67.	*'There are no areas influencing water resources where the groundwater level is not maintained (decreases are shown with negative (purple) contour lines) or raised under these representative simulation conditions.'* (Page 69, 4th paragraph) This statement is unclear and requires clarification.	Page 69, 4th paragraph, Section 10.3.3.1 Interim Conditions – Groundwater Assessment (Issues list item 1.29)	Norbert M. Woerns		
68.	*'The total annual available water inflow to the quarry for the proposed full extraction condition with the MQEE is simulated to be 7,369,573 m3. _ _ _ There is clearly sufficient water available to provide the proposed mitigation and enhancement for water resources associated with the MQEE area and the existing quarry'.* Water from recharge wells and diffuse flow to wetlands via the WMS appears to be recirculated back into the quarry and included in the groundwater inflow quantities as suggested by Figure 3.1 Appendix G. The available water to the quarry from external sources on an annual basis appears to be significantly lower than indicated in Table 10.2 Clarification is required. See Comment 65.	Page 70, 2nd paragraph, Section 10.3.3.1, Interim Conditions, (Groundwater Assessment, Predictive Site Water Budget, Table 10.2 Groundwater Inflow).	Norbert M. Woerns		

69.	*'As per the existing approved Milton Quarry Extension, if monitoring indicates the final lake level is high enough to support the eastern wetlands and sufficient seasonal fluctuations in water levels occur, the groundwater recharge system operation will be discontinued. Due to the variability and uncertainty inherent in the hydrogeologic system, this cannot be definitively established at this time. Therefore, the proposed MQEE may require extension or modification of the potential seasonal recharge system operation approved for the East Cell and has been allowed for in the proposed MQEE rehabilitation plans.'* What decisioning process is in place to determine when recharge system and diffuse discharge can be terminated? It is not clear who makes that decision and what criteria will be used to make that decision. Clarification is required.	Page 70, Section 10.3.3.2, 3rd paragraph, Rehabilitation Conditions.	Norbert M. Woerns		
70.	Considering the time required for lake filling and given that the proposed final lake levels are lower than the groundwater levels in the area, there is a potential for impacts to W41, W46 and W56. As such, the groundwater recharge system would need to be left in place to ensure that requested target levels for W41, W46 and W56 are maintained and until it can be demonstrated through monitoring that the recharge system is not necessary to maintain them. The above needs to be addressed in updates to the AMP.	Page 70, Section 10.3.3.2, 3rd paragraph, Rehabilitation Conditions.	CH		
71.	Considering, lake filling may take several years to establish after quarry rehabilitation, similarly to previous comments, who would be responsible for the groundwater recharge system in terms of assessment, decision making, etc.? This needs to be addressed in updates to the AMP.	Page 70, Section 10.3.3.2, 3rd paragraph, Rehabilitation Conditions.	CH		
72.	The climate change scenarios assumed increase in precipitation but did not consider the possibility of decreasing precipitation. Justification for this is required with detailed analysis. See Comment 16 (Issues list item 1.5), Comment 61 (Issues list item 1.27), Comment 62 and Comment 65.	Page 72, Section 10.3.3.3.3 – Assessment of lake filling time and impact of Climate Change, 6th paragraph (Issues list item 1.30)	Norbert M. Woerns		
73.	See Comment 38 (Issues list items 1.15) and Comment 39 (Issues list item 1.16).	Page 73, Section 10.3.4 Water Quality, (Issues list item 1.31)	Norbert M. Woerns		

74.	*'The Milton Quarry and the proposed MQEE are located outside of all Wellhead Protection Areas (WHPAs), as presented on Figure 2.7'.* (Page 74, Section 10.3.5,1st paragraph) This area is also recognized as an area of Significant Groundwater Recharge. (SGRA) and is also designated as a Highly Vulnerable Aquifer (HVA). The report concludes that *'The overall groundwater recharge will be maintained or enhanced in the SGRA as part of the MQEE'.* (Page 74, section 10.3.5,2nd paragraph.) This is attributed to the recharge system which *'is operated to maintain groundwater levels that are at, or above target water levels at trigger wells*. (Page 74, section 10.3.5, 2nd paragraph). There is no discussion regarding the possible reduction or termination of the recharge system or portions of the recharge system under post rehabilitation conditions and the impact this may have on groundwater recharge. Details are lacking to support the above noted conclusion. The extraction of bedrock as part of MQEE will expose the underlying aquifer including the bottom of the quarry as well as the quarry walls. A detailed discussion is lacking with respect to the possible change in vulnerability of the Amabel Aquifer within the MQEE area between existing conditions and proposed post rehabilitation conditions. A discussion of measures proposed to reduce the vulnerability of the aquifer und post rehabilitation conditions should be included. See Comment 7 (Issues list item 1.1) and Comment 47 above.	Page 74, Section 10.3.5, 1st paragraph, Source Water Protection Considerations, (Issues list item 1.32)	Norbert M. Woerns		
75.	*'The water resources characterization and impact assessments presented in this report have considered the potential for cumulative effects that may arise from the development of the proposed MQEE. The proposed MQEE has been designed and evaluated in manner that is fully integrated with the existing quarry. The AMP/AMP Addendum and its mitigation, monitoring, and response actions directly ensure the protection or enhancement of features and functions related to water resources in the vicinity of Milton Quarry and the proposed MQEE. There are no known other forms of development identified in the immediate study area (refer to the Planning Summary Report,) that would contribute to a significant cumulative effect on water resources in the area of Milton Quarry.*' (Page 74 last paragraph, page 75,1st paragraph The existing groundwater impacts of the Dufferin Quarry have been combined with those anticipated from the MQEE as shown in Figure 10.1 and 10.2. Impacts from the existing Dufferin Quarry have not been identified separately from those anticipated from the MQEE. It is not clear whether the trigger levels will acknowledge the existing impacts of the existing approved Dufferin Quarry. See Comment 18 (Issues list item 1.6).	Page 74, last paragraph and page 75, 1st paragraph, Section 10.4 Cumulative Effects, (Issues list item 1.33)	Norbert M. Woerns		

76.	Some of the groundwater elevation data is reported as depths rather than as elevations (masl), which makes understanding and comparison of the dataset difficult. Recommend updating this section to include the groundwater data as elevations in meters above sea level.	Appendix D, Table D.1, page 27 onward	CH		
77.	Monitoring for surface water and wetlands is only for 2 years (2020/2021). Does this period contain the full range of conditions? (Wet, dry and normal year?). Several of the surface water observations state that they were dry but have observed water in the past.	Multiple Sections	CH		
78.	General note for all drawings: Labels for wetlands and other natural features are sometimes 'floating' and not clearly associated with an individual feature (example W37, W38, W39) or are missing altogether. Please ensure figures are easy to read and that labels clearly indicate the feature.	Geology and Water Resources Assessment Report	CH		
79.	Dufferin proposes as part of the MQEE to artificially maintain water levels in Wetland U1. Since there has been no traditional surface water assessment (hydrology) using design events nor any hydraulic evaluation of the outlet channel, it is suggested that these investigations be completed to inform the planning and management of the feature. It is suggested that this be conducted as a form of sensitivity analysis to ensure there are no risks of flooding or erosion. A worst case analysis is considered appropriate which uses detailed topography/bathymetry of the wetland and channel extended to W36. Dufferin proposes as part of the MQEE to artificially maintain water levels in Wetland U1 through the WMS which relies on injection wells and target wells to provide water to features of significance. As noted, since there has been no traditional surface water assessment (hydrology) for Wetland U1 using design events or severe recorded events nor any hydraulic evaluation of the outlet channel from this feature, it is suggested that these investigations be completed as a further test and complement to work completed to-date. It is suggested that this work could further inform the planning and management of the feature in terms of water levels over multi-seasons including severe storms. It is suggested that this be conducted as a form of sensitivity analysis to ensure there are no risks of flooding or erosion in the downstream lands which could be exacerbated by artificial filling of the wetland. A worst-case analysis is considered appropriate which uses detailed topography/bathymetry of the wetland and channel properties extended to Wetland W36.		Ron Scheckenberger		