

## Proposed Burlington Quarry Expansion JART COMMENT SUMMARY TABLE – AMP

Please accept the following as feedback from the Burlington 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 (February 2021)	Reference	Source of Comment	Applicant Response	JART Response (June 2023)
	<b>Report/Date: Adaptive Management Plan, April 2020</b>		<b>Author: EarthFX Incorporated, Savanta and Tatham Engineering</b>		
1.	Staff recommends the Adaptive Management Plan be revisited and updated once significant issues with the Level 1 and Level 2 Natural Environment Technical Report, Surface Water Assessment, Phase 1 and 2 Hydrogeological and Hydrological Study, other reports and After Use have been resolved.	General	Conservation Halton	See applicant response dated June 27, 2022 and the Preliminary Adaptive Management Plan dated June 2022	<p>On January 1, 2023, Ontario Regulation 596/22 came into effect. As a result, technical review services for planning and development applications previously provided by Conservation Halton (CH) under Memorandums of Understanding with municipalities (e.g., technical reviews related to natural heritage and select aspects of stormwater management) can no longer be provided.</p> <p>O. Reg. 596/22 does not affect CH's mandatory programs or services. CH has only reviewed this comment based on natural hazard, and wetland matters, per Ontario Regulation 686/21 and Ontario Regulation 162/06.</p> <p>CH has no further comment from a regulatory perspective. We defer any remaining natural heritage related comments to the other JART members to confirm whether it has been addressed.</p> <p>Halton Region staff have reviewed Nelson's response and provided the following JART response:</p> <p>The original comment still stands as the significant issues remain and the Adaptive Management Plan should be revisited and updated when these issues are resolved.</p>
2.	The Adaptive Management Plan (AMP) should identify securities to be posted by the applicant to protect the public agencies from financial liability for performance of the mitigation requirements and any on-going management over the long term, in the event the owner fails to do so.	General	Conservation Halton	See applicant response dated June 27, 2022 and the Preliminary Adaptive Management Plan dated June 2022	Noted.
3.	The wetland AMP/monitoring program should be based on modelled baseline water levels within the wetlands, not just the hydroperiod start dates, in order to confirm if the proposed quarry activities impact the wetlands.	General	Conservation Halton	See applicant response dated June 27, 2022 and the Preliminary Adaptive Management Plan dated June 2022	Please see Response to Comment # 1.
4.	The AMP must consider all items listed in Section 4.11 of the Region's Aggregate Resource Reference Manual.	General	Conservation Halton	See applicant response dated June 27, 2022 and the Preliminary Adaptive Management Plan dated June 2022	On January 1, 2023, Ontario Regulation 596/22 came into effect. As a result, technical review services for planning and development applications previously provided by Conservation Halton (CH) under Memorandums of Understanding with municipalities (e.g., technical

					reviews related to natural heritage and select aspects of stormwater management) can no longer be provided. As such, we defer this comment to the other JART members to confirm whether it has been addressed.  Halton Region staff have reviewed Nelson's response and note that the comment still stands.
5.	A general comment is that the groundwater triggers should be more clearly explained by a graphic such as a flow chart. A clear indication of timelines between the trigger and the remedial action should be provided, as it appears from this analysis that the timeline could be a year or more.	General	North-South Environmental Inc.	See applicant response dated June 27, 2022 and the Preliminary Adaptive Management Plan dated June 2022	This comment still stands.
6.	The AMP does not contain any monitoring of anything other than groundwater and surface water. Biological monitoring of remaining features should be proposed.	General	North-South Environmental Inc.	See applicant response dated June 27, 2022 and the Preliminary Adaptive Management Plan dated June 2022	This comment still stands.
7.	The AMP chart should clearly identify targets for monitoring (which should include biota), thresholds against which monitoring will be measured, and concrete, meaningful actions to be taken should there be a clear indication that the quarry is affecting biota through impacts on surface or groundwater. The actions should include potential cessation of extraction.	General	North-South Environmental Inc.	See applicant response dated June 27, 2022 and the Preliminary Adaptive Management Plan dated June 2022	This comment still stands.
8.	The most important, central mitigation technique proposed by the Adaptive Management Plan to mitigate future surface water deficits in wetlands or streams is to maintain them by pumping water from the quarry. This means that if there is uncertainty as to the ability to maintain the pumping in perpetuity then it affects the entire mitigation plan. There are concerns about the uncertainty of relying so heavily on the ability to maintain pumping, considering uncertainty regarding so many factors (e.g., continued water supply and its quality, land ownership, financial viability) decades in the future.	General	North-South Environmental Inc.	See applicant response dated June 27, 2022 and the Preliminary Adaptive Management Plan dated June 2022	This comment still stands.
9.	No water quality discussion or threshold levels for groundwater quality are included. See comments on surface water report.	General	Norbert M. Woerns	See applicant response dated June 27, 2022 and the Preliminary Adaptive Management Plan dated June 2022	Partially Addressed. Water quality monitoring is included in the AMP however there is no discussion of water quality thresholds and the need to meet the Ontario Drinking Water Quality Standards for the proposed infiltration pond. Surface water thresholds have been identified within the existing Environmental Certificate of Approval. These are limited to few parameters and do not consider that the discharge water will be infiltrated and used for drinking water purposes. The proposed water quality monitoring for groundwater and surface water is inadequate considering the quarry discharge water is intended to be infiltrated and used as a potable water source for downgradient wells.
10.	Prior to the surrender of the existing ARA licence the licence is required to provide confirmation that any long term monitoring, pumping, or mitigation will not result in a financial liability to the public. Due to the uncertainty of the proposed mitigation measures for the proposed expansion, this should be confirmed prior to the issuance of the ARA licence.	General	Norbert M. Woerns	See applicant response dated June 27, 2022 and the Preliminary Adaptive Management Plan dated June 2022	Unresolved. There is no information provided to address financial liability within the AMP.
11.	What options are available and what process will be followed if a suitable replacement well cannot be installed on properties where adverse well interference from quarry operations has been confirmed?	General	Norbert M. Woerns	See applicant response dated June 27, 2022 and the Preliminary Adaptive Management Plan dated June 2022	Unresolved. No information is provided in the AMP to address alternatives to well replacement apart from providing a cistern. The cistern option is only at the request of the landowner. A cistern

					is not generally considered an acceptable long term solution to domestic water supply.
12.	How will the effects of current climatic conditions on groundwater levels be evaluated?	General	Norbert M. Woerns	See applicant response dated June 27, 2022 and the Preliminary Adaptive Management Plan dated June 2022	Unresolved. It is not clear how climate has been addressed within the AMP. The proposed method of establishing threshold water levels relies on three years of background water level monitoring. This implies that the climatic conditions during the establishing of background water levels are 'normal' or representative of background conditions. Climatic data does not appear to have been incorporated into the establishment of background water levels.
13.	No water level thresholds have been provided for shallow monitoring wells nor for existing wells shown on Figure 4 and 6 that have less than 5.0 metres of available drawdown.	General	Norbert M. Woerns	See applicant response dated June 27, 2022 and the Preliminary Adaptive Management Plan dated June 2022	Partially addressed. Shallow wells have been included in the monitoring program outlined within the AMP. However, there is no discussion of shallow private wells with less than 5 metres of available drawdown and whether they will be deepened prior to quarry expansion.
14.	The AMP should identify measures required to address the current decline in groundwater levels in the vicinity of sensitive receptors.	General	Norbert M. Woerns	See applicant response dated June 27, 2022 and the Preliminary Adaptive Management Plan dated June 2022	Unresolved. Existing quarry impacts have not been addressed.
15.	The AMP does not fully recognize the interests of local agencies and municipalities in the protection of private water supplies and ecological features. Details are missing with respect to AMP implementation oversight and ongoing data access with these agencies.	General	Norbert M. Woerns	See applicant response dated June 27, 2022 and the Preliminary Adaptive Management Plan dated June 2022	Partially Resolved. The AMP identifies a Stakeholders Liaison Committee including a number of agencies and community representatives. It appears as though the Stakeholders Liaison Committee will be provided with information of the quarry operation. It is not clear how any stakeholder concerns will be addressed.
16.	The long-term financial implications of the recommended final site rehabilitation scenario have not been addressed.	General	Norbert M. Woerns	See applicant response dated June 27, 2022 and the Preliminary Adaptive Management Plan dated June 2022	Unresolved. There is no information provided in the AMP to address the long term financial implications of the proposed site rehabilitation
17.	The use of available drawdown as criteria for implementation of mitigation measures does not consider existing well conditions such as well productivity or water quality issues and is inadequate for assessing negative impact on private wells.	General	Norbert M. Woerns	See applicant response dated June 27, 2022 and the Preliminary Adaptive Management Plan dated June 2022	Unresolved. Factors other than available drawdown have not been considered in the proposed mitigation measures.
18.	The AMP approach to mitigation is reactive and should be proactive especially with respect to residential wells at high risk of potential well interference.	General	Norbert M. Woerns	See applicant response dated June 27, 2022 and the Preliminary Adaptive Management Plan dated June 2022	Unresolved. No information has been provided as proactive measures to prevent impacts to vulnerable wells such as shallow wells. See comment 13 above.
19.	There is no figure/map showing the location of wetland or stream monitoring locations (surface water stations).	General	Daryl W. Cowell & Associates Inc.	See applicant response dated June 27, 2022 and the Preliminary Adaptive Management Plan dated June 2022	Original Comment Stands.
20.	Report appears to be incomplete (see previous comment) and section numbers referenced in the text do not correspond to actual numbers (e.g., references to Section 6).	General	Daryl W. Cowell & Associates Inc.	See applicant response dated June 27, 2022 and the Preliminary Adaptive Management Plan dated June 2022	Original Comment Stands.
21.	Although titled "Adaptive", this plan is not so – there is no reference to how the monitoring would be adjusted/revised based on results, particularly in the event of unanticipated impacts. One particular fault is the absence of any contingency recommendations in the event of impacts such as shifting or halting quarry operations.	General	Daryl W. Cowell & Associates Inc.	See applicant response dated June 27, 2022 and the Preliminary Adaptive Management Plan dated June 2022	Original Comment Stands.
22.	The Level 1 and 2 Hydrogeology Assessment notes that the Medad Valley is a "significant groundwater discharge area" (Level 1 and 2 Hydrogeology Assessment report). These discharges occur via springs located near the base of the Goat Island/Gasport formations. The locations of springs and one round of discharge	General	Daryl W. Cowell & Associates Inc.	See applicant response dated June 27, 2022 and the Preliminary Adaptive Management Plan dated June 2022	Original Comment Stands.

	estimates (March 2006) had been documented by Dr. Worthington. Given the noted significance of the springs, why are there no plans to monitor spring flows in the valley? There should be background monitoring and on-going monitoring for several springs over at least 2 years prior to quarrying. Estimated impacts are derived via an EPM model even though, as Dr. Worthington notes (Worthington 2006), each spring represents a discrete “karstic groundwater basin” (page 5) of varying sizes – a very specific anisotropic condition.				
23.	<p>The purpose of the Adaptive Management Plan (ADM) was to provide Nelson Aggregate Co. with the information needed to verify that the quarry is operating without causing adverse impacts to the natural environment or private water supplies. The ADM states that the monitoring data to date shows that the tributary to Willoughby Creek and West Arm depend on quarry discharge for much of their flow. Recommendations from the ADM is to establish streamflow and water temperature thresholds from historic surface water monitoring. If baseflows are detected to drop below minimum thresholds, then applicable mitigation measures will be implemented while the cause for potential impact is evaluated to determine if these were related to quarry dewatering or extraction. Discharge rates will also be adjusted to compensate for the reduction of flow subject to permissible discharge rates in Nelson’s PTTW.</p> <p>When temperature thresholds are exceeded, the quarry discharges offsite will be reduced to reduce the influence of the discharge on the water temperature of the receiving watercourse.</p> <p>This pumping scenario indicated above does not appear to be simple in terms of moving forward. If this is to be done in perpetuity, the following details should be clarified:</p> <ul style="list-style-type: none"> <li>(a) Are there assurances that trained operators will be available to apply the operational rules for pumping as noted in the ADM?</li> <li>(b) How will trigger levels detected in pumping be responded to as changes are experienced over time?</li> <li>(c) Based on the preferred rehabilitation scenario, potential to downstream fisheries impacts need to be clarified. For example, when the when lake is filling up with water, how will flow supplementation with pumping be maintained for the downstream fish habitat? Another concern is how will the overflows from newly created lake be discharged into the downstream watercourses?</li> </ul>	General	Matrix Solutions Inc.	See applicant response dated June 27, 2022 and the Preliminary Adaptive Management Plan dated June 2022	These items are addressed in the updated AMP provided by the applicant. It is understood that downstream water flows to fish habitat will be maintained in the AMP, but details regarding how this is done simultaneously during lakefilling was not provided.
24.	Second paragraph should note the Region of Halton directly as a consulting agency with regard to the AMP.	Cover Letter (dated April 23, 2020) and Page 2	Daryl W. Cowell & Associates Inc.	See applicant response dated June 27, 2022 and the Preliminary Adaptive Management Plan dated June 2022	Original Comment Stands.
25.	Purpose of the AMP is to “verify that the quarry is operating without causing adverse impacts”. No, the purpose of the AMP is to determine whether or not quarry operations impact ground and surface waters, to determine the nature of any impacts and take corrective actions.	Page 2 3 <sup>rd</sup> Paragraph	Daryl W. Cowell & Associates Inc.	See applicant response dated June 27, 2022 and the Preliminary Adaptive Management Plan dated June 2022	Original Comment Stands.
26.	If the site not developing acceptably, then “Adjust/Refine/Modify”; this does not speak directly to quarry operations but could refer to only the monitoring. There should be a step involving quarry operational responses (e.g., stop quarrying). Without this, the plan is not “Adaptive” in any way.	Figure 1	Daryl W. Cowell & Associates Inc.	See applicant response dated June 27, 2022 and the Preliminary Adaptive Management Plan dated June 2022	Original Comment Stands.
27.	“Dewatering post extraction will also lower groundwater levels surrounding the west extension.” What are the implications for the karstic subwatersheds feeding the springs in the Medad Valley? What is the final groundwater elevations?	Page 4 3 <sup>rd</sup> Paragraph	Daryl W. Cowell & Associates Inc.	See applicant response dated June 27, 2022 and the Preliminary Adaptive Management Plan dated June 2022	Original Comment Stands.

28.	<p>'Prior to the surrender of the <i>Aggregate Resources Act</i> licence, the licensee will provide, to the satisfaction of the MNRF, confirmation that any long-term monitoring, pumping, or mitigation will not result in a financial liability to the public.'</p> <p>Public financial liability. How will this be addressed? There is no discussion of how this will be addressed in this document. This should be demonstrated prior to approval of the licence application.</p>	Page 4 Section 2.2. West Extension 3 <sup>rd</sup> Paragraph	Norbert M. Woerns	See applicant response dated June 27, 2022 and the Preliminary Adaptive Management Plan dated June 2022	Unresolved See comment 16 above.
29.	"The AMP will become a condition referenced on the approved ARA Site Plans". The most recent version of the site plans does not incorporate the AMP and does not show monitoring locations.	Page 5 2 <sup>nd</sup> Paragraph	Daryl W. Cowell & Associates Inc.	See applicant response dated June 27, 2022 and the Preliminary Adaptive Management Plan dated June 2022	Original Comment Stands.
30.	This reference is intended to direct Earthfx's whole approach to setting thresholds. What are this author's qualifications and experience? Has this been peer-reviewed? There must be much greater discussion in the validity of this thesis than just throwing-off a single paper that is not fully reviewed, assessed or further discussed in the AMP.	Page 5 Footnote	Daryl W. Cowell & Associates Inc.	See applicant response dated June 27, 2022 and the Preliminary Adaptive Management Plan dated June 2022	Original Comment Stands.
31.	Further to comment 30, reference to a discussion regarding setting targets in Section 6 is confusing as Section 6 is titled "Jefferson Salamander Breeding Ponds".	Page 6 1 <sup>st</sup> Paragraph	Daryl W. Cowell & Associates Inc.	See applicant response dated June 27, 2022 and the Preliminary Adaptive Management Plan dated June 2022	Original Comment Stands.
32.	Groundwater quality monitoring should be at least quarterly (as shown in Table 6 for surface water).	Page 6 Section 4.1 and Table 10	Daryl W. Cowell & Associates Inc.	See applicant response dated June 27, 2022 and the Preliminary Adaptive Management Plan dated June 2022	Original Comment Stands.
33.	<p>'the domestic water wells, which will be incorporated into the AMP shall be constructed to comply with Ontario Regulation 903 (as amended).'</p> <p>Does this mean only private wells meeting this requirement will be included in the AMP and monitoring program?</p>	Page 7 3 <sup>rd</sup> Paragraph Section 4.2. Off-Site Domestic Water Wells	Norbert M. Woerns	See applicant response dated June 27, 2022 and the Preliminary Adaptive Management Plan dated June 2022	Unresolved. The AMP does not specifically address the issue of private wells not meeting the Ontario Regulation 903 requirements.
34.	Impact assessments will only be undertaken during the first 5 years (of 10) of quarrying (?). The monitoring and assessment, particularly associated with wetlands should be undertaken throughout and following quarrying.	Page 7 Section 4.3	Daryl W. Cowell & Associates Inc.	See applicant response dated June 27, 2022 and the Preliminary Adaptive Management Plan dated June 2022	Original Comment Stands.
35.	What is the scientific justification for using thresholds based on a "worst-case" scenario? Thresholds need to reflect actual real-time climatic situations and be set accordingly.	Page 7 Section 4.3	Daryl W. Cowell & Associates Inc.	See applicant response dated June 27, 2022 and the Preliminary Adaptive Management Plan dated June 2022	Original Comment Stands.
36.	<p>'The impact assessment has been developed for the initial 5 years of quarry operation'</p> <p>The above statement appears to contradict the modelling scenarios that were completed. Please clarify.</p>	Page 7 Section 4.3. Groundwater Impact Assessment Methodology 2 <sup>nd</sup> Paragraph	Norbert M. Woerns	See applicant response dated June 27, 2022 and the Preliminary Adaptive Management Plan dated June 2022	Unresolved. It is unclear what is meant by impact assessment as this was to have been completed by the Level 1 and Level 2 Hydrogeological and Hydrological Impact Assessment (April 2020).
37.	<p>'The predictive-based approach relied upon the simulated water level drawdowns in the bedrock aquifers resulting from both climatic conditions and quarry dewatering. The predicted water levels during drought conditions represent a worst-case scenario that may be encountered during the initial phases of quarry operation (Phase 1 and 2).'</p> <p>There is no discussion or predictions regarding the potential for water quality impacts.</p>	Page 7 Section 4.3. Groundwater Impact Assessment Methodology 4 <sup>th</sup> Paragraph	Norbert M. Woerns	See applicant response dated June 27, 2022 and the Preliminary Adaptive Management Plan dated June 2022	Partially Resolved. Water quality monitoring has been included within the AMP however there is no discussion of water quality thresholds beyond that included within the existing ECA which is limited to surface water discharge. There is no discussion of the importance of meeting Ontario drinking water standards for the proposed infiltration pond.
38.	A private well at 2377 Colling Road is proposed to be used as background monitoring well. The well is located 350.0 metres away from the existing quarry and is potentially within the existing quarry zone of influence. How many years of data is available for this well? In addition to the above, a private well should not be used as a background monitoring well as there is no guarantee it will not be decommissioned during extraction due to, for example, property sale or changes to water taking requirements	Page 7 Section 4.3.1. Monitoring of Background Groundwater Conditions	Conservation Halton	See applicant response dated June 27, 2022 and the Preliminary Adaptive Management Plan dated June 2022	On January 1, 2023, Ontario Regulation 596/22 came into effect. As a result, technical review services for planning and development applications previously provided by Conservation Halton (CH) under Memorandums of Understanding with

	on the property. Private well water taking can also change, which could impact the reliability of the groundwater level data.				<p>municipalities (e.g., technical reviews related to natural heritage and select aspects of stormwater management) can no longer be provided. As such, we defer this comment to the other JART members to confirm whether it has been addressed.</p> <p>Norbert Woerns has reviewed Nelson's response and provided the following JART response: PARTIALLY ADDRESSED- Background monitors separate from private wells have been identified although a number of these have yet to be installed and monitored.</p>
39.	<p>'Background monitoring well is a domestic water well located north of the existing quarry at 2377 Collins Road (referred to as DW2; Figure 2. This background monitoring well has shown to have no drawdown from the proposed quarry extension.'</p> <p>What is the period of record available for this well? No water level or water quality data was found in the reports for this well. Has this well been impacted by the existing quarry? This well is shown on figure 7 not figure 2.</p>	Page 7 Section 4.3.1. Monitoring of Background Groundwater Conditions 1 <sup>st</sup> Paragraph	Norbert M. Woerns	See applicant response dated June 27, 2022 and the Preliminary Adaptive Management Plan dated June 2022	Unresolved. No details were provided on this well. An alternate background monitoring well has been proposed. See comment 38.
40.	It seems obvious that the proposed monitoring well has shown "no drawdown" from the proposed quarry extension when quarrying has not yet occurred?	Page 8 1 <sup>st</sup> Paragraph	Daryl W. Cowell & Associates Inc.	See applicant response dated June 27, 2022 and the Preliminary Adaptive Management Plan dated June 2022	Original Comment Stands.
41.	What is the proof for this statement? Even so what if there are false positives – better to be prepared than surprised!	Page 8 Section 4.3.2. 2 <sup>nd</sup> Paragraph	Daryl W. Cowell & Associates Inc.	See applicant response dated June 27, 2022 and the Preliminary Adaptive Management Plan dated June 2022	Original Comment Stands.
42.	Not clear what this says – it seems evident that there should be concern if levels drop "below a minimum reported".	Page 8 Section 4.3.2. 3 <sup>rd</sup> Paragraph, Last Sentence	Daryl W. Cowell & Associates Inc.	See applicant response dated June 27, 2022 and the Preliminary Adaptive Management Plan dated June 2022	Original Comment Stands.
43.	<p>It is noted that "trigger values set based on the traditional approach have caused numerous false positive trigger exceedances". Have these "false positives" been noted within the existing Nelson Quarry itself or is this a comment that applies to quarries in general?</p> <p>It would be helpful if the groundwater triggers could be more clearly explained by a graphic.</p>	Page 8 4 <sup>th</sup> Paragraph	North-South Environmental Inc.	See applicant response dated June 27, 2022 and the Preliminary Adaptive Management Plan dated June 2022	This comment still stands.
44.	<p>It is stated that "Prolonged climatic changes mean sustained periods of departure from "normal" precipitation amounts, for example droughts." Climatic changes that result in greater rainfall, or more extreme rainfall events, have also been predicted as a result of climate change. Both these eventualities should be referenced. It is stated that short-term trends (seasonal) "should not cause a concern if an exceptionally dry year results in water levels that drop below a minimum reported or predicted water level".</p> <p>As noted previously, breeding amphibians depend on "good" years that allow high levels of reproduction that compensate for bad years, and so the number of years with extreme low levels of water in breeding ponds must not increase. This should be taken into account when providing thresholds.</p> <p>It appears that several years would be needed to determine the thresholds that would indicate whether there are impacts on groundwater. This means the potential period of inaction would likely be much longer than one year. If groundwater is increasingly affected by the quarry extensions, there is the possibility that the known salamander</p>	Page 8 5 <sup>th</sup> Paragraph	North-South Environmental Inc.	See applicant response dated June 27, 2022 and the Preliminary Adaptive Management Plan dated June 2022	<p>The threshold hydroperiod value does not provide a range through which the variation in hydroperiod from year to year can be assessed. Threshold values should reflect the needs of the biota that depend on the wetland, rather than establishing a date that indicates when remediation should occur. For example, if the threshold is May 15th, and water remains in the wetland only until May 31st for several years in a row, the detrimental effects to breeding salamanders would likely be high as they require standing water until July to be able to transform.</p> <p>There is very little reported about the biotic function of wetlands that are supported by seepage in the Medad Valley. It was noted that</p>

	<p>pond southeast of the quarry could be affected before any action is taken. A clear graphic of the timelines should be provided, and scenarios, based on potential impacts on Jefferson Salamander and taking into account climate change impacts, should be provided to help resolve triggers as quickly as possible.</p> <p>Triggers described here refer only to groundwater and surface water parameters. Since the objectives from the Region's guidelines specifically refer to terrestrial features and functions, the triggers should go beyond surface water and groundwater and include monitoring of biota. The objectives of the Aggregate Resources Reference Manual (Section 4, page 34) specifically require that "features and functions (including implications on terrestrial systems) be identified and that meaningful observation data should be collected relative to each to ensure that the observed data are evaluated relative to effects on these features and functions" (Region of Halton, undated).</p>				<p>monitoring locations did not always correspond with wetlands in the Medad Valley.</p> <p>Trigger values should be informed by the species that have been found in all monitoring conducted since the early 2000s.</p>
45.	<p>Either this is self-evident or needs explanation as to how quarrying operations can be the "confirmed reason" for decreasing trends – please detail and indicate what operating adjustments are intended.</p>	<p>Page 9 Section 4.3.3. 1<sup>st</sup> Sentence</p>	<p>Daryl W. Cowell &amp; Associates Inc.</p>	<p>See applicant response dated June 27, 2022 and the Preliminary Adaptive Management Plan dated June 2022</p>	<p>Original Comment Stands.</p>
46.	<p>'Data collected from existing domestic water wells along No. 2 Sideroad, which are within 80.0 metres of the quarry, show that wells constructed in the hydrostratigraphy layer beneath the quarry floor (Layer 8) can meet peak domestic water demands with between 2.0 and 5.0 metres of available drawdown.'</p> <p>No data was provided in the report to substantiate this conclusion.</p>	<p>Page 10 2<sup>nd</sup> Paragraph Section 4.3.4. Proposed Ground Water Mitigation Measures</p>	<p>Norbert M. Woerns</p>	<p>See applicant response dated June 27, 2022 and the Preliminary Adaptive Management Plan dated June 2022</p>	<p>Unresolved. No data were provided for these wells within the Preliminary Adaptive Management Plan.</p>
47.	<p>'Compensation must be acceptable to the homeowner and the quarry operator and could include all or part of the costs associated with drilling of a new well, deepening a well, and abandonment of the old well.'</p> <p>Does this also include a permanent supply of water if suitable well cannot be drilled on the property?</p>	<p>Page 10 3<sup>rd</sup> Paragraph Section 4.3.4. Proposed Ground Water Mitigation Measures</p>	<p>Norbert M. Woerns</p>	<p>See applicant response dated June 27, 2022 and the Preliminary Adaptive Management Plan dated June 2022</p>	<p>Unresolved The alternative to deepening, enlarging, or drilling a new well has not been adequately addressed. A cistern is proposed only at the request of the landowner. This alternative is not generally accepted as a long term solution as a replacement water supply.</p>
48.	<p>Please provide details of this mounding and to what degree it will be maintained during quarrying despite an approximately 20.0 metre lowering of the bedrock surface combined with pumping. Please provide a description of the height and extent of mounding (now and once new infiltration pond is created).</p>	<p>Page 10 Section 4.3.4. Last Paragraph (and Page 28 Last Paragraph)</p>	<p>Daryl W. Cowell &amp; Associates Inc.</p>	<p>See applicant response dated June 27, 2022 and the Preliminary Adaptive Management Plan dated June 2022</p>	<p>Original Comment Stands.</p>
49.	<p>'Interference will be in part masked or, coupled by local climatic conditions. Key groundwater monitoring locations that have over 7 years of water level data have been selected to act as the long-term sentry wells to ensure the influence on the groundwater regime is consistent with the predicted influence from quarry operations (Figure 3).'</p> <p>How will the effects of current climate on groundwater levels be evaluated? Will the proposed background well/monitor at 2377 Collins Road be used as baseline? Groundwater monitoring sentry wells will likely also be influenced by the quarry and the climate. How will quarry effects be distinguished for current climate conditions?</p>	<p>Page 10 Section 4.4.1. Groundwater monitoring Program 1<sup>st</sup> Paragraph</p>	<p>Norbert M. Woerns</p>	<p>See applicant response dated June 27, 2022 and the Preliminary Adaptive Management Plan dated June 2022</p>	<p>Unresolved The impact of climate on groundwater levels has not been discussed. It remains unclear how the monitoring program will identify quarry induced water level changes versus climate induced water level changes.</p>
50.	<p>Extreme drought based on existing data or simulated?</p>	<p>Page 11 Table 1, Right Column (and Table 3)</p>	<p>Daryl W. Cowell &amp; Associates Inc.</p>	<p>See applicant response dated June 27, 2022 and the Preliminary Adaptive Management Plan dated June 2022</p>	<p>Original Comment Stands.</p>
51.	<p>'Level 1 Threshold conditions occur when the measured water level falls below the Threshold 1 value (10<sup>th</sup> percentile) for a 15-day period. Level 2 conditions occur when the water level falls below the Threshold 2 value (5<sup>th</sup> percentile) for a 15-day period. These threshold levels are set as early warning water level elevations were the</p>	<p>Page 15 Section 4.4.2. Groundwater Thresholds</p>	<p>Norbert M. Woerns</p>	<p>See applicant response dated June 27, 2022 and the Preliminary Adaptive Management Plan dated June 2022</p>	<p>Unresolved. No response to this concern can be found in the applicant response.</p>

	<p>cumulative influence of drought conditions and quarry dewatering have lowered the water levels to an early warning threshold, where local private wells (adjacent to or in close proximity to the quarry) may start to notice a decrease in well yield.'</p> <p>If the 15 day period of simulation represents worst case drought conditions (i.e., 2015/2016 drought conditions) it may be limited as an early warning threshold of quarry impacts under normal climatic conditions.</p>	2 <sup>nd</sup> Paragraph			
52.	No threshold values are assigned to intermediate level 'B' series monitoring wells or 'C' series shallow wells. This does not take into account potential interference with private wells completed into shallow bedrock zones or overburden.	Page 15 Section 4.4.2. Groundwater Thresholds Table 2 Groundwater Threshold Values	Norbert M. Woerns	See applicant response dated June 27, 2022 and the Preliminary Adaptive Management Plan dated June 2022	Unresolved. It is unclear what the status is of shallow monitoring wells and the role they play in providing an early warning of groundwater level impacts of the proposed quarry expansion.
53.	'notify the SLC, MECP and MNR in writing;'  What does SLC represent?	Page 15 Section 4.4.2. Groundwater Thresholds 2 <sup>nd</sup> Last Bullet	Norbert M. Woerns	See applicant response dated June 27, 2022 and the Preliminary Adaptive Management Plan dated June 2022	Resolved. SLC represents Stakeholders Liaison Committee
54.	For the southern extension groundwater levels 'Preliminary groundwater threshold values have been assigned to key Sentry Wells that are located outside of the extraction area.' AMP page 15 section 4.4.2 1 <sup>st</sup> paragraph. However, for the west extension "No groundwater thresholds are proposed until enough groundwater monitoring data is collected to establish baseline conditions." AMP page 17, section 4.5.3, 1 <sup>st</sup> paragraph. Groundwater level thresholds for the west extension are missing from the report.	Page 15 Section 4.4.2. 1 <sup>st</sup> Paragraph and Page 17 Section 4.5.3 1 <sup>st</sup> Paragraph	Norbert M. Woerns	See applicant response dated June 27, 2022 and the Preliminary Adaptive Management Plan dated June 2022	Unresolved. No threshold levels have been provided for groundwater monitors in the west extension.
55.	What's the point of simply repeating the process? This should trigger a change in operations (e.g., full stop or re-direction)?	Page 16 2 <sup>nd</sup> Paragraph	Daryl W. Cowell & Associates Inc.	See applicant response dated June 27, 2022 and the Preliminary Adaptive Management Plan dated June 2022	Original Comment Stands
56.	'Groundwater monitoring at several monitoring wells on the West Extension commenced in 2018 and 2019. The monitoring of water levels and water quality shall continue for the duration of this AMP. Data collected will represent background conditions for as long as Phases 3-6 remain undisturbed.'  This assumes that the extraction of phase 1 and 2 will not impact background conditions around the proposed phases 3 to 6. This will represent baseline conditions affected by phase 1 and 2.	Page 16 Section 4.5.2. Groundwater monitoring Program 1 <sup>st</sup> Paragraph	Norbert M. Woerns	See applicant response dated June 27, 2022 and the Preliminary Adaptive Management Plan dated June 2022	Unresolved. It remains questionable whether the baseline conditions established during the Phase 1 and 2 South Extension are appropriate for establishing baseline conditions as they may be influenced by the impacts of the Phase 1 and 2 Southern Extension.
57.	'The extraction of the proposed West Extension (Phase 3 through to 6) is scheduled to commence approximately 10-years following the issuance of the ARA licence. No groundwater thresholds are proposed until enough groundwater monitoring data is collected to establish baseline conditions.'  This suggests that currently there is insufficient groundwater monitoring information to establish threshold levels. As noted in comment 56 above, the additional monitoring will represent a baseline that is affected by the Phase 1 and 2 extraction and not represent an undisturbed condition. How will the additional monitoring data affect the AMP?	Page 17 Section 4.5.3. Groundwater Thresholds 1 <sup>st</sup> Paragraph	Norbert M. Woerns	See applicant response dated June 27, 2022 and the Preliminary Adaptive Management Plan dated June 2022	Unresolved. See Comment 56.
58.	This process/commitment has to be included in the Site Plans.	Page 17 Section 4.5.3	Daryl W. Cowell & Associates Inc.	See applicant response dated June 27, 2022 and the Preliminary Adaptive Management Plan dated June 2022	Original Comment Stands.

59.	Well contractor must be independent; if both pump condition and over-pumping is ruled out, then licensee's (note spelling in document) operations should be the default.	Page 20 Complaint Protocol	Daryl W. Cowell & Associates Inc.	See applicant response dated June 27, 2022 and the Preliminary Adaptive Management Plan dated June 2022	Original Comment Stands.
60.	Why would stations be removed? Presumably they have been selected for specific purposes for impact assessment.	Page 23 Section 5.2	Daryl W. Cowell & Associates Inc.	See applicant response dated June 27, 2022 and the Preliminary Adaptive Management Plan dated June 2022	Original Comment Stands.
61.	Explain why there is no threshold value for SW14 in the Medad valley, located directly downflow from the west quarry extension.	Table 7	Daryl W. Cowell & Associates Inc.	See applicant response dated June 27, 2022 and the Preliminary Adaptive Management Plan dated June 2022	Original Comment Stands.
62.	Note that flows go to "0.0 litre/second" for SW6 and SW29 – the timing of this "threshold" in the year is important and what is the impact to Lake Medad/Grindstone Creek?	Table 7	Daryl W. Cowell & Associates Inc.	See applicant response dated June 27, 2022 and the Preliminary Adaptive Management Plan dated June 2022	Original Comment Stands.
63.	Typographical errors. There are references to Section 6.4. These should be Section 5.4.	Page 25 Section 5.3.1. Streamflow and Water Temperature Thresholds	Norbert M. Woerns	See applicant response dated June 27, 2022 and the Preliminary Adaptive Management Plan dated June 2022	Unresolved Typographical error.
64.	If year-round baseflow in the West Arm of the West Branch of the Mount Nemo Tributary is required, why is the threshold for SW6 dry (0.0 litre/second)?	Page 25 2 <sup>nd</sup> Paragraph, Last Sentence	Daryl W. Cowell & Associates Inc.	See applicant response dated June 27, 2022 and the Preliminary Adaptive Management Plan dated June 2022	Original Comment Stands.
65.	"Mitigation is discussed in Section 6.4" – correction, this should read "Section 5.4"	Page 25 3 <sup>rd</sup> Paragraph and 4 <sup>th</sup> Paragraph	Daryl W. Cowell & Associates Inc.	See applicant response dated June 27, 2022 and the Preliminary Adaptive Management Plan dated June 2022	Original Comment Stands.
66.	'Its recommended that the wetland hydroperiod thresholds be established from the results of the historic surface water monitoring, existing condition water balance and integrated surface water groundwater model completed in support of the proposed quarry extension. Specifically, dates when the wetlands must remain wet should be established from the monitoring data and water balance and integrated surface water groundwater model results.'  How does the retained consultant know whether the current hydroperiod for the wetlands hasn't been altered from historical operations of the existing quarry and whether this represents appropriate baseline conditions for a quarry impact assessment and for determining a preferred rehabilitation option?	Page 26 Section 5.3.2. Wetland Hydroperiod Thresholds 2 <sup>nd</sup> Paragraph	Norbert M. Woerns	See applicant response dated June 27, 2022 and the Preliminary Adaptive Management Plan dated June 2022	Unresolved. Issue of impact from existing quarry has not been addressed.
67.	These hydroperiod thresholds (0.0 metre of water level) seem to be reached very early in the year given the belief that the Halton Till is an "aquitarde".	Table 8	Daryl W. Cowell & Associates Inc.	See applicant response dated June 27, 2022 and the Preliminary Adaptive Management Plan dated June 2022	Original Comment Stands.
68.	'Downstream of each quarry discharge location (SW2 and SW10), water quality thresholds will be established to identify impacts on the water quality of the surface water features resulting from the quarry discharge. Its recommended that the water quality thresholds be established from the results of the historic water quality sampling completed in support of the proposed quarry extension. Specifically, maximum and minimum concentration limits should be established from the sample results collected while considering the Provincial Water Quality Objectives (PWQO) and role water quality plays in the Natural Heritage Features.'  A portion of the discharge from Sump 100 is currently directed to the golf course irrigation ponds and is proposed to be directed to future infiltration ponds for purposes of recharging the groundwater system and the maintenance of groundwater levels for down gradient private wells. Water quality monitoring for this discharge should be	Page 28 Section Water Quality Thresholds 3 <sup>rd</sup> Paragraph	Norbert M. Woerns	See applicant response dated June 27, 2022 and the Preliminary Adaptive Management Plan dated June 2022	Unresolved. The Preliminary Adaptive Management Plan June 2022 does not address this water quality concern. No monitoring of water quality of proposed infiltration pond has been identified. Also, no water quality threshold levels have been identified beyond the existing ECA approvals for quarry discharge water which are proposed to continue.

	evaluated against Ontario Drinking Water Standards since the infiltrated discharge is expected to ultimately impact drinking water supplies.				
69.	Are these measures intended to be maintained post-closure if the wetland hydroperiod/stream flow thresholds are exceeded?	Page 29 Additional Mitigative Measures	Daryl W. Cowell & Associates Inc.	See applicant response dated June 27, 2022 and the Preliminary Adaptive Management Plan dated June 2022	Original Comment Stands.
70.	It is noted in Section 7.3 on Page 38 that should pumping cease in the West Arm of the West Branch of the Mount Nemo Tributary of Grindstone Creek, fish habitat would be affected. It should also be noted that the small amphibian breeding pond associated with this tributary meets the criteria for Significant Wildlife Habitat. This breeding pond must also be maintained. Water quality of quarry water as a mitigation measure needs to be monitored, as quarry water may have high conductivity, and amphibian larvae are highly sensitive to increased conductivity. Conductivity should be monitored in ponds maintained by quarry discharge.	Page 38 Section 7.3	North-South Environmental Inc.	See applicant response dated June 27, 2022 and the Preliminary Adaptive Management Plan dated June 2022	Conductivity monitoring has been proposed. However, there is no information on how groundwater conductivity triggers would be developed, given that pumping of quarry water will be the only mitigation available should wetlands need to be supplemented.  An additional issue has been identified as the water volumes to be pumped will be very large, and will potentially flush out the pond. This would make it less functional as amphibians cannot breed in moving water.
71.	Any revisions should be based on review of the data/trends and should be separately identified for the southern and western extensions. Why would the AMP be revised for the western extension when only the southern extension is being extracted? This needs to be more clearly defined as it will eventually be part of the Site Plans.	Page 39 AMP Revisions	Daryl W. Cowell & Associates Inc.	See applicant response dated June 27, 2022 and the Preliminary Adaptive Management Plan dated June 2022	Original Comment Stands.
72.	Section 1 Introduction: I note in the second paragraph that Halton is not included as one of the agencies that Nelson Aggregates Co. intends to consult with in order to finalize the AMP. It appears any additional charges, amendments, or additions required by Halton will need to be established during the Hearing Process.		Daryl W. Cowell & Associates Inc.		Original Comment Stands.
73.	Section 3.1 South Extension: paragraph 3 notes that the "lake will fill to an elevation of 271 m." However, paragraph 1 notes that this is the elevation of the floor in Phase 1A?		Daryl W. Cowell & Associates Inc.		Original Comment Stands.
74.	Table 2 West Extension: I understand that wells BS-01 through 07 have been drilled and information is provided for location and well depth but why no information "Top of Casing"?		Daryl W. Cowell & Associates Inc.		Original Comment Stands.
75.	Section 5.4.1 Monitoring of Background Groundwater Conditions: I note that the background monitoring well is located east of the existing quarry in close proximity to the Niagara Escarpment. I do not believe this setting is representative of groundwater conditions in the areas of the southern or western extensions. The Niagara Escarpment on the east is much further fractured (vertically and horizontally) due to many cycles of glaciation (deep crevice caves are well documented) whereas the 'escarpment' forming the Medad Valley is a much younger feature created post-glacially and had not been subject to direct glacial loading after information. Hydrogeological conditions in the two settings are significantly different.		Daryl W. Cowell & Associates Inc.		Original Comment Stands.
76.	Table 4 Groundwater Quality: TSS and turbidity should be included.		Daryl W. Cowell & Associates Inc.		Original Comment Stands.
77.	Section 5.4.3 Groundwater Thresholds: I am not familiar with the 'percentile method' for groundwater monitoring but am not opposed. However, we need to understand what actual elevations these represent in order to evaluate the threshold relative to quarry floor elevations and surrounding surface water features.		Daryl W. Cowell & Associates Inc.		Original Comment Stands.

78.	Section 6.1.3 MECP PTTW and ECA Requirements: The second paragraph on page 19 indicates that Nelson will be seeking to permanently increase the maximum allowable discharge rate based on seasonal changes. It is not clear what discharge amount(s) is being sought. Is this greater than the existing 8,200 L/minute maximum? Is so, how much? The amount(s) are important because the operation of sump 0100 effectively re-routes groundwater causing it to enter the Medad Valley (via Willoughby Creek) much further to the north. This will have an effect on groundwater recharge to the central portion of the valley and much be assessed with regard to impacts to the Medad Valley PSW.		Daryl W. Cowell & Associates Inc.		Original Comment Stands.
79.	Section 6.2.2 Wetland Hydroperiod Thresholds: Second paragraph on page 21..."the wetlands are <b>generally perched</b> " (my emphases). What is this? Either they are perched or they are not perched but have a higher hydraulic conductivity.		Daryl W. Cowell & Associates Inc.		Original Comment Stands.
80.	Table 8 Environmental Compliance Approval Effluent Limits: Turbidity should be included as well-not the same as TSS, especially in karst/fractured rock settings.		Daryl W. Cowell & Associates Inc.		Original Comment Stands.
81.	Section 6.2.5 Surface Water Mitigation Measures: First paragraph identifies general mitigation measures including "adjusting quarry discharge rates", however the document does not indicate specific measures associated with specific non-compliance events.		Daryl W. Cowell & Associates Inc.		Original Comment Stands.
82.	Section 6.2.5, third paragraph, page 23: This describes a mitigation strategy involving a bottom draw outlet to feed water to wetland 13201. Please provide a schematic of this system. Also, how are rate and quality controlled/determined? Is this directly tied to a piezometer? Does this simply involve someone interpreting data and turning on the hose?		Daryl W. Cowell & Associates Inc.		Original Comment Stands.
83.	Section 6.2.5, fourth paragraph page 23 and first paragraph page 24: Design details please...see above comment.		Daryl W. Cowell & Associates Inc.		Original Comment Stands.
84.	Section 6.2.5 page 24, first bullet: Design details please.		Daryl W. Cowell & Associates Inc.		Original Comment Stands.
85.	Page 24, second bullet: How is temperature regulation achieved, as presented, it appears to be by 'trial and error'.		Daryl W. Cowell & Associates Inc.		Original Comment Stands.
86.	Page 24, third bullet: What happens if water quality doesn't 'adhere' to effluent limits? What does 'adheres' mean?		Daryl W. Cowell & Associates Inc.		Original Comment Stands.
87.	Page 24, fourth bullet: "If the second sample confirms the results of the first, the quarry sump and settling pond will be <b>reviewed</b> and the <b>necessary</b> modifications will be made to address the effluent limits (my emphasis). Please indicate what kind of review and what are 'necessary modifications'. As written, this is not a mitigation measures.		Daryl W. Cowell & Associates Inc.		Original Comment Stands.
88.	Page 24, fifth bullet: same comment as 87.		Daryl W. Cowell & Associates Inc.		Original Comment Stands.

89.	Page 25, last bullet: Notes that “mitigation measures implemented will cease and operations will return to normal.” This is the first mention of mitigation measures involving quarry operations (quarrying?) - please provide specifics on how quarry operations will be modified for each non-compliance of each threshold.		Daryl W. Cowell & Associates Inc.		Original Comment Stands.
90.	Section 9 Water Management and Mitigation Plan: This section (and elsewhere in the AMP) does not provide any detailed design information pertaining how water management will be undertaken (pipes, hoses, discharge valves) nor how mitigation volumes are determined and translated to flows and durations.		Daryl W. Cowell & Associates Inc.		Original Comment Stands.
91.	Section 9.1.2 West Extension, first paragraph: Please detail how “enhanced permeability” will be achieved.		Daryl W. Cowell & Associates Inc.		Original Comment Stands.
92.	Section 9.1.2, third paragraph: How exactly is the test conducted to demonstrate that groundwater recharge is occurring? What constitutes a successful test? Further, a water balance involving changes in pond storage does not provide an indication of where the water is going relative to pre-gold course conditions or relative to the existing irrigation pond (which we don't know anyway).		Daryl W. Cowell & Associates Inc.		Original Comment Stands.
93.	Section 9.1.2, third paragraph: What mitigation measure(s) will be implemented if it is determined that the infiltration pond does not function as designed in regard to the Medad Valley wetland groundwater flows.		Daryl W. Cowell & Associates Inc.		Original Comment Stands.
94.	Section 9.1.2, fourth paragraph: Again, please provide design/control details		Daryl W. Cowell & Associates Inc.		Original Comment Stands.
95.	Section 11 Medad Valley and ANSI and PSW, third paragraph: A hydrogeologist should be involved in the surveys.		Daryl W. Cowell & Associates Inc.		Original Comment Stands.
<b>JART SITE PLAN COMMENTS (June 2023)</b>					
96.	Missing information: Other than the location of the 'bottom draw outlet' at the southern end of the proposed infiltration ponds, there is no detail regarding the “Water Management” system (Section 9 of the AMP) on the Site Plans. The location and detailed design of all water lines, valves and other infrastructure as well as operational methodology should be provided on these plans as they become an enforceable component of the applicant's license.		Daryl W. Cowell & Associates Inc.		Original Comment Stands.