TECHNICAL MEMORANDUM

DATE October 22, 2025 **Project No.** CA-GLD-1791470A

TO Andreanne Simard - Director of Lands, Resources and Environment
Stephen May - Lands Manager, Western Region
CBM Aggregates

CC Craig DeVito, Warren Aken, Daniel Eusebi - WSP; Neal DeRuyter - MHBC

FROM George Schneider, Paul Menkveld **EMAIL george.schneider@wsp.com**

RESPONSES TO HARDEN / TOWNSHIP OF PUSLINCH REVIEW COMMENTS – PROPOSED CBM ABERFOYLE SOUTH LAKE PIT

The table below provides WSP's responses to review comments made by Harden Environmental Services Ltd. (Harden) on February 7, 2024 and received by MHBC Planning from the Township of Puslinch on April 29, 2024 related to the ARA licence application for the proposed CBM Aberfoyle South Lake Pit.

If you have any questions about the responses, please contact us at your earliest convenience.

WSP Canada Inc.

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https://wsponline.sharepoint.com/sites/gld-21291g/deliverables/01 agency comments/01 township of puslinch (objection letter and 9 sets of comments)/01 harden/final/1791470a-tm-rev0-cbm aberfoyle south lake-harden-responses_22oct2025.docx

TABLES

Table 1 – WSP Responses to Harden / Township of Puslinch Review Comm

Table 1 – WSP Responses to Harden Review Comments

Num	Topic	Section	Harden Comment	WSP Response
1	General	General	Silt Deposition at Aberfoyle Main Pit (South of Hwy 401) - The proposed operations include aggregate processing at the McNally Pit (License 5497) with deposition of fine-grained material possibly into the Aberfoyle Main Pit (5520). The area designated for silt deposition in the Aberfoyle Main pit is also used for deposition of silt from the Neubauer and Lanci Expansion. CBM has a history of depositing silt in areas not designated for silt ponds at this location. A detailed analysis of ongoing and future sediment deposition needs must be prepared, and the appropriate areas designated for sediment disposal. Potential hydrogeological and ecological impact assessments for the areas designated for silt disposal below the water table must be made, verification monitoring undertaken, and mitigation measures identified.	A hydrogeological study was undertaken by CBM in 2023-2024 to assess the potential effects of continued silt deposition in the McNally Pit Pond on baseflow to Mill Creek (WSP 2024). This study (Attachment #1) included a compilation of available hydrogeologic data and development of a numerical groundwater flow model to simulate future silt deposition scenarios and assess their potential impacts to baseflow in Mill Creek. The study concluded that the future washing of aggregates and accumulation of fines in the McNally Pit Pond from neighbouring "feeder" pit operations will not result in a significant reduction in baseflow to Mill Creek. Future silt deposition is therefore not considered to be a potential impact from the proposed Aberfoyle South Lake pit development from a water resources or natural environment perspective. As a result of further discussions between the Township and CBM regarding this matter, CBM agreed to install a water trench in the McNally Pit designed to allow direct groundwater flow between sand and gravel aquifer into the trench. Based on Harden's letter dated February 11, 2024, this addressed their concerns regarding deposition of silt.
2	General	General	Cumulative Impact of Multiple Below-Water-Table Aggregate Operations and Permitted Groundwater Abstractions - A cumulative impact assessment of ongoing aggregate extractive activities in this area of intensive aggregate operations has not been prepared or presented. A cumulative impact assessment including all groundwater abstractions from Permitted water taking, aggregate extraction from below-the-water-table and deposition of sediment below the water table must be included. The cumulative impact assessment must also include a detailed water balance of the cumulative impact of increased evaporation in this area from converting farmland to open bodies of water. Mill Creek should not be assumed to be a hydrologic boundary to the effects of below water table extraction, particularly when up to four metres of drawdown are being predicted. The impacts of other groundwater abstractions extend beneath Mill Creek.	The Water Report includes a cumulative effects assessment, which was carried out in accordance with the GRCA (2010) guidance document "Cumulative Effects Assessment (Water Quality and Quantity) Best Practices Paper for Below-Water Sand and Gravel Extraction Operations in Priority Subwatersheds in the Grand River Watershed". The scope and complexity of the cumulative effects assessment that Harden suggests is required in their review comment is beyond what could be reasonably expected for this type of technical study. We also note that the Tier 3 groundwater model for the area also used Mill Creek as a hydrogeologic boundary, suggesting that this approach is technically reasonable.

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3	General	General	Localized Impact to Private Property - The proposed pit is surrounded by private property. It is clear throughout the reporting that there will be impacts on both groundwater movement and groundwater elevations beyond the applicant's property boundaries. For example, all groundwater movement from the CBM property will cease or be significantly reduced between the proposed lake and Mill Creek along a 1600 m stretch of Mill Creek as detailed in Appendix G of the Water Report. This impact is not isolated to the CBM property. Groundwater levels beneath properties north and south of the CBM owned lands will decrease (east half of site) and groundwater levels beneath properties south and west of the CBM lands will increase (west half of site). There is also the potential for annual seasonal overland flow from the proposed lake onto private lands. The concerns of the private landowners must be addressed.	The Water Report includes a comprehensive assessment of the potential impacts of the proposed pit operation on neighbouring properties and groundwater users and concluded that there would be no significant impacts to water users during operation or post-rehabilitation of the proposed pit. It is recognized that there will be some uplift in groundwater levels downgradient of the future pit upon rehabilitation, which may result in temporary flooding of very localized area of the adjoining property to the west during high water level periods (e.g. spring freshet). This specific issue has been further assessed (see attached Technical Memorandum – Attachment #2) and a tile drain is proposed as a mitigation measure, should it be needed to alleviate high groundwater levels and prevent temporary flooding from occurring in that area. The proposed tile drain will convey excess water to Tributary 3 and increase baseflow in that reach of Tributary 3.
4	General	General	Direct Impacts to Mill Creek Within the Area of Influence of the Pit - There is a significant reach of Mill Creek that will either have reduced or eliminated groundwater discharge from the west and or north shore because of the proposed below water table mining. Approximately 1,600 metres of shoreline will have between 92% and 100% of natural groundwater discharge diverted from Mill Creek to the proposed lake (WSP 2023, Section 4.2.3: Table 8 and corresponding Figure 16). This area of Mill Creek is an important fishery as we have learned through the work commissioned by the Department of Fisheries and Oceans and work done for the Grand River Conservation Authority. The direct impact of this groundwater flow reduction to Mill Creek has not been adequately described, other than in a general way calculated as a percentage reduction of total upstream baseflow.	The potential impacts of the proposed pit operation on baseflow to Tributary 3 and Mill Creek has been further assessed (see attached Technical Memorandum – Attachment #3) through a more detailed examination of groundwater levels and fluxes within the domain of the numerical groundwater flow model . This assessment clearly shows that baseflow is redistributed within the study area and is not reduced. When baseflows are accounted for downgradient of the proposed pit at the confluence of Tributary 3 and Mill Creek, there is essentially no net change in the overall baseflow reporting to Mill Creek and Tributary 3 (0.1% net increase between existing and rehabilitated conditions).
5	General	General	Impacts to the Mill Creek Puslinch Provincially Significant Wetland - In correlation with the direct impacts to Mill Creek described above, discharge to the Mill Creek Puslinch Provincially Significant Wetland (PSW) will be reduced by 60% to 100% in the upgradient zones (WSP 2023, Section 4.2.3: Table 7 and corresponding Figure 16). The reporting provided in Appendix G, Groundwater Model of the Water Report clearly identifies areas where there will be both temporary and permanent groundwater level reductions and groundwater level	The potential impacts of the proposed pit operation on PSW areas have been further assessed (see attached Technical Memorandum – Attachment #4) through a more detailed examination of wetland hydrology on a zone-by-zone basis, following hydrologic first principles. The supplemental assessment considered the relative importance of the water inputs and outputs and the effect of the organic layer in

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			increases. These extensive areas are not identified in the Natural Heritage Report assessment. There are three main areas where the Natural Heritage Report hydrological assumptions do not correlate to the findings of the Groundwater Model. 1) The Natural Heritage report states that there will be no groundwater level impact beyond 120 m whereas the Groundwater Model indicates impacts occurring at a distance greater than 720 m. 2) The Natural Heritage report states that there will be up to 489 mm/year of additional groundwater discharge to the Mill Creek Puslinch Provincially Significant Wetland south of the proposed lake whereas the model shows that the PSW in Zone 2 will have a significant decrease in groundwater discharge. This is the same area where groundwater flow will be reduced. 3) The Natural Heritage report states that that the rise in water levels in the southwest area will not change water availability to the wetland. The groundwater model predicts a rise of up to 0.9 m in the southwest corner of the site significantly reducing the thickness of the unsaturated zone and greatly increasing the volume of groundwater discharge into the wetland.	retaining water to the hydrology of the seven PSW zones identified at the Site in the Water Report. - The PSW zones to the north of the Site are primarily supported by direct precipitation and surface water during high water level events (such as the spring freshet), and impacts to these zones are predicted to be minor (Zone 5) to minimal (Zones 1 and 6) during operation and post-rehabilitation. - The PSW zones to the east, south, and west of the Site primarily rely on direct precipitation with little input from runoff or groundwater discharge. Consequently, potential impacts to these wetland zones were predicted to be minor (Zones 2 and 3) to negligible (Zones 4 and 7) during operations and post-rehabilitation. - The exception is Zone 3a in the southern central portion of the Site, which has a moderate potential for impact during the early years of operation, primarily due to a short-term reduction in groundwater inputs to that PSW sub-zone as a result of aggregate extraction. Overall, the potential for impacts to the PSW zones surrounding the Site are predicted to be minor to negligible, with the exception of PSW Zone 3a, which can be monitored and may require corrective action during early phases of operations to ensure its wetland function is maintained. The proposed monitoring, conceptual approach to the development of triggers, and potential corrective actions are detailed in the Monitoring Plan (see attached Technical Memorandum – Attachment #5).
6	General	General	Impacts to On-Site Tributary 3 - The surface water catchment area for Tributary 3 will be reduced. There will also be a permanent decline in groundwater levels beneath Tributary 3 leading to a reduction in baseflow. It is estimated that there will be a permanent 52% reduction in baseflow to Tributary 3 as documented in the Groundwater Model report. A referral to the DFO has been made and we recommend that our detailed comments and those of Aboud and Associates are also sent to the DFO. The groundwater model only simulates a steady state solution calibrated to, presumably, an average condition and drought conditions will result in even lower levels of the water table	As mentioned above, the potential impacts on baseflow in Tributary 3 and Mill Creek have been further assessed (see attached Technical Memorandum – Attachment #3). The supplemental baseflow assessment shows that baseflow is redistributed to a lower portion of the Tributary 3 reach and is not reduced. Numerical groundwater flow modelling predicts that Tributary 3’s baseflow along the reach downstream of the site to the confluence with Mill Creek will increase by ~7% post-rehabilitation (relative to current conditions). In the event of drought, the pit pond will store additional water (compared to

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			adjacent to and beneath Tributary 3. It is known that the flow in Tributary 3 varies considerably seasonally but generally has baseflow throughout the year. The flow in Tributary 3 should be evaluated in a holistic manner including seasonal surface water and groundwater inputs in order to assess long term impacts.	existing conditions) upgradient of Tributary 3 and will further moderate potential baseflow impacts.
7	General	General	Flood Control - The potential for flood control will be reduced at the site because of the creation of a large single pond in combination with the a) reduction in discharge to upgradient PSW areas and b) capture of baseflow normally discharging to Mill Creek at the northeast end of the lake. The pond will allow for instantaneous transfer of hydraulic potential from upstream end(northeast)of the site to downstream edge(southwest). The proposed lake level (302 m AMSL) at the downstream edge will already be very close to, if not above the original ground surface. The site plans show a wetland at 301 m AMSL in very close proximity to the proposed lake in the southwest area. The groundwater model is calibrated to an average condition, not a high level or low-level condition. Therefore, assuming similar fluctuations in the pond level as observed at other nearby pit ponds, the water level in the spring of the year, could be 0.5 to 0.75 higher and overflow from the lake will be an annual event under normal conditions, let alone flood conditions. This has implications for adjacent wetland hydrology and private properties.	To minimize the potential for flooding, the ground surface around the perimeter of the Site will be grading to a design elevation. . The ARA Site Plan has been updated accordingly. This will ensure floodplain elevations for the regional storm are maintained within the pit. Flood waters will be permitted to enter the pit at the northeast corner of the site. Additional floodplain assessment details were previously provided to the Township of Puslinch in a Technical Memorandum (WSP 2025, Attachment #6).
8	General	General	Groundwater Model - There are numerous concerns with the applicability, accuracy and total reliance upon results of the groundwater model as indicated in the following section of this report. For these reasons, it is our opinion that the information provided is not sufficient to be accepted for a complete application.	Groundwater flow model construction and calibration were undertaken using standard methodology and was informed using both site-specific data and results from available regional level studies which have been peer reviewed and accepted by regulatory agencies. Model input data compared well with the available site-specific information and was also within accepted ranges for these deposits reported by others. Additionally, overall model calibration results are within industry standard accepted limits. Other comments are address specific areas of applicability of the model to the findings of the Water Report and show concurrence with other lines of evidence.
9	Nat Env	P1 S1.1	Report - Predicted groundwater impact not expected beyond 120 m, therefore no sensitive natural features beyond 120 m have the potential to be impacted.	The assessment of impact on natural heritage features within 120 m of the licence limit is a reasonable selection based on

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			Comment - Please see attached figures from the groundwater model report showing that the maximum extent of predicted drawdown is at least 720 m from the northeast corner of the site. The Natural Heritage report assumption of no impact beyond 120 m is incorrect.	the conservative nature of modeled groundwater drawdown and sensitive nature of receptors within 120 m. The model conservatively estimates drawdown and baseflow changes as detailed in Section 3.5.3. of Appendix G of the Water Report. Mill Creek is modelled as a drain boundary condition for the impact assessment on wetlands, as this represents drawdown conservatively. This approach is conservative but reasonable for its purpose. It is expected that monitored response of the aquifer to extraction would be significantly less than that predicted. As provincially significant wetlands and sensitive water courses are identified on and nearby the licence limits, the sensitive receptors most likely to be impacted by the proposed operations have been included in the impact assessment. It is reasonable to conclude any impacts likely to occur are likely to occur within 120m of the licence limit. Therefore, the impact assessment focused on receptors within 120m is a reasonable approach in the NE impact assessment consistent with the requirements of the Aggregate Resources Act.
10	Nat Env	P14 S5.2.1	Report - Seeps were identified in the reach of Mill Creek entering the northeast corner of the site. Comment - Please provide additional details including location for the seeps identified in the reach of Mill Creek entering the northeast corner of the site. Are they seasonal, is there active groundwater upwelling in the stream or is the seepage on the banks or in the fields? These seeps are not mentioned in the Water Report. Will this seepage continue post development?	The statement contained in the Natural Environment Report is based on the observation of vegetation often associated with groundwater discharge, observed in or near Mill Creek, as detailed in the appendices of that report. This observation is consistent with the Water Report's comments on groundwater surface water interaction on the site, including the discharge of groundwater in and around Mill Creek.
11	Nat Env	P15 S5.2.1	Report - Minimal recharge function, significant storage capacity attenuating high flows and sustaining low flows, local discharge areas, intermittent perennial streams…. Comment - Section 4.9 of the Water Report states that the site is a Significant Groundwater Recharge Area. Does this change the understanding of hydrological relationships to the on-site ecology?	As described in Section 5 of the Water Report, the local groundwater flow system receives recharge from upland areas and provides discharge to surface water features at low elevations, such as Mill Creek. The flat to slightly downward gradients between the overburden aquifer and the bedrock aquifer, so suggest recharge to the bedrock aquifer over the course of the season. The results of the Water Balance (Section 6 of the Water Report) show a negligible impact on

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				groundwater recharge as a result of the proposed operations. Therefore, the conceptualization of the Natural Environment Report sufficiently represents the anticipated hydrological impacts of the Water Report.
12	Nat Env	P17 S5.3	Report - Highest groundwater elevation is 303.5 m AMSL in northeast corner and 303.8 m AMSL between Tributary 3 and 5. Lowest in western side at confluence of Tributary 3,4,5. Comment - The maximum predicted water table occurs MW18-05 at an elevation of 304.34 m AMSL as shown on Figure 2 of the Maximum Groundwater Elevation Report.	The elevations referenced in this statement are based on Figure 16 of the Water Report entitled "Inferred Typical Water Table Elevation". For the purposes of the Natural Environment Report, commenting on typical groundwater elevations and flow patterns, referring to this figure is an appropriate choice. However, this sentence could be clarified as follows: Under typical groundwater conditions, presented in Figure 16 of the Water Report, the highest groundwater elevation is 303.5 m AMSL in northeast corner and 303.8 m AMSL between Tributary 3 and 5 and the lowest is in western side at confluence of Tributary 3,4,5.
13	Nat Env	P18 S5.4	Report - Mill Creek and its tributaries are mainly fed by groundwater through most of the year. Comment - We concur with this assessment.	The statement in the NE Report was intended to convey that groundwater is an important water input along this reach of Mill Creek (and its tributaries) through most of the year. Other important inputs include direct runoff, interflow, precipitation and streamflow.
14	Nat Env	P18 S5.4	Report - In floodplain, pit pond would be overtopped, no damage as pit already partially flooded, excess water reports back to Mill Creek via infiltration. Comment - There is presently storage at the site in terms of an unsaturated zone at both the northeast and southwest areas of the site and in surface depressions. The mining will remove the unsaturated zone storage area and depressional areas in the fields to be replaced by a lake. According to the Water Report, the 302 m AMSL lake level will already be at least 0.8 m higher than the present groundwater table at the southwest edge of the lake. The site plans show that the ground surface elevation is approximately 302 m AMSL at the west and southwest areas. In addition, the 302 m AMSL final lake level is based on a steady state simulation of at a particular time and does not represent the highest possible lake level. There is very little storage at the site and a flood wave propagated from the upgradient side of the site will	Although the unsaturated soils on site and the low-lying areas in the agricultural fields can store water for a short period of time as interflow during a flood event, the extraction of the pit is expected to provide a greater storage volume (even with the increased groundwater table in the southwest corner of the pit). Additionally, it is proposed that berms will be installed to ensure flood waters do not move to lower lying areas outside of the extraction area or onto adjacent lands.

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			move rapidly through the and inundate low lying lands on neighbouring private property.	
15	Nat Env	P31 S5.6.4	Report - Tributaries 1,2,3, 4 have coldwater thermal regime that support same fish as Mill Creek. Comment - The coldwater thermal regime is related to the groundwater discharge into these tributaries.	Based on the habitat within these tributaries, the fish community differs and is less diverse than Mill Creek. A fish community survey was undertaken in September 2024. Brook Stickleback, Western Blacknose Dace and Creek Chub were the most abundant species sampled. Brown Trout were only sampled in Tributary1.
16	Nat Env	P45 S7.1	Report - Drawdown of the water table up to 2.5 m, during final three years range of drawdown 1 to 2 m along Mill Creek. Baseflow contributions to Mill creek decreased by 1.7% due to volume replacement. Comment - The water table beside Mill Creek will be permanently lower than Mill Creek for a lengthy portion of the creek along the east side of the pit. This is shown on Figure 14B of the Water Report that shows permanent drawdown of 0.2 m to 1 m of groundwater lowering below the creek along a 1600m reach of the creek. The particle tracking on Figure 15 of the groundwater model report clearly shows the cessation of groundwater movement through the PSW to Mill Creek in a 900 m reach. There will also be a permanent drawdown of the water table north of the rehabilitated pit extending several hundred metres into the Mill Creek Puslinch PSW and along Mill Creek. The percentage reduction in baseflow contribution mentioned is relative to all baseflow contributions upstream of surface water station. It must be recognized that 100% of baseflow contributions in Zone 1 (Figure 16, Appendix G, Water Report) will be permanently stopped and 92% of baseflow from Zone 2 will be permanently stopped.	See Response to Comment #4 – Baseflow.
17	Nat Env	P45 S7.1	Report - Post extraction lower water table permanent at 0.8 m NE and increase of 0.65 SW. Baseflow contributions decrease by 2% at SW3 due to evaporation from pond. Comment - Figure 14B shows an increase of 0.4 m in the water table at the property edge where groundwater levels are less than 0.4 metres below ground surface. This area will be permanently inundated. There is private property beyond this property line.	See second part of Response to Comment #3 - Groundwater uplift / tile drain.
18	Nat Env	P45 S7.1	Report - Less seasonal variability resulting in smaller seasonal fluctuations in baseflow in comparison to existing conditions. Higher	See Response to Comment #4 – Baseflow.

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			baseflow during dry periods and lower baseflow during wet periods. This is likely a benefit providing a more constant baseflow throughout the year. Comment - There is a permanent lowering of lake level compared to Mill Creek and a permanent loss of groundwater discharge compared to the present situation.	
19	Nat Env	P46 S7.1	Report - Change from site runoff to infiltration expected to decrease peak flows from site and moderate magnitude of baseflow fluctuations at nearby receptors. Comment - There will be a permanent lowering of the water table adjacent to a 1,600 m reach of Mill Creek resulting in a permanent loss of baseflow to Mill Creek. Greater infiltration occurring at the southwest end of the creek will inundate adjacent lands. The estimated lake level of 302 m AMSL is not the highest to occur on a seasonal basis and will result in inundation of lands west and southwest of the lake.	See Response to Comment #4 – Baseflow. Also see second part of Response to Comment #3 - Groundwater uplift / tile drain
20	Nat Env	P46 S7.1	Report - Change in temperature of groundwater reporting to Mill creek less than 1C. Comment - The highest observed groundwater temperatures occur at Station MW18-01B due to the proximity of the water table to the ground surface. The projected increase in the water table elevation in this area will increase shallow groundwater temperatures.	A small change in the depth to the groundwater table will have a negligible effect on groundwater temperatures relative to all of the other factors that influence groundwater temperature in a natural system. The relevant potential thermal impact due to the proposed pit development to consider is the movement of relatively warm water from a pit pond through the ground and discharging as baseflow into a sensitive ecological receptor. This impact has been conservatively assessed in the Water Report and WSP stands behind our assessment.
21	Nat Env	P46 S7.1	Report - Tributary 3 Reduced runoff to Tributary 3 by reducing catchment area, loss of runoff and loss of infiltration in catchment area due to pit. Comment - The Water Report confirms that both runoff and groundwater discharge to Tributary 3 will decrease.	See Response to Comment #4 – Baseflow.
22	Nat Env	P46 S7.1	Report - Tributary 3 Reduction in baseflow of 29% during operations. Tributary 3 is perennial feature, dry on four occasions, extraction will prolong seasonal dry period but not result in permanent drying. Comment - This is a significant reduction in flow as a percentage of total baseflow to Mill Creek. The model only simulates an average	See Response to Comment #4 - Baseflow In addition to the Comment Response #4, it is further noted that other components of the water balance for Tributary 3 are unaffected, the conceptual model of Tributary 3 is conservative,

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			time of year, there is no seasonality to the evaluation so it is not possible to indicate how long the prolonged dryness will be or when the greatest impact will occur.	and that monitoring and proposed mitigations will address potential impacts. As described in Section 5.6.3 of the Water Report, Tributary 3 receives precipitation, run off, interflow, and baseflow. Under typical conditions, baseflow represents approximately 30% of flow in Tributary 3, therefore a change of 29% to baseflow, represents a change of <9% to typical flow conditions. The conceptual model of Tributary 3 is conservative with respect to its dependence on baseflow. The Water Report considers Tributary 3 to be a typical ephemeral channelized stream feature throughout its course. This is a correct characterization of Tributary 3 south of Concession Road 2 and does not include some details of water course's interaction with the culvert in the road. North of the road, the water course is poorly channelized and routinely exceeds its banks, impounding water north of the road. This storage effect north of the road supports flow in Tributary 3 and suggests that predicted impacts are conservatively estimated. While seasonal variability is not explicitly represented in the numerical model or baseflow, the monitoring data allows for observation of periods of low or no flow in Tributary 3. Prior to the commencement of extraction, mitigation triggers will be proposed based on all available monitoring data and consultation with regulators. Using monitoring data, length of time periods of low or no water level in Tributary 3 will be included in the monitoring plan to ensure conditions in Tributary 3 are within the historic range of observed conditions. When prolonged low or no water level periods in Tributary 3 occur that are attributable to aggregate extraction, several forms of mitigation could be implemented, including reduced extraction rates to allow groundwater levels to recover, temporary cessation of extraction, or providing a direct input of water from the pit pond to support the tributary during such periods, as described in the Monitoring Plan (see attached Technical Memorandum – Attachment #5).

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23	Nat Env	P46 S7.1	Report - Tributary 3: 1 to 7.5% decrease in baseflow. Comment - The model represents an average day of the year and cannot be used to project impacts on a seasonal basis. Table 7 in Appendix G of the Water Report shows that there is a 52% reduction in groundwater discharge to Zone 5 (Tributary 3).	See Response to Comment #4 - Baseflow and Comment #22 - Tributary 3 Hydrology
24	Nat Env	P46 S7.1	Report - Tributary 3: DFO to be informed about potential HADD. Comment - We recommend that the Township provide our technical comments to the DFO. We recommend that this request be expanded to include a review of impacts to Mill Creek given the predicted reductions in groundwater discharge.	Additional fish surveys were conducted, including Tributary 3. These data were included in the Request for Review (RFR) that was submitted to DFO and are presented in the Fish Community Survey report (WSP 2024 – See attached Fish Community Survey – Attachment #7)). The fish community survey confirmed that although a range of small-bodied fish were caught within Tributary 3, several shallow muddy sections and barriers limit the movement of larger fish such as trout upstream. Within Tributary 3, upstream of SW4, there is limited spawning and rearing habitat for Coldwater species such as brown trout. Within the upper reaches of Tributary 3, brook stickleback and central mudminnow dominated the fish assemblage. Potential impacts to Mill Creek are being assessed. The numerical groundwater flow model shows redistribution of groundwater contributions to baseflow from reaches upstream of SW3 and SW4 to reaches further downstream and from Mill Creek to Tributary 3. The redistribution of groundwater to baseflow in the Mill Creek is realized with lowered groundwater contributions between SW2 and SW3, and increased contributions downstream to the confluence with Tributary 3. Mill Creek downstream of the Tributary 3 confluence, experiences <10% reduction during operation, with no changes anticipated post-extraction. Ongoing consultation with DFO is underway. DFO are reviewing the water reports as well as the supplementary technical memoranda, which include all Tributaries as well as Mill Creek.
25	Nat Env	P48 S7.2	Report - Flood storage function provided by MC PSW not impacted as no removal of wetland expected. Pond created expected to replace flood storage function expected to provide additional storage for water to prevent increased flooding downstream.	See Response to Comment #7 - Floodplain Assessment / Berm.

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			Comment - Flood storage is generally needed when surface water and groundwater elevations are at their highest. The lake will not provide any storage as it is already at least 0.8 m higher at the southwest corner and will have increased overland discharge should flood conditions occur. The proposed lake level of 302 m AMSL is based on a model, calibrated to an average water level. Seasonal high lake level can be expected to be 0.5 to 0.75 m higher based on observations at nearby pits. This will result in annual overflow of the lake into the riparian wetlands along Mill Creek and Tributary 3. During extreme flow conditions, the flooding will be made worse on the McNie property and on the adjacent private property south of the proposed lake.	
26	Nat Env	P48 S7.2	Report - Mill Creek Puslinch PSW supported by groundwater and surface water inputs from site. Aggregate extraction will decrease runoff to these wetland areas, the potential impact to PSW due to reduced runoff expected to be mitigated by infiltration surplus from pit. Comment - The Natural Heritage report clearly states that the Mill Creek Puslinch PSW is supported by groundwater and surface water from the site. For approximately 1,000 m along the edge of the wetland, the groundwater levels in the proposed lake area will be lower than present, thereby eliminating or greatly reducing groundwater flow to the PSW. This is shown on the particle tracking Figure 15 in the Water Report. Table 7 and Figure 16 of the Groundwater Modeling Report clearly identify large areas of wetland that will be impacted by the proposed aggregate extraction.	See Response to Comment #5 - PSW Zones / Wetland hydrology.
27	Nat Env	P48 S7.2	Report - 1.7 % reduction in baseflow to the PSW due to below water table extraction. Most of catchment area east of Mill Creek and no groundwater drawdown expected to extend east of creek. Majority of baseflow contributions to continue unaltered. Comment - The groundwater model does not extend beyond Mill Creek, therefore there is no way of determining the impact of drawdown on the wetland from the eastern side. Please refer to findings in Appendix G for groundwater model estimated reduction of groundwater discharge to the adjacent wetlands and Mill Creek.	The domain of the groundwater model is sufficient to address the impacts anticipated as a result of the proposed aggregate extraction. Impacts east of Mill Creek are not anticipated because (1) Mill Creek acts as a hydraulic divide in the sub-watershed and the (2) groundwater conditions east of Mill Creek. The model results the comment refers to are conservative, especially with respect to wetlands east of Mill Creek (3). However, out of an abundance of caution, supplemental monitoring and corrective actions are proposed (4). 1. As shown on Figure 1 (attached), Mill Creek acts as a water table divide in the sub-watershed with limited influence anticipated. This conceptualization is consistent with the Tier 3

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				model. Mill Creek clearly receives groundwater discharge in many reaches and therefore it stands to reason that Mill Creek would recharge groundwater through the same connection to the aquifer. 2. Of note on Figure 1, the area to the east of Mill Creek directly opposite the Site, the water table slopes typically 2m over approximately 500m of distance (a gradient of 0.004), toward the McMillan Pond, which can reasonably be expected to locally control groundwater head. These local groundwater conditions suggest that there will not be impacts east of Mill Creek. 3. The model conservatively estimates drawdown as detailed in Section 3.5.3. of Appendix G of the Water Report. Mill Creek is modelled as a drain boundary condition for the impact assessment on wetlands, as this represents drawdown conservatively. (Conversely, Mill Creek is considered constant head boundary condition when impacts to baseflow are predicted, which results in a conservative estimate of impacts on baseflow.) This approach is conservative but reasonable for the wetlands to north and west of Mill Creek, where it is applied. However, it is unreasonably conservative to apply it for features east of Mill Creek, where shallow groundwater levels will be supported by Mill Creek and wetlands are further from the pit. Therefore, no impacts are anticipated to the east of Mill Creek. 4. Monitoring and Mitigation: Although no impacts are anticipated to the east of Mill Creek, to demonstrate that this is the case and observe any possible change in hydrogeologic conditions, the installation of a new monitoring well on the east side of Mill Creek is recommended. This will allow for observation of groundwater discharge gradients from both sides of the creek and ensure Mill Creek continues to represent a groundwater divide as conceptualized in the Water Report. Should drawdown attributable to aggregate extraction be observed east of Mill Creek, several forms of mitigation could be implemented, including reduced extraction rates to allow groundwater levels to recover, temporary cessation of extraction, use of enhanced infiltration systems (to reduce

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				drawdown), or the installation of a silt curtain on the east side of the pond to reduce groundwater inflows from that direction.
28	Nat Env	P48 S7.2	Report - Post rehabilitation, baseflow to PSW net gain of groundwater discharge of up to 489 mm/year south of extraction area due to water table flattening. Comment - The particle tracking on Figure 15 of the groundwater model report clearly shows the cessation of groundwater movement through the PSW to Mill Creek in a 900 m reach downstream of the bridge at Concession 2 Road. The statement in the Water Report in Section 7, Page 38 , Section 10.1 P 51 and in the Groundwater Model Report Section 5, Page 15 incorrectly lump Zone 2 as being an area of net groundwater gain as Tables 7 and 8 of the groundwater model report state that there will be loss of water to this area of the PSW and Mill Creek.	See Response to Comment #5 - PSW Zones / Wetland hydrology.
29	Nat Env	P48 S7.2	Report - Groundwater level in southwest corner expected to increase post rehab. Therefore no change in water availability to MC P PSW is predicted. Comment - There will be a significant increase in water availability in Wetland Zones, 3,4,6 and 7 ranging from 168 mm/year to 1,116 mm/year (Table 7, Groundwater Model Report). These are significant changes and they do not represent the maximum potential increase in water during the seasonal high groundwater period. It can be expected that there will be considerable overland flow during seasonal high periods into these wetlands.	See second part of Response to Comment #3 - Groundwater uplift / tile drain. It is noted that Appendix G, Table 7 of the Water Report contains a typo. Where the table indicates 1,116 mm/year increase, it should read 116 mm/year.
30	Nat Env	P48 S7.2	Report - Pit pond expected to decrease water levels near Tributary 3, may affect hydroperiod off-site at the north end of the study area. Comment - This is contradictory to P47 S 7.2 says PSW located off site and no impact and setback required to prevent indirect impacts. There is a different message provided in different sections of this report. Please refer to estimated reductions in groundwater discharge to the wetland and tributary in Zone 5 as reported in Appendix G of the Water Report.	See Response to Comment #5 - PSW Zones / Wetland hydrology.
31	Nat Env	P48 S7.2	Report - Post rehabilitation, PSW north of extraction area to show a net decrease in groundwater discharge of 173 mm/year. Plant community likely tolerant to short term fluctuations. Comment - The groundwater model represents the average	See Response to Comment #5 - PSW Zones / Wetland hydrology.

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			groundwater elevation and neither seasonal drought nor seasonally wet conditions are considered. The lake level will be even lower during dry conditions resulting in even lower water levels in the PSW north of the extraction area.	
32	Nat Env	P48 S7.2	Report - The runoff lost from downsizing the catchment area will largely be offset by water directed to the rehabilitated pond, most of which will report to the MC P PSW as baseflow. Comment - This is not beneficial to Zone 1 and Zone 2 where all groundwater is reduced or removed entirely according to Figure 16 and Tables 7 and 8 of the groundwater modeling report. The Natural Heritage report should be clear on which Zones of the wetland will benefit and which ones will have permanently lower water levels and discharge.	See Response to Comment #5 - PSW Zones / Wetland hydrology.
33	Nat Env	P49 S7.4	Report - Cumulative Effects; no cumulative effects. Comment - The cumulative impacts of the extraction have not been assessed in any way including several major water takings upgradient and several major below water table extraction areas. There is great concern from the Township that the cumulative impact has not been addressed in any meaningful manner.	See Response to Comment #2 - Cumulative Effects.
34	Max PWT	P1 S2.2	Report - Minimum 30 m from wetlands and water courses and 60 m from Mill Creek. Comment - The effects of below water table mining and permanent lake levelling extend beyond 30 m and 60 m. Justification for these setbacks must be provided.	The purpose of the Max PWT Report is not to establish setbacks from natural features, therefore no such justification is required in this report. The Water Report and Natural Environment Report provide assessments of potential impacts with consideration of the set back distances.
35	Max PWT	P2 S2.2	Report - 5.5 million tonnes, 95% below water table, max depth 20 m below water table. Comments: a - Justification for the maximum extraction depth of 20 m must be provided. Both bedrock and significant thicknesses of fine-grained glacial till, silt and clay occur at less than the 20 m depth. b - There has been insufficient characterization of the vertical hydraulic gradients above and below the silt layers to determine the potential impacts of depressurizing the aquifer. Significant upward hydraulic gradients occur in this area as shown by the permanent flowing artesian condition at SP18-03, recognition in the Tier 3 Model	The Site Plans propose extraction to the base of the sand and gravel resource as it is encountered, to a minimum (i.e. lowest) elevation of 285 masl. A contour map showing the base of resource elevation is presented on Figure 2 (attached). The base of the resource varies across the Site from 301 masl (at BH18-05) to below 288 masl (at BH18-09) and in places exceeds the maximum depth of the boreholes drilled. As such, and minimum (lowest) elevation of extraction of 285 masl was specified on the Site Plan and in the Resource Assessment Report to allow for the extraction of aggregate to that lowest elevation, where the resource is present. The proposed

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			as being an area of significant groundwater upward gradients and the significant event of flowing artesian well on the Reid Heritage Homes site. Mining blindly through silt layers will have unknown consequences given that none of the monitoring wells constructed at the site for the purpose of evaluating the overburden groundwater system extend to a depth greater than 11.89 m.	extraction methodology (i.e. dragline) will maximize the retrieval of resource and minimize disturbance of the underlying till layer (if and where it is present). Regarding the potential "unforeseen" effects of "disturbing" the till layer, which the reviewer suggests could result in the creation of artesian conditions, WSP notes that the vertical hydraulic gradients at the Site and surrounding area are low in magnitude and variable in direction, and the till layer is discontinuous, indicating there is already a hydraulic connection between the overburden and bedrock aquifers. These observations indicate that encountering unexpected artesian conditions is highly unlikely. Additional information about hydraulic gradients: Observations of head in the shallow bedrock aquifer and in the overburden aquifer show small gradients of mixed direction. Monitoring on the Site shows a slight downward gradient under typical conditions between MW18-01B and TW11-16, with a typical head difference of approximately 0.1 to 0.2 m (Figure 14 of the Water Report (WSP 2023a)). Monitoring data collected for the neighboring Dufferin Mill Creek Pit shows slight upward gradients TW16-78 (the borehole log notes, water levels stabilize slightly above the top of casing elevation) (WSP 2023b). The head difference at this location is typically approximately 0.3 m. Further to the east of the Site, the North Well is monitored and shows a near zero gradient between the overburden and the bedrock. Direct observations in the area of the Site show small gradients of mixed direction between the overburden and the bedrock. Observed head and gradients in the shallow bedrock aquifer and in the overburden aquifer agree with the Tier 3 Model (Matrix Solutions 2017). Specifically, the Site falls between the 300 and 310 masl contours in the Tier 3 Model in both the water table aquifer and the bedrock contact aquifer, with near identical gradations between the contours. This suggests little or no gradient exists in the area of the Site. The groundwater flow model developed in the Water Report is also consistent with this conclusion (WSP 2023a). The model predicts near zero gradients in most of the area of the Site, with slight

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				upward gradients beneath surface water features were groundwater head is reduced. Based on consideration of direct observation of overburden-bedrock gradients, the Tier 3 Model, and the model presented in the Water Report, little to no gradient is predicted to exist between the bedrock and the overburden in the area of the Site.
36	Max PWT	P2 S2.3	Report - Pond level final is 302 m AMSL plus / minus. Comment - The final predicted pond level of 302 m AMSL (plus or minus) does not adequately represent the lake level at all seasons of the year. This is inadequate given that the ground elevation at the southwest and west ends of the proposed lake also have an elevation of 302 m AMSL. Seasonally, the lake will overtop the native ground and flood into neighbouring properties.	See Response to Comment #7 - Floodplain Assessment / Berm
37	Max PWT	P2 S3.0	Report - Note: Water table is not static and is expected to vary from location to location over time. Comment - We concur with this statement, and it should have been recognized during the modeling process that the water table does not occur at one elevation throughout the year.	The intent of the Max PWT Report is to establish the highest water table elevations across the Site over an annual period, primarily for the purposes of defining zones of aggregate extraction above versus below the water table. In response to the Reviewer’s comment about the suitability of the numerical groundwater flow model presented in the Water Report, , we note that it is standard industry practice in this type of hydrogeologic study to model groundwater flow in a steady state, as it is a useful predictive tool to support the hydrogeologic impact assessment. Seasonal variability in the water table is also discussed in the Water Report and its implications are considered in the hydrogeologic impact assessment.
38	Max PWT	P3 S4.0	Report - All monitors completed in the water table aquifer. Comment - The veracity of this statement should be considered. The highest on-site readings at the site occur at MW18-05 which appears to occur in a confined condition. The water chemistry for water obtained from MW18-05 is very different than that obtained at the other monitoring wells and the seasonal rise and fall in the water level in this well suggest different conditions than occur at other stations. Had the other monitoring wells or additional monitoring wells been	The conceptual model of the aquifer as an unconfined water table aquifer is supported by the borehole logs and spatial water level information. Lithological information from boreholes on site and other available high quality data sources do not show confining layers above the Wentworth and Port Stanley Till units (as shown on Figure 4 and Appendix C, in the Water Report). Water level information shows a distribution of groundwater head consistent with the conceptualization of a single the water table aquifer, as shown on Figures 13 and 16

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			installed at a greater depth, would they also exhibit confining conditions?	in the Water Report, and supplemented with additional monitoring data on Figure 3 (attached). The conceptualization of the water table aquifer is well supported by the available data. In the case of MW18-05, the primary means to identify confined conditions is using lithological information presented in the borehole log. In this case, no confining layer exists. Water levels observed at MW18-05 are consistent the observations in other wells closer to where the water table aquifer discharges to Mill Creek (as presented on Figure 13 of the Water Report). Further, MW18-05 shows rapid responses to precipitation, similar to the other monitoring wells on the site, consistent with a shallow unconfined aquifer. MW18-05 are explained by its position as the furthest upgradient well, at the greatest distance from Mill Creek, its upland location with deepest water levels observed on the Site, and its higher silt content (silt and sand, with some gravel) compared to typical aquifer material descriptions (generally sand or sand and gravel).
39	Max PWT	P4 S5.0	Report - Max predicted water table measured on Jan 12, 2020. Comment - No water level measurements were made on January 12, 2020. Figure 2 shows data for water level measurements made on March 12, 2020. The highest water level occurs at MW18-05 at 304.33 m AMSL.	The date referenced on the figure in the Water Report and Max PWT reports should be January 12, 2020. This is the date the water levels were recorded on site.
40	Max PWT	P4 S5.0	Report - Also presented Well 16-79, 9 m deep and screened in water table aquifer, max 303.76 m AMSL April 2018 to Dec 2022 vs 303.88 m AMSL since 1989. MW18-04 max level is 303.95 m AMSL. Comment - Why is the water level at MW18-04 higher than Well 16-79? MW18-04 is downstream of Well 16-79. The location of Well 16-79 is not shown on any figure. The highest groundwater elevation at the site occurs at MW18-05. The borehole log suggests potential upward gradients.	The conceptual model of the Site presented in the Water Report suggests that Mill Creek receives groundwater discharge from both sides in most reaches in the area of the Site. In that conceptual model, the MW18-04 and TW16-79 are cross gradient relative to one another. This is consistent with the Reviewer's observation that the water levels are similar (within 0.1 m).
41	GW Model	P1 S1.1	Report - Of specific interest is the assessment of potential changes to baseflow and potential changes in groundwater temperature on nearby Mill Creek and its tributaries. Comment - If this was the interest, then why not ensure that the on-site calibration met with industry standards? The Normalized Root	Omission of MW18-01B from the calibration statistics shown on Figure 10 of Appendix G was unintentional. The average observed water level at this location is 301.85 masl (see Fig 17 of Water Report), while the model computed head at this location is 300.83 m, resulting in a residual value of roughly 1m

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			Mean Square Error for on-site wells is 32%. This is unacceptable. The water level at MW18-05 is underpredicted by 1.16 metres and the water level data for MW18-01 is not mentioned in the calibration statistics. It appears that the calibrated value for MW18-01 when compared to the March 2021 calibration date is also off by more than 1 m. With Mill Creek being nearby and the reliance on the model for the impact analysis, there should have been better on-site calibration.	below the observed value. This value, along with that seen at MW18-05 are greater than the residual head values calculated for the other monitoring wells and standpipe piezometers installed at the site which range from 0.01m to 0.68m. The higher residual values at MW18-01B and MW18-05 may be attributable to the presence of silt within the sand and gravel at these locations which is not noted at the other site monitoring well locations. This can result in locally lower hydraulic conductivity at these locations which Is not captured in the numerical model. Model input parameterization was undertaken following the principal of parsimony whereby the hydrostratigraphic units have not been subdivided beyond necessity and uniform hydraulic properties are assigned across the major hydrostratigraphic units represented in the model. The parameterization used here is of sufficient complexity to capture the system behaviour, while accepting that small local variations with the hydraulic properties may not be captured and this can lead to local discrepancies between observed and simulated data. Additionally, characterizing the model calibration performance within the area of interest using only the installed on-Site monitoring wells ignores other nearby water level calibration targets from the available MECP WWIS. Model calibration results for the on-Site monitoring wells, along with the closest available targets from the MECP WWIS dataset are shown on Figure 4 (attached). When considered together, calibration data for these wells indicate that the model provides an acceptable match to the observed data across the site and upgradient from it, i.e., from recharge areas to the northwest to the discharge zone along Mill Creek.
42	GW Model	S 3.51	Report - No-flow boundaries at northern edge. Comment - A review of Figure 10 shows that a number of wells with predicted groundwater potentials between 313 and 317 m AMSL have higher than observed groundwater potentials. This occurs not that distant from the site towards the north, and is likely a result of the no flow boundary constraint. The calibration of the model is very germane to the predictive accuracy of the model and in the immediate area of	The no-flow model boundary along the western model domain extent has been assigned to coincide with the surface drainage catchment divide for Mill Creek in this aera, which is inferred to coincide with a local groundwater divide in the shallow groundwater flow system. This represents a logical groundwater divide, at least in the shallow flow system, which is the primary focus of the developed groundwater flow model.

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			the site all wells are predicting lower than the observed and near the model boundary the potentials are predicted to be higher than observed. Figure 3-10 of the Tier 3 study shows groundwater flow to be parallel to the surface water divide on the Paris Moraine north of the site, rather than perpendicular as shown on the WSP model.	Groundwater equipotential contours shown on Figure 3-10 of the Tier 3 Study are shown at 10m contour intervals, which is much coarser than what is shown on Figure 10 of Appendix G. The 310m, 320m and 330m groundwater equipotential contours compare reasonably well between the two models and it is not possible to determine if a local groundwater mound is present in the Tier 3 Study, although it should be noted that each model in the respective studies was constructed for different purposes and at much different scales, so they should not be expected to replicate each other exactly. A plot of the model calibration is provided on Figure 5 (attached), which shows both the 95% confidence interval (magenta dashed lines) and 95% data interval (orange dashed lines), which were not included in Figure 10 of Appendix G. This plot indicates that the both the on-Site observation well data as well as the X=Y line fall within the 95% confidence interval, which is desirable. Several of the datapoints from 313 m amsl to 317m amsl near the model domain boundary do not fall within the 95% confidence interval, however all of these data points fall within the 95% data interval, i.e., are not considered as 'outliers', and model calibration results shown on this figure are within industry accepted norms for indicating goodness of fit.
43	GW Model	S 3.5.2	Report - Ratio of Overburden thickness used from Tier 3 model. Comment - There is no indication that on-site geological conditions were used to determine the position, absence, presence of lower permeability layers. It is clear from the borehole logs that silty sand, silt, silty clay or clay layers occur throughout the site. Cross sections showing the model layers through the site and surroundings should be presented.	The conceptual model of the aquifer as an unconfined water table aquifer is supported by the borehole logs and spatial water level information. Lithological information from boreholes on Site and other available high quality data sources do not show confining layers above the Wentworth and Port Stanley Till units (as shown on Figure 4 and Appendix C, in the Water Report). While some there are occasional observations of fine materials included in the sand and gravel aquifer, there is no consistent elevation or lithological characterization that would support the conceptualization of hydraulically significant continuous fine grain layers. Water level information shows a distribution of groundwater head consistent with the conceptualization of a single the water table aquifer, as shown on Figures 13 and 16 in the Water Report, and supplemented with additional

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				monitoring data on Figure 3 (attached). The conceptualization of the water table aquifer is well supported by the available data.
44	GW Model	S 3.5.2	Report - Uppermost hydrologic unit is subdivided into two numerical layers, a 0.5 m thick upper layer defined by topography. Comment - Is this the 0.5 m thick layer where the Type 1 Dirichlet Condition was applied?	Yes, the Type 1 Dirichlet boundary conditions have been applied to model slice 1.
45	GW Model	S 3.5.2	Report - Unit B, basal till aquitard Wentworth and Port Stanley 0.3 to 25 m thick. Comment - The on-site drilling confirms that silt, clay or lower permeability glacial till occurs throughout the site. The Tier 3 model recognizes this area as having significant upward hydraulic gradients. The productive fishery in Mill Creek is in part because of the upward hydraulic groundwater conditions. The role of the fine grained layers in directing and creating the important upwellings in Mill Creek has not been explored nor included in the model.	The Reviewer's comment suggests that the lower till unit and the groundwater head gradient between the bedrock contact aquifer and the overburden combine to cause groundwater discharge to Mill Creek. The comment is addressed in two components: 1) the hydrostratigraphic conceptualization of the basal aquitard and 2) the groundwater head gradient between the bedrock contact aquifer and the overburden. Firstly, the conceptual model of the till layers as a relatively thin, continuous, and of moderately low permeability (typically 1 to 2 orders of magnitude lower than the overlying aquifer) is supported by the direct on-site observations of lithology (Water Report Figure 4 (WSP 2023a)) and summarized in (Appendix G, Figure 6 of the Water Report (WSP 2023a)). This conceptualization is consistent the Tier 3 hydrogeological model (Matrix Solutions 2017) (Appendix G, Table 2 of the Water Report (WSP 2023a)). Secondly, the hydraulic head gradient between the bedrock and the overburden is very small in the area of the Site, as shown by head observations in the area of the Site, the Tier 3 Model, and the model presented in the Water Report. Observations in the area of the Site, the Tier 3 model, and the model presented in the Water Report, concur that there is little gradient between the overburden and the bedrock in the area of the Site. Observations of head in the shallow bedrock aquifer and in the overburden aquifer show small gradients of mixed direction. Monitoring on the Site shows a slight downward gradient under typical conditions between MW18-01B and TW11-16, with a

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				typical head difference of approximately 0.1 to 0.2 m (Figure 14 of the Water Report (WSP 2023a)). Monitoring data collected for the neighboring Dufferin Mill Creek Pit shows slight upward gradients TW16-78 (the borehole log notes, water levels stabilize slightly above the top of casing elevation) (WSP 2023b). The head difference at this location is typically approximately 0.3 m. Further to the east of the Site, the North Well is monitored and shows a near zero gradient between the overburden and the bedrock. Direct observations in the area of the Site show small gradients of mixed direction between the overburden and the bedrock. Observed head and gradients in the contact aquifer and in the overburden aquifer agree with the Tier 3 Model (Matrix Solutions 2017). Specifically, the Site falls between the 300 and 310 masl contours in the Tier 3 Model in both the water table aquifer and the bedrock contact aquifer, with near identical gradations between the contours. This suggests little or no gradient exists in the area of the Site. The model presented in the Water Report is consistent with this conclusion (WSP 2023a). Attachment #7 contains figures presenting modeled head distribution with bedrock contact aquifer, the overburden aquifer, and the gradient between the two. The model predicts near zero gradients in most of the area of the site, with slight upward gradients beneath surface water features were groundwater head is reduced. Based on consideration of direct observation of overburden-bedrock gradients, the Tier 3 Model, and the model presented in the Water Report, little to no gradient is predicted to exist between the bedrock and the overburden in the area of the Site. This is consistent with observations, that any till aquitard beneath the overburden aquifer is thin, so it is unlikely that the till aquitard effectively isolates head in the overburden aquifer from that in the bedrock.
46	GW Model	S 3.5.2	Report - Competent bedrock is Guelph Fm to the west and north and Reformatory to the east. These are two numeric model layers totaling 35 m. The bottom of this layer is no flow to reflect the material properties of the deeper bedrock units.	Where present, the Guelph Formation is often found as the uppermost bedrock unit across the region, however this unit pinches out and becomes essentially absent east of the City of Guelph. The spatial distributions of the Guelph Formation and

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			Comments - Figure 2.2 of the Tier 3 Study shows that only the Guelph Formation underlies the model area and is underlain by relatively thin layer of Reformatory Formation, Vinemount Formation and relatively thick layers of the Goat Island and Gasport Formations. The Vinemount Member is a regionally significant aquitard that is influential to groundwater flow and is not included in the bedrock layers. The Guelph Formation, a known regional aquifer is modeled at a K of 7 x 10-7 m/s and the Reformatory an aquifer/aquitard is modeled at 6 x 10-7 m/s almost the exact same value. The Tier 3 model suggests a 10-4 to 10-6 m/s for the Guelph and 5 x 10-7 to 5.3 x 10-6 for the reformatory. The modelled competent bedrock layer is 35 m thick and represents the Guelph, Reformatory, Vinemount, Goat Island and Gasport formations which have vastly different hydraulic properties. Given that regional groundwater models indicate that Mill Creek influences hydraulic potentials in all of the underlying bedrock aquifers above the basal shale unit, a better definition of the bedrock layer(s) is warranted.	Reformatory Quarry Member used in the developed groundwater flow model were taken from the City of Guelph Tier 3 Water Budget and Local Area Risk Assessment Groundwater Flow Model which incorporates this pinch out. The hydraulic conductivity distribution of the uppermost competent bedrock used in that study is shown on Figure 2-18 of Appendix B (Matrix, 2017) and indicates the presence of the Reformatory Quarry Member across the central portion of the model domain used in this study (as shown on Figure 6b). The Vinemount Member, which is found below the Guelph Formation and Reformatory Quarry Member and ranges in thickness from 5m to 10m across the model domain acts as an aquitard, and is conceptualized to contribute negligible groundwater flow to the uppermost bedrock aquifer and is therefore not considered in the developed groundwater model (i.e., the model bottom, or contact with the Vinemount Member, is treated as a no-flow barrier). As noted in Table 2 of Appendix G, hydraulic conductivity input parameters used in the presented model fall with the ranges of conductivity estimates described in the 2017 Tier 3 groundwater study for the 'high quality' borehole data. Also, it should be noted that while the horizontal hydraulic conductivity model input values of the Guelph and Reformatory Members used in the groundwater flow model may be similar, the vertical hydraulic conductivity values show more contrast. The ratio of horizontal hydraulic conductivity to vertical hydraulic conductivity for the Guelph Formation is set at 10 while for the Reformatory Member it is set as 50. Based on these factors, the bedrock conceptualization and parameterization used in the developed groundwater flow model are considered acceptable and further definition with the bedrock is not necessary.
47	GW Model	S3.5.3	Report - Within surface layer tributaries, ditches and wetlands are Type 1. Comment - The surface layer is only 0.5 m thick. Were all tributaries, creeks, wetlands and ditches modelled in this layer only? How were drawdown values calculated beneath the wetlands if the Type 1 boundary condition was applied?	Tributaries, creeks, wetlands and ditches where simulating using a Type 1 Dirichlet boundary condition which has been constrained by a maximum flux of 0 m3/d, meaning that the condition is only active in case of water flowing out of the aquifer, i.e., like a seepage face. These have been applied to the uppermost model slice with the reference head being

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			Was a maximum/minimum withdrawal injection rate set for these nodes? How were the initial values for the wetland nodes specified? Why is there a drain modeled on the west side of the Hanlon from County Road 34 up to Maltby Road. There is no such water course. Why was only one branch of Tributary 3 (the west side) modeled north of Concession Road 2.	specified at the nodal elevation which is defined by the LiDAR derived digital elevation model. Drawdown was calculated by subtraction of the model computed heads obtained during the predictive simulations from the heads predicted with the model calibration variant. Surface water features represented in the model are consistent with the Tier 3 model (Matrix 2017) in the subwatershed and with observations of water courses at a Site scale (WSP 2023).
48	GW Model	S 3.5.3	Report - Case 1: Mill is modelled as a drain only. Comment - Are the model calibration statistics based on this version? Was a maximum injection rate assigned to these nodes?	Model calibration results presented on Figure 10 of Appendix G correspond to the model variant where Mill Creek is treated as a gaining only type surface water feature. A maximum flux rate of 0 m3/day is assigned to these nodes in the model calibration variant, i.e., the boundary condition can only remove water from the aquifer.
49	GW Model	S3.5.3	Report - Case 2: Mill is modelled as a river in and out possible. Comment - Baseflow results were taken from this model. Which model calibration is described in this report? Changing a boundary condition should result in a check on the calibration. How was the hydraulic potential value assigned to Mill Creek?	Model calibrated baseflow values (i.e., those shown in Table 4 of Appendix G) correspond to the model variant where Mill Creek is treated as a gaining only type surface water feature. When assessing possible changes to baseflow conditions in Mill Creek as a result of resource extraction for the operational and rehabilitated conditions using the predictive models, computed baseflows were taken from the model variant which allows flux both to and from the aquifer from the creek as this results in a more conservative (in this case greater) estimate of potential impacts to baseflow. Hydraulic head values in Mill Creek were assigned based on the nodal elevation which is defined by the LiDAR derived digital elevation model. Allowing creek nodes to exchange groundwater between the aquifer and river and vice versa had no appreciable impact on the model calibration results.
50	Nat Env	P46 S7.1	Report - Tributary 3 Reduced runoff to Tributary 3 by reducing catchment area, loss of runoff and loss of infiltration in catchment area due to pit. Comment - The Water Report confirms that both runoff and groundwater discharge to Tributary 3 will decrease.	See Response to Comment #4 – Baseflow.

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51	GW Model	S3.5.3	Report - Recharge based on Layer 1. Comment - This layer is only 0.5 m thick. Does this affect the ability of the model to accurately represent recharge?	Having a uniform layer thickness across model layer 1 of 0.5m does not affect the model's ability to represent the recharge.
52	GW Model	S3.5.3	Report - Withdrawal wells: Capital total of 281 m3/day. Comment - There are significant water takings in Aberfoyle that modify groundwater flow in all geological units in this area including bedrock, and overburden. These are ignored in the model. The water taking from Blue Triton extends to the north side of Mill Creek in both bedrock and overburden, this water taking should be taken into account.	The taking from the former Blue Triton site occurs outside of the model domain in depth and location. Takings at the site occur beneath the lower permeability layer in the bedrock, which corresponds to the position of the Vinemount Formation in the stratigraphic sequence and the bottom of the model. The water taking occurs to the south-east of Aberfoyle Creek with little observed impact to the north-west of the creek in shallower groundwater levels. Extensive monitoring at the former Blue Triton site show that taking from the lower bedrock aquifer (outside the model domain of this assessment) has only muted impacts above the upper bedrock aquifer (WSP, 2023c).
53	GW Model	P6 S3.5.3	Report - K of pond is 1 m/s. Comment - There are no figures showing that the hydraulic conductivity of 1 m/s adequately flattens the water table in the area of the proposed pond.	Hydraulic conductivity of 1 m/s assigned to the ponds is 10,000 times higher than that of the surrounding aquifer and is adequate to result in a flattened water table within the pit footprint. Model results indicate there is less than 0.005m of head drop across the pit lake.
54	GW Model	S3.5.5	Report - Baseflow calibration values scaled for Mill Creek to represent that which comes from model area. Comment - This does not make hydrologic sense. The north side of Mill Creek is the main source of groundwater and includes McCrimmon Creek, Pond Creek and the significant groundwater recharge associated with the Paris Moraine. There are significant aggregate resource extraction areas and water takings of the south side that limit groundwater discharge to Mill Creek. A simple scaling of baseflow according to catchment area is not appropriate. The model study area should be increased to include both sides of Mill Creek and calibrated to all of the baseflow occurring to Mill Creek.	To respond to this comment, overall recharge rates on the southeast side of Mill Creek are compared to those on the northwest side and the impact of aggregate extraction to the southeast of Mill Creek is considered. Inferred groundwater recharge rates, developed for the Tier 3 Water Budget are shown on Figure 6. The Mill Creek surface water catchment area upstream of the confluence of Tributary 3 and Mill Creek is overlain on the figure along with the model domain (hatched area) used in the present study. The inferred recharge distribution shown on this figure does indicate some areas of increased recharge (>400 mm/yr) relative to the surrounding areas on the north side of Mill Creek in its uppermost reaches, as the reviewer points out, but it does not appear disproportionally so. Qualitatively, the areas of the highest recharge on the northern side of Mill Creek do not appear to comprise the bulk of the area and it is noted that there are numerous areas of the same inferred recharge rate located on the south side of Mill Creek throughout its

Num	Topic	Section	Harden Comment	WSP Response
				catchment area. Areas of recharge that are estimated to be from 300 mm/yr to 400 mm/yr appear to fill the bulk of the surface catchment area and these appear more-or-less evenly distributed on a qualitative basis. Further, following a review of extensive monitoring data for the licenced properties east of Mill Creek it was noted that “aggregate activities have not significantly altered groundwater levels” and that “groundwater levels in the general mining area of the CBM Aggregates sites are behaving similarly to ambient groundwater levels elsewhere in the Township” (Harden 2023 in response to AECOM 2023). This suggests that these aggregate extraction activities have little impact on recharge and baseflow at a sub-watershed scale. Therefore this, scaling the observed baseflow according to the model domain area is an acceptable approach. Citations: AECOM, 2023. Response to Puslinch Township Review - CBM Aggregates McNally Pit Monitoring Report. Dated October 12, 2022. Harden, 2023. McNally Pit Monitoring Report Update Lanci Expansion Area Processing Issue. Dated November 8, 2023.
55	GW Model	P9 S4.13	Comment - The discussion on changes to baseflow does not show that long reaches of Mill Creek and Tributary 3 will no longer have groundwater discharge. See Figure 15, Appendix G, which show the particle tracks (i.e. groundwater flow) that no longer ends at Mill Creek. Table 8 of Appendix G documents that the majority of groundwater flow to Mill Creek and Tributary 3 will be eliminated.	See Response to Comment #4 - Baseflow
56	GW Model	Model Report Fig 7	Comment - This bedrock figure does not accurately show bedrock at 292.54 m AMSL in MW18-05 or the other two onsite boreholes that intersect the bedrock. On-site geology should be prioritized.	Bedrock surface elevation within the model domain has been generated using both the on-Site borehole data as well as relevant datapoints from the MECP WWIS database. The 290 m contour, which appears as a small ‘bullseye’ around MW18-05 on Figure 7 of Appendix G illustrates that the bedrock surface takes this datapoint into account. On-site bedrock geology has been incorporated into the modelled bedrock surface. Additionally, a detailed presentation of the bedrock contact is included on Figure 6 (attached).

Num	Topic	Section	Harden Comment	WSP Response
57	GW Model	Model Report Fig 10	Comment - The predicted potential at all onsite wells are at the theoretical regression line or below. The on-site calibration targets have a very poor normalized root mean square error of 32%. This suggests that the onsite groundwater flow system is not well represented in the model. This affects estimates such as baseflow contributions, area of influence of the pit and drawdown estimates. Why isn't MW18-01 shown on the inset map as being a calibration target? The March 3, 2021 observation value is 301.84 m AMSL and the model predicted value is approximately 300.9 m AMSL. How does the predicted hydraulic head at MW18-01 compare to the elevation of Mill Creek nearby? What elevation of Mill Creek is in the model?	See Response to Comment #42 - Omission of MW18-01B from the calibration statistics shown on Figure 10 of Appendix G is unintended. The average observed water level at this location is 301.85 masl (see Fig 17 of main report), while the model computed head at this location is 300.83 masl, resulting in a residual value of roughly 1m below the observed value. The modelled elevation of Mill Creek along the reach closest to this location is roughly 300 masl. Model computed equipotential contours are plotted along with the inferred typical water elevation on Figure 8 (attached). This figure indicates that the model predicted heads tend to be approximately 0.5m below the inferred equipotential values but that the model adequately replicates the hydraulic gradients and inferred flow directions across the site. This suggests that the groundwater flow model adequately represents the on-Site groundwater flow system.
58	GW Model	Model Report Fig 14a	Comment - The steady state model represents only a single day of the year. The calibration targets on-site are the March 2021 data for the monitoring wells and it is not clear what data is used for the SP series wells. The majority of the calibration targets are private water wells with notoriously erroneous water levels obtained at different times of the year. There are numerous sources of high-quality monitoring data available in the Township could have been used to calibrate the model. Calibration to on-site targets should be improved.	The March 2021 values used for the on-site wells as calibration targets are close the average values observed at these wells, with all values being within 0.1m of the average values obtained from the 2018 to 2022 data. If these average values are substituted into the model calibration targets the overall model mean error changes from 0.38m to 0.37m, the mean absolute error changes from 1.70m to 1.67m and the RMS error changes from 7.8% to 7.7%. These changes are not considered to be significant. Available records from the MECP WWIS were filtered to removed well records that might be unreliable, so that only those well records that were deemed valid were included as model calibration targets. While it would be ideal if each of these records were accompanied by a hydrograph of water levels over a long period to verify the assumption that the water levels obtained from these sources are close to the long-term average values this is not possible. Nevertheless, these records still represent important data and inclusion of them into the model development process, after a preliminary vetting as was done here, is a standard and accepted modelling practice.

Num	Topic	Section	Harden Comment	WSP Response
59	Water Rpt	S 2.2	Report - 27 ha in size for extraction area, total license is 44 ha. 5.5 million tonnes, 95% below water table, maximum depth of resource is 20 m to an elevation of 285 m AMSL. Comment - Bedrock was encountered at an elevation above 285 m AMSL in three on-site wells. Silt/clay/till layers occur in each of the exploration wells at varying depths across the site, but mainly above the elevation of 285 m AMSL. Confining conditions may occur beneath the site as created by the fine-grained layers, thus preventing groundwater discharge in the area of the proposed excavation and resulting in groundwater discharge to Mill Creek farther downstream. The mining through fine grained layers should not be permitted unless the role of the fine-grained layers is understood in this sensitive groundwater flow system.	Same as response to Comment #36, which clarifies extraction plan and discusses the very small and mixed direction of groundwater vertical gradient observations.
60	Water Rpt	S 2.2	Report - Raw aggregate feedstock off-site processing. Comment - Where will the silt be deposited? It is necessary to provide silt generation volumes for all feeder pits and volume calculations for remaining approved sediment ponds.	Same as Response to Comment #1 - A numerical groundwater flow modelling study was undertaken in 2023-2024 to assess the potential effects of continued silt deposition in the McNally Pit Pond on baseflow to Mill Creek (WSP 2024, Attachment #1). This study indicated that the future washing of aggregates and accumulation of fines in the McNally Pit Pond will not result in a significant reduction in baseflow to Mill Creek and is therefore not a concern from a water resources or natural environment perspective.
61	Water Rpt	S 2.3	Report - Final lake level +/- 302 m AMSL. Comment - The final lake level is based on a poorly calibrated model for the area around the site and represents only one day of the year. Please provide the seasonal hydraulic potential range for the lake level.	Based on on-Site observations of seasonal groundwater levels, the seasonal variation in the final pond water level in a post-rehabilitation condition is estimated to be +/- 0.3m. As noted in previous responses, WSP strongly disagrees with the Reviewer's opinion and through our earlier responses have demonstrated that the numerical groundwater model is well-calibrated for its intended purpose.
62	Water Rpt	S 4.1	Report - Ground surface elevation ranges from 303 to 304 m AMSL. Comment - At MW18-01 the ground surface elevation is at 302.66 m AMSL and at TW11-16 the ground surface elevation is at 302.39 m AMSL. The Geo Optic based ground contours at the southwest and west ends of the lake are at 302 m AMSL and one wetland in the southwest corner is shown at 301 m AMSL. These elevations are very close to or below the proposed lake level. Any seasonal increase or	See Response to Comment #7 - Floodplain Assessment / Berm. Also see second part of Response to Comment #3 - Groundwater uplift / tile drain.

Num	Topic	Section	Harden Comment	WSP Response
			increase from a flooding event will result in overland surface water from the west end of the lake.	
63	Water Rpt	S 4.5	Report - Competent bedrock: Guelph Formation and Reformatory Quarry Member. Comment - Figure 2.2 of the Tier 3 Study shows that only the Guelph Formation underlies the model area and is underlain by relatively thin layer of Reformatory Formation, Vinemount Formation and relatively thick layers of the Goat Island and Gasport Formations. The Vinemount Member is a regionally significant aquitard and is not included in the bedrock layers. The Guelph Formation, a known regional aquifer, is modeled at a K of 7 x 10-7 m/s and the reformatory an aquifer/aquitard is modeled at 6 x 10-7 m/s almost the exact same value. The Tier 3 model suggests a 10-4 to 10-6 m/s for the Guelph and 5 x 10-7 to 5.3 x 10-6 m/s for the reformatory. The modelled competent bedrock layer is 35 m thick and represents the Guelph, Reformatory, Vinemount, Goat Island and Gasport formations which have vastly different hydraulic properties. Given that regional groundwater models indicate that Mill Creek influences hydraulic potentials in all of the underlying bedrock aquifers above the basal shale unit, a better definition of the bedrock layer is warranted.	See Response to Comment #47 - Conceptualization and parameterization of the bedrock in the GW flow model.
64	Water Rpt	S 4.7	Report - Nearby aggregate sites are recognized. Comment - No cumulative impact assessment has been made of proposed pit as an addition to other pits. The cumulative impact of all below water table extractions and water taking in the area should be determined from the groundwater model.	See Response to Comment #2 - Cumulative Impact Assessment
65	Water Rpt	S 4.8.1	Report - Water well survey required. Comment - Given the stated potential for off-site impacts, private wells on the immediately adjacent properties should be surveyed as part of the initial assessment to confirm the depth, location and source of local water wells.	As recommended in the Water Report, a private well survey will be conducted prior to the start of extraction to confirm well construction details, which is a common practice. As noted in the Water Report, the potential for impacts to neighbouring private wells is low and the information on private wells available in the MECP WWIS is sufficient for the purposes of completing the impact assessment. CBM has a comprehensive on-Site groundwater monitoring program and a Well Complaint Response Plan already in place to ensure that private water supplies will not be impacted due to the proposed pit operations.

Num	Topic	Section	Harden Comment	WSP Response
66	Water Rpt	S 4.9	Report - Site is identified as an area of downward hydraulic gradients. Comment - This is not representative of conditions at MW 18-05. Water levels at MW18-05 are approximately 1 m above the nearby stream. Also, Figure 3-16 of the Tier 3 study recognizes this area as being a regional area of upwards gradients. SP18-03 is described as permanently flowing, another indication of upward groundwater movement. A significant flowing artesian well occurred nearby at Reid Heritage Homes on the east side of the Hanlon Expressway. The importance of upward flowing groundwater discharge to Mill Creek cannot be overstated in this area.	Section 4.9 of the Water Report discusses Source Water Protection mapping of the Site as presented by the Grand River Conservation Authority (GRCA). The GRCA mapping of downward gradients is calculated by comparing the water table surface with a deep potentiometric surface (more than 40 mbgs) to assess whether or not it appears that deeper regional flow systems are recharging or discharging at this location. In the case of this Site, the GRCA's mapping indicates a slight downward gradient recharging the deep aquifer, which is consistent with observations at TW11-16 (Figure 14 of the Water Report). The Reviewer's comment regarding artesian groundwater conditions does not pertain to the local-scale shallow flow system (such as MW18-05 to Tributary 3) of concern at the Site. Please refer to the Response to Comment #36 for further discussion on hydraulic gradients.
67	Water Rpt	S 5.1.1	Report - Each of the onsite observation wells have 2m to 3m long screens. Comment - None of the screened depths in on-site monitoring wells are installed to the depth of the proposed extraction. The potentially confining nature of the natural silt/clay/glacial till layers has not been evaluated.	See Response to Comment #36 regarding till layers, vertical hydraulic gradients and the potential for confining till layers to create artesian conditions.
68	Water Rpt	S 5.12	Report - Silt layers less than 1 m thick in Sand and Gravel. Comment - The continuity of low permeability layers within the sand and gravel deposit should have been evaluated. The water level at MW18-05 and water quality do not represent the water table aquifer and appear to be artesian (not flowing artesian). The mining of the aggregate could have farther ranging impacts than predicted under unconfined conditions.	See Response to Comment #36 regarding till layers, vertical hydraulic gradients and the potential for confining till layers to create artesian conditions.
69	Water Rpt	S 5.12	Report - 12 boreholes drilled deep enough to encounter underlying silt unit found to vary 2 to 7 m thick Comment - The top of silt/till/clay should be recognized as the minimum elevation for extraction and not an arbitrary 285 m AMSL. Where the resource is known to be greater depth, this can be recognized on the site plans. The role of the silt/till/clay layers in	See Response to Comment #36 regarding the establishment of the base of extraction, till layers, vertical hydraulic gradients and the potential for confining till layers to create artesian conditions.

Num	Topic	Section	Harden Comment	WSP Response
			maintaining hydraulic head in lower aquifer layers is unknown and has not been evaluated with the exiting monitoring network.	
70	Water Rpt	S 5.12	Report - Confirmed depth of resource is 294 to 287 m AMSL. Comment - It is not appropriate to set minimum mining elevation based on a bump and grind feel of the dragline bucket. Where the resource is known to be shallower, the pit floor should be raised.	See Response to Comment #36 regarding the establishment of the base of extraction, till layers, vertical hydraulic gradients and the potential for confining till layers to create artesian conditions.
71	Water Rpt	S 5.2.2	Report - Groundwater Levels Comment - There is no discussion of the highest groundwater levels being observed in MW18-05. Confined levels at MW18-05 or any other stations are not recognized. Model does not accurately predict MW18-05 levels.	It is noted that groundwater head at MW18-05 is the highest under typical conditions in Section 5.2.2 of the Water Report (the fifth bullet point in that section). The conceptual model of the aquifer as an unconfined water table aquifer is supported by the borehole logs and spatial water level information. Lithological observations, including those at MW18-05, showed no confining layers are present. Water level information shows a consistent distribution of groundwater head in the water table aquifer, as shown on Figure 16. Model computed head at MW18-05 is lower than the observed value by 0.96m (when compared against the average of values available for MW18-05 from 2018 to 2022). Although this residual value is higher then typical for the other on-Site monitoring wells, it is still within acceptable limits given the overall model calibration results and also considering that it is still within the range of water table changes seen across the Site seasonally.
72	Water Rpt	S 5.5	Comment - The water quality at MW18-05 is significantly different than at other wells. Artesian conditions are likely as no chloride observed at this station.	See Response to Comment #39. Artesian conditions have not been observed at MW18-05, as no confining layer exists there.
73	Water Rpt	S 5.6.3	Comment - SW3 is located 40% of the way along the property line and about 40% along Mill Creek, the reach of Mill Creek that is adjacent to this site. The overall impact to streamflow along the whole reach of Mill Creek should be assessed and compared to existing conditions.	See Response to Comment #4 – Baseflow.
74	Water Rpt	Figure 14a	Comment - The final impact scenario does not have sufficient detail on groundwater levels, only a one metre contour interval issued to determine how 1 m/s hydraulic conductivity assigned to the Lake affects hydraulic potentials through the lake.	See Response to Comment #53 - Modelling of final pond water level.

Num	Topic	Section	Harden Comment	WSP Response
			Please also confirm that the hydraulic conductivity of 1 m/s was assigned to all overburden layers, given that the proposed base level of 285 m AMSL extends to the bedrock in several areas beneath the site.	
75	Water Rpt	Figure 12a	Comment - End of Year 1, when the pond is just being created and the rate of extraction is the same as all other years will have the greatest potential drawdown. The impact of this year should be evaluated and shown.	The Water Report presents pre-extraction and operational water levels and drawdown in Figure 12 of Appendix G. Figure 9 (attached) presents the predicted heads and drawdown at the end of Year 1. These model results are consistent with those shown on Figures 12a and 12b which indicate a general flow pattern of groundwater moving from the northwest towards Tributary 3 and groundwater onsite moving toward the pit predominantly from upgradient and laterally from east and west of the pit. While operational drawdown at the end of year 1 is marginally higher than operational drawdown in subsequent years, the area of influence is smaller and generally closer to the pit. In subsequent years the increased radius of influence increases and is a suitable basis for the evaluation of potential impacts.
76	Water Rpt	Figure 13	Comment - These baseflow simulations confirm that there will be a permanent decrease in groundwater discharge to both Mill Creek and Tributary 3. During the years of extraction, there will not be a recovery of water levels during the winter period. It will take approx. nine months to recover post extraction.	See Response to Comment #4 - Baseflow. It is acknowledged that there is an annual cycle of drawdown and recovery during operational years, which is discussed in the Water Report and Appendix G.
77	Water Rpt	S 5.7.1	Report - SW3 and SW4 both show upward gradient. Comment - Contradiction to downward gradient discussed in Section 4.9.	See response to Comment #66 - Source Water Protection vertical hydraulic gradient mapping refers to a deeper aquifer.
78	Water Rpt	S 5.7.1	Report - SP18-03 flows continuously. Comment - Not a downward gradient at SP18-03. This is consistent with Tier 3 characterization of this area.	We agree that the artesian flow in the mini-piezometer at surface water station 3 is suggests that groundwater discharges to Mill Creek at this location, as stated in Section 5.7 of the Water Report.
79	Water Rpt	S 5.7.1	Report - SW5 upward gradient when surface water is present. Comment - This indicates upward hydraulic gradients and also suggests that the surface water is present because of discharge of groundwater at this location.	See response to Comment #5 and the attached Technical Memorandum, which discuss the relationship between groundwater gradients and the hydrologic conditions.

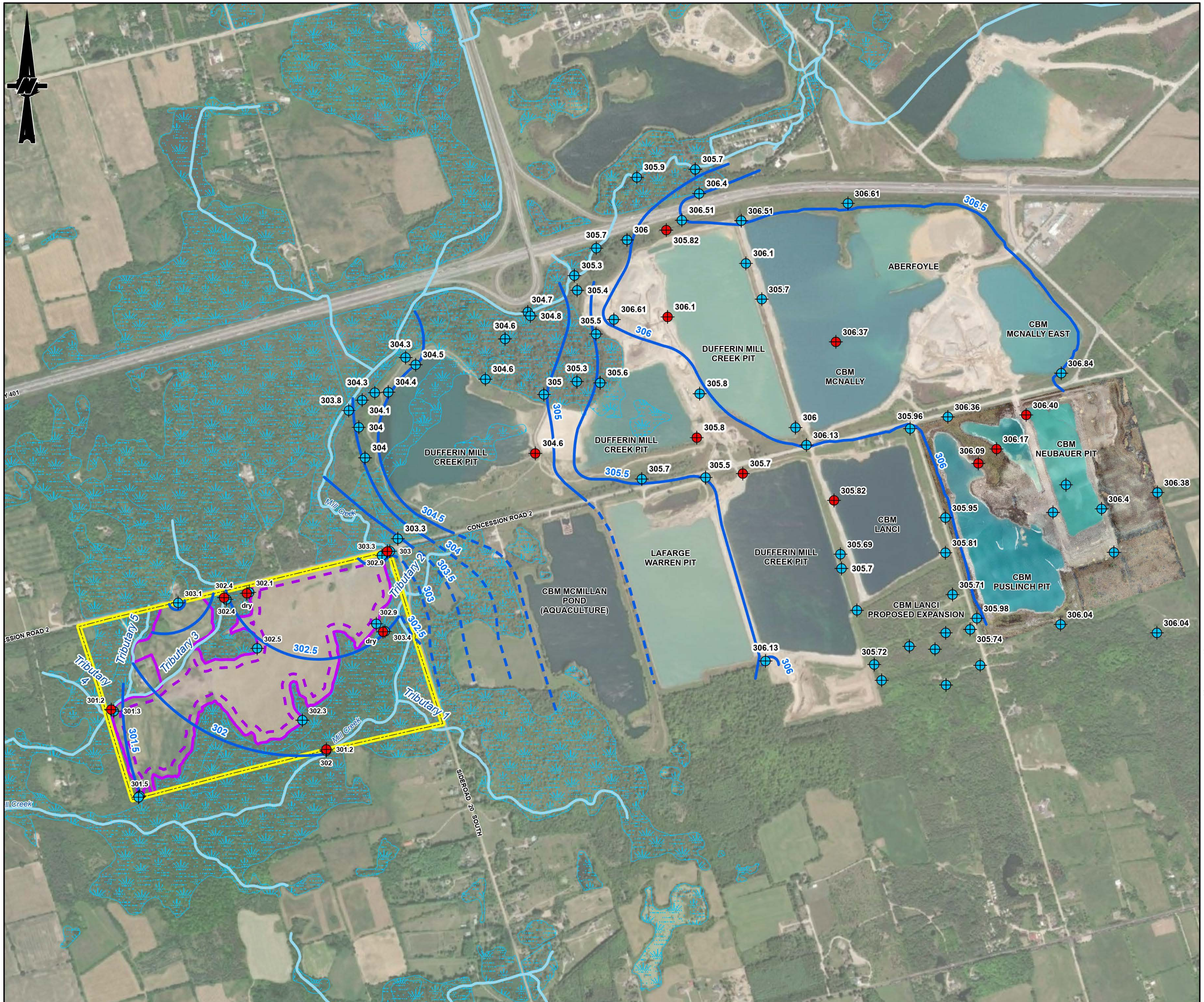
Num	Topic	Section	Harden Comment	WSP Response
80	Planning Rpt	General	Report - Processing at the McNally Pit. Comment - A full accounting of volumes of sediment expected from Lanci, Neubauer and Lake Pits compared to approved silt ponds must be undertaken to confirm that the proposed silt has an approved sediment pond.	See Response to Comment #1 - Report on Siltation in the McNally Pond and its lack of impact to baseflow to Mill Creek (Attachment #1).
81	Planning Rpt	P37 S7	Report - The effects on groundwater will largely be confined to the license area and surrounding CBM owned property. Comment - We refer you to: Figure 16 and Tables 7 and 8 of Appendix G in the Water Report. There are significant off-site groundwater reductions in wetlands, creeks and tributaries off-site including Zone, 1, Zone 2 and Zone 5. In addition, there are groundwater level increases off-site that may inundate wetlands off-site.	See Responses to Comments #3, 4 and 5 - Groundwater uplift / tile drain (Attachment #2), Baseflow redistribution (Attachment #3), and PSW zones / wetland hydrology (Attachment #4).
82	Planning Rpt	P37 S7	Report - There will be a small area immediately northeast of the site, west of Mill Creek where the temporary groundwater table reduction is up to 2.5 m. Comment - The effects of drawdown extend at least 720 m offsite and there are permanent reductions in groundwater discharge to Mill Creek. Zone 1 will have a permanent groundwater table reduction, reduction in groundwater discharge to the wetland and reduction in baseflow to Mill Creek. There will be a permanent increase in groundwater elevation extending onto private lands west and southwest of the site.	See Responses to Comments #3, 4 and 5 - Groundwater uplift / tile drain (Attachment #2), Baseflow redistribution (Attachment #3), and PSW zones / wetland hydrology (Attachment #4).
83	Planning Rpt	P38 S7	Report - Upon rehabilitation there will be a decrease of 1 m at northern end of pond and increase of 0.9 m at southern end of pond. Comment - There is very little unsaturated zone at the south end of the pond and it is likely that overland flow will occur. This will increase the permanent drawdown east of the pit. The estimated final lake level of 302 m AMSL only represents a single day and does not represent high or low expected groundwater conditions.	See Response to Comment #7 - Floodplain Assessment / Berm (Attachment #5). Also see second part of Response to Comment #3 - Groundwater uplift / tile drain (Attachment #2).
84	Planning Rpt	P28? S7	Report - Zones 2,3,4 and 7 show gains in groundwater discharge up to 489 mm/yr. Comment - This is incorrect. The statement in the Water Report in Section 7, Page 38, Section 10.1, P 51 and in the Groundwater Model Report Section 5, Page 15 incorrectly lump Area 2 as being an area of net groundwater gain as Tables 7 and 8 of the groundwater model	That is a typographic error. The Water Report should have referred to Zones 3, 4, 6 and 7 which shows gains in groundwater discharge. This error has been communicated to the NE team so that they may update their analysis in light of this correction to the Water Report.

Num	Topic	Section	Harden Comment	WSP Response
			report state that there will be loss of water to this area of the PSW and Mill Creek. This error also led to incorrect assumptions in the Natural Heritage report.	
85	Planning Rpt	P38 S8.1.1	Report - Temporary reductions in localized water table elevations which will be mostly confined to the proposed license area and immediate surrounding CBM owned property. Comment - We refer you to: Figure 16 and Tables 7 and 8 of Appendix G in the Water Report. There are significant off-site groundwater reductions in wetlands, creeks and tributaries off-site including Zone, 1, Zone 2 and Zone 5. In addition, there are groundwater level increases off-site that may inundate wetlands off-site. CBM does not own the McNie property where water levels are expected to rise. CBM does not own the wetland located within the 720 m north of the pit belonging to Mr. Johnson where much of the impact will be concentrated.	See Responses to Comments #3, 4, 5 and 7 - Groundwater uplift / tile drain (Attachment #2), Baseflow redistribution (Attachment #3), PSW zones / wetland hydrology (Attachment #4) and Floodplain Assessment / Berm (Attachment #6).
86	Planning Rpt	P39 S8.1.1	Report - Post-Rehabilitation Impacts Comment - There is no mention of the permanent lowering of the water table at the north end of the site and permanent increase in water level at south end of site, no mention of permanent reduction in groundwater flow to Mill Creek along a 1,500 m reach and permanent loss of groundwater discharge to Mill Creek Puslinch PSW.	See Responses to Comments #4 and 5 - Baseflow redistribution (Attachment #3), and PSW zones / wetland hydrology (Attachment #4).
87	Planning Rpt	P39 S8.1.2	Report - This reduced variability is likely to lead to higher baseflow to Mill Creek and its tributaries during dry periods and lower baseflow during wet periods. Comment - This statement fails to acknowledge the permanent reduction in baseflow to a 1,500 m reach of Mill Creek regardless of variability in water level. The water table elevation variability post extraction will result in overland flow from the site onto private lands.	See Responses to Comments #3, 4 and #7 - Groundwater uplift / tile drain (Attachment #2), Baseflow redistribution (Attachment #3), and Floodplain Assessment / Berm (Attachment #6).
88	Planning Rpt	P41 S8.4	Report - The site would provide additional temporary storage capacity for water to Mill Creek to reduce flooding effects downstream. Comment - This is not accurate. The water level in the future lake is at or just below the ground surface at the southwest and west end of the pit. Any increase in lake level will cause the lake level to flood overland. The existing condition has more unsaturated soil to fill before flooding overland and has the potential to store water in local depressions.	See Response to Comment #14 - Although the unsaturated soils on site and the low-lying areas in the agricultural fields can store water in the event of a flood event, the extraction of the pits is expected to provide a greater storage volume (even with the increased groundwater table in the southwest corner of the pit). Additionally, it is proposed that berms will be installed to ensure flood waters do not move to lower lying areas outside of the

Num	Topic	Section	Harden Comment	WSP Response
				extraction area or neighbouring sites. Also see Response to Comment #7 – The ground surface around the perimeter of the pond will be graded to elevations suitable to prevent flooding as described in the floodplain assessment Technical Memorandum (WSP 2025, Attachment #6).
89	Site Plans	Note B1	Comment - How does the Geo Optic elevations compare to elevations obtained by Van Harten Surveys for the monitoring wells. A table of monitoring wells should be included on the site plans.	The Site Plan Standards (2020) do not require that a table of monitoring wells be added to the site plan.
90	Site Plans	P1	Replace - Not all monitoring stations are located on the plan. The BR well is identified differently in the reports as TW11-16.	The Site Plan has been updated to rename the "BR" well to "TW11-16"
91	Site Plans	Note C1	Comment - Flow directions of tributaries not shown or for Mill Creek.	Flow directions have been added to the Site Plan.
92	Site Plans	Note D1	Comment - SW4 is a surface water station and should not be used to indicate groundwater elevations. The highest groundwater elevation in the southwest area is reported as 302.05 m AMSL at station MW18-01B on more than one occasion.	The Site Plan note D1 has been updated to rename "SW4" to “SP18-04", which is the mini-piezometer that was used to indicate groundwater elevations in that area.
93	Site Plans	Note D1	Comment - The maximum predicted water table occurs MW18-05 at an elevation of 304.34 m AMSL as shown on Figure 2 of the Maximum Groundwater Elevation Report.	Site Plan note D1 has been updated accordingly.
94	Site Plans	Rehab page	Comment - The predicted lake level of 302 m AMSL is based on a steady state model and does not represent the seasonal high or low potential water level.	Based on on-Site observations of seasonal groundwater levels, the seasonal variation in the final pond water level in a post-rehabilitation condition is estimated to be +/- 0.3m.
95	Site Plans	Rehab page	Comment - There are no flood control measures on the plan for the Southwest area or near to west end of Tributary 3 where the ground elevation and lake level are the same.	The floodplain assessment Technical Memorandum details the use of perimeter grading to mitigate flood risk (WSP 2025, Attachment #6).

FIGURES

Figures 1 to 9



KEY MAP

SCALE: 1:15,000

LEGEND

- GROUNDWATER MONITORING
- SURFACE WATER MONITORING
- WATERCOURSE
- CONTOURS
- CONTOURS
- LICENSED BOUNDARY
- PROPOSED EXTRACTION AREA
- PROVINCIALLY SIGNIFICANT WETLAND (EVALUATED)
- SITE BOUNDARY

0 200 400 600 800

1:15,000 METRES

NOTES

1. WATER LEVELS MEASURED IN AUGUST AND SEPTEMBER OF 2022

REFERENCE(S)

1. MECP WATER WELL RECORD DATA OBTAINED SEPTEMBER 2020.
2. BASEDATA: MNRF LIO, OBTAINED 2019
3. IMAGERY SOURCE: WORLD TOPOGRAPHIC MAP: CITY OF HAMILTON, REGION OF WATERLOO, ONTARIO BASE MAP, PROVINCE OF ONTARIO, ONTARIO MNR, ESRI CANADA, ESRI, © OPENSTREETMAP CONTRIBUTORS, HERE, GARMIN, USGS, NGA, EPA, USDA, NPS, AAFC, NRCAN
WORLD IMAGERY: SOURCE: ESRI, MAXAR, EARTHSTAR GEOGRAPHICS, AND THE GIS USER COMMUNITY IMAGE SEPTEMBER 2016
4. PROJECTION: TRANSVERSE MERCATOR DATUM: NAD 83 COORDINATE SYSTEM: UTM ZONE 17N

CLIENT

CBM AGGREGATES, A DIVISION OF ST. MARYS CEMENT INC. (CANADA)

PROJECT

ABERFOYLE SOUTH LAKE PIT

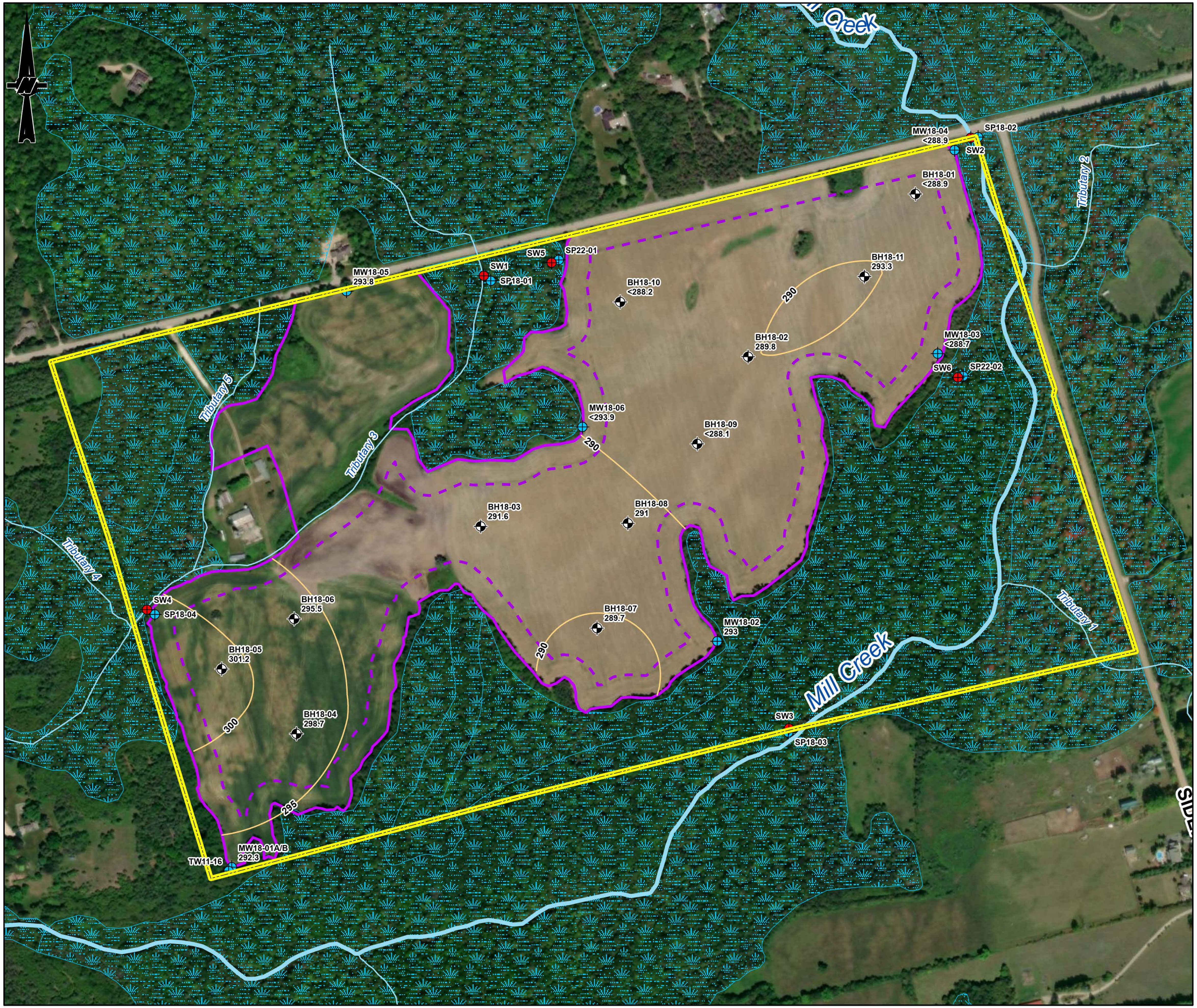
TITLE

2022 GROUNDWATER LEVELS WITHIN THE SITE AND SURROUNDING AREA

CONSULTANT

YYYY-MM-DD	2025-04-11
DESIGNED	SO
PREPARED	AP
REVIEWED	GWS
APPROVED	GWS

PROJECT NO.	CONTROL	REV.	FIGURE
CA-GLD-1791470A	0001	0	1



SCALE: 1:5,000

LEGEND

- RESOURCE EVALUATION BOREHOLE
- GROUNDWATER MONITOR
- SURFACE WATER MONITOR
- WATERCOURSE
- LICENSED BOUNDARY
- CONTOURS
- PROPOSED EXTRACTION AREA
- SITE BOUNDARY
- PROVINCIALLY SIGNIFICANT WETLAND (EVALUATED)

0 80 160 240 320

1:5,000 METRES

REFERENCE(S)

1. MECP WATER WELL RECORD DATA OBTAINED SEPTEMBER 2020.
2. BASEDATA: MNRF LIO, OBTAINED 2019
3. IMAGERY SOURCE: WORLD TOPOGRAPHIC MAP: CITY OF HAMILTON, REGION OF WATERLOO, ONTARIO BASE MAP, PROVINCE OF ONTARIO, ONTARIO MNR, ESRI CANADA, ESRI, © OPENSTREETMAP CONTRIBUTORS, HERE, GARMIN, USGS, NGA, EPA, USDA, NPS, AAFC, NRCAN
WORLD IMAGERY: SOURCE: ESRI, MAXAR, EARTHSTAR GEOGRAPHICS, AND THE GIS USER COMMUNITY IMAGE SEPTEMBER 2016
4. PROJECTION: TRANSVERSE MERCATOR DATUM: NAD 83 COORDINATE SYSTEM: UTM ZONE 17N

CLIENT
CBM AGGREGATES, A DIVISION OF ST. MARYS CEMENT INC. (CANADA)

PROJECT
ABERFOYLE SOUTH LAKE PIT

TITLE
BASE OF RESOURCE ELEVATION

CONSULTANT

YYYY-MM-DD	2025-04-10
DESIGNED	SO
PREPARED	AP
REVIEWED	GWS
APPROVED	GWS

PROJECT NO.	CONTROL	REV.	FIGURE
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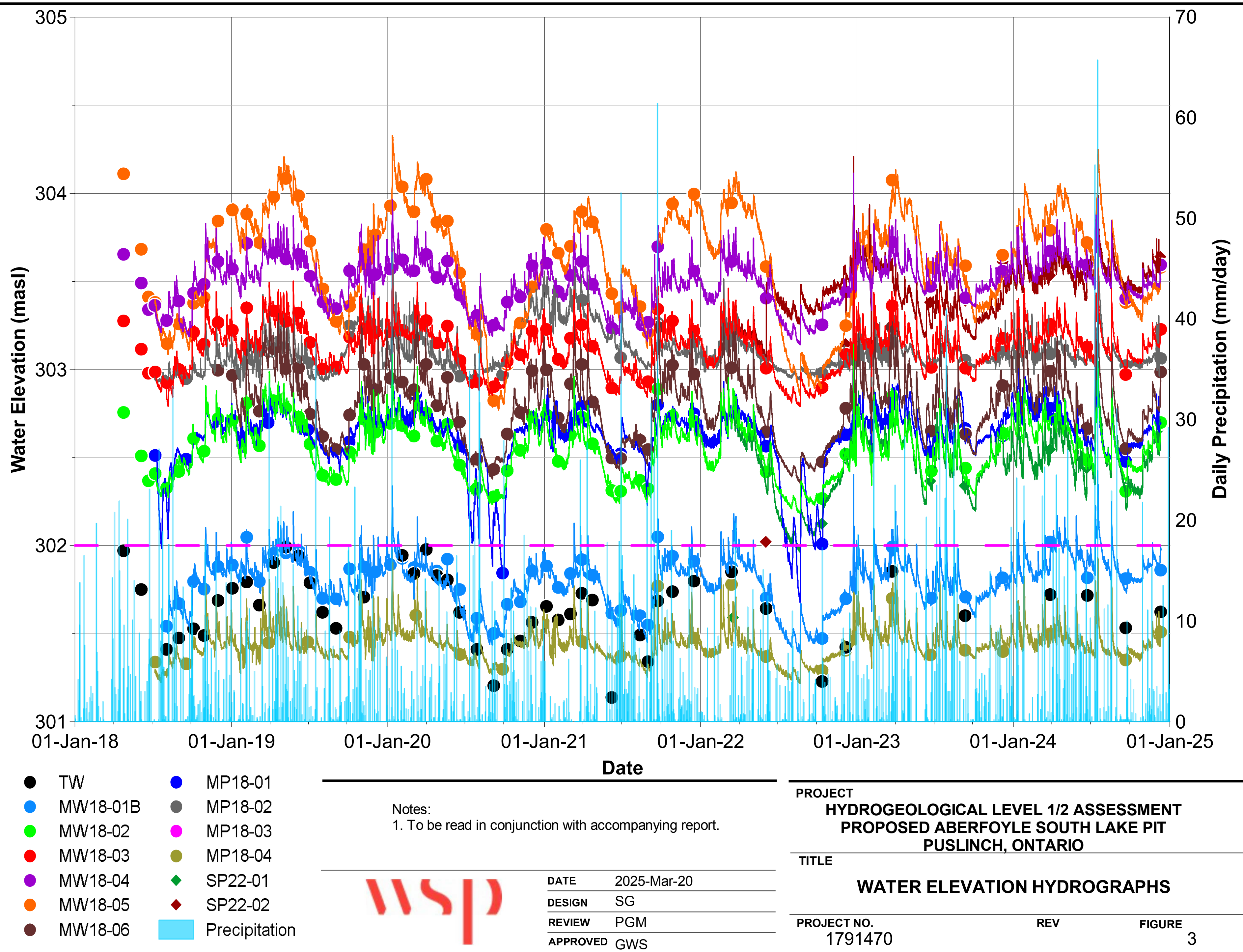

Notes:
1. To be read in conjunction with accompanying report.

DATE	2025-Mar-20
DESIGN	SG
REVIEW	PGM
APPROVED	GWS

PROJECT
HYDROGEOLOGICAL LEVEL 1/2 ASSESSMENT
PROPOSED ABERFOYLE SOUTH LAKE PIT
PUSLINCH, ONTARIO

TITLE
WATER ELEVATION HYDROGRAPHS

PROJECT NO.	REV	FIGURE
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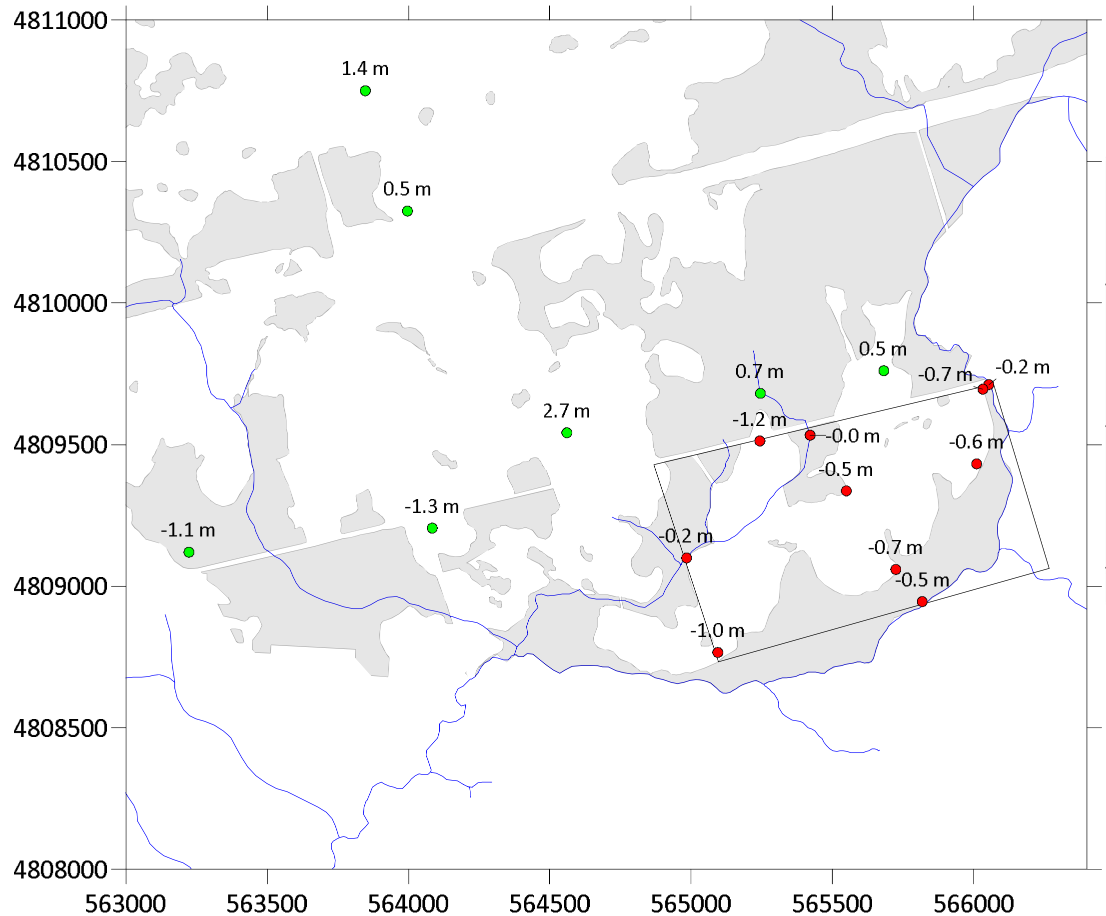

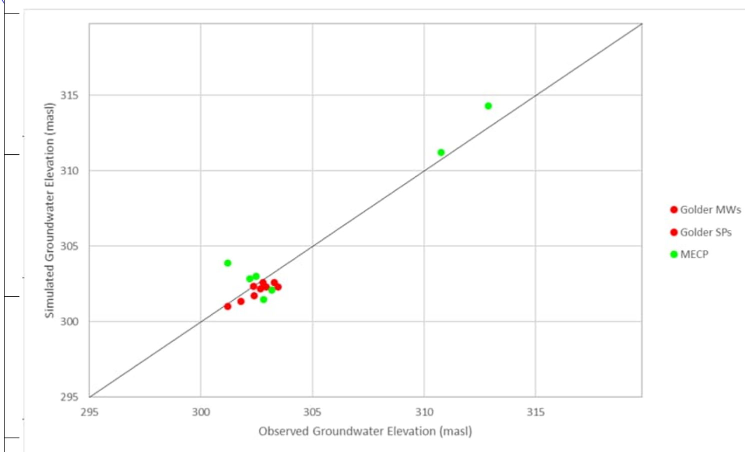

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Max residual Error	2.68	[m]
Residual Mean Error	-0.10	[m]
Residual Mean Absolute Error	0.80	[m]
RMS error	1.01	[m]
Normalized RMS error	8.60	%

Note: Based on model described in the Water Report dated November 2023 (WSP 2023)

CLIENT
CBM AGGREGATES (CBM), A DIVISION OF ST. MARYS CEMENT INC. (CANADA)

CONSULTANT
wsp

YYYY-MM-DD	2025-04-07
PREPARED	BM
DESIGN	PGM
REVIEW	GWS
APPROVED	

PROJECT
ABERFOYLE SOUTH LAKE PIT LICENCE APPLICATION
Comment Responses

TITLE
Model Calibration Summary

PROJECT No.	PHASE	Rev.	FIGURE
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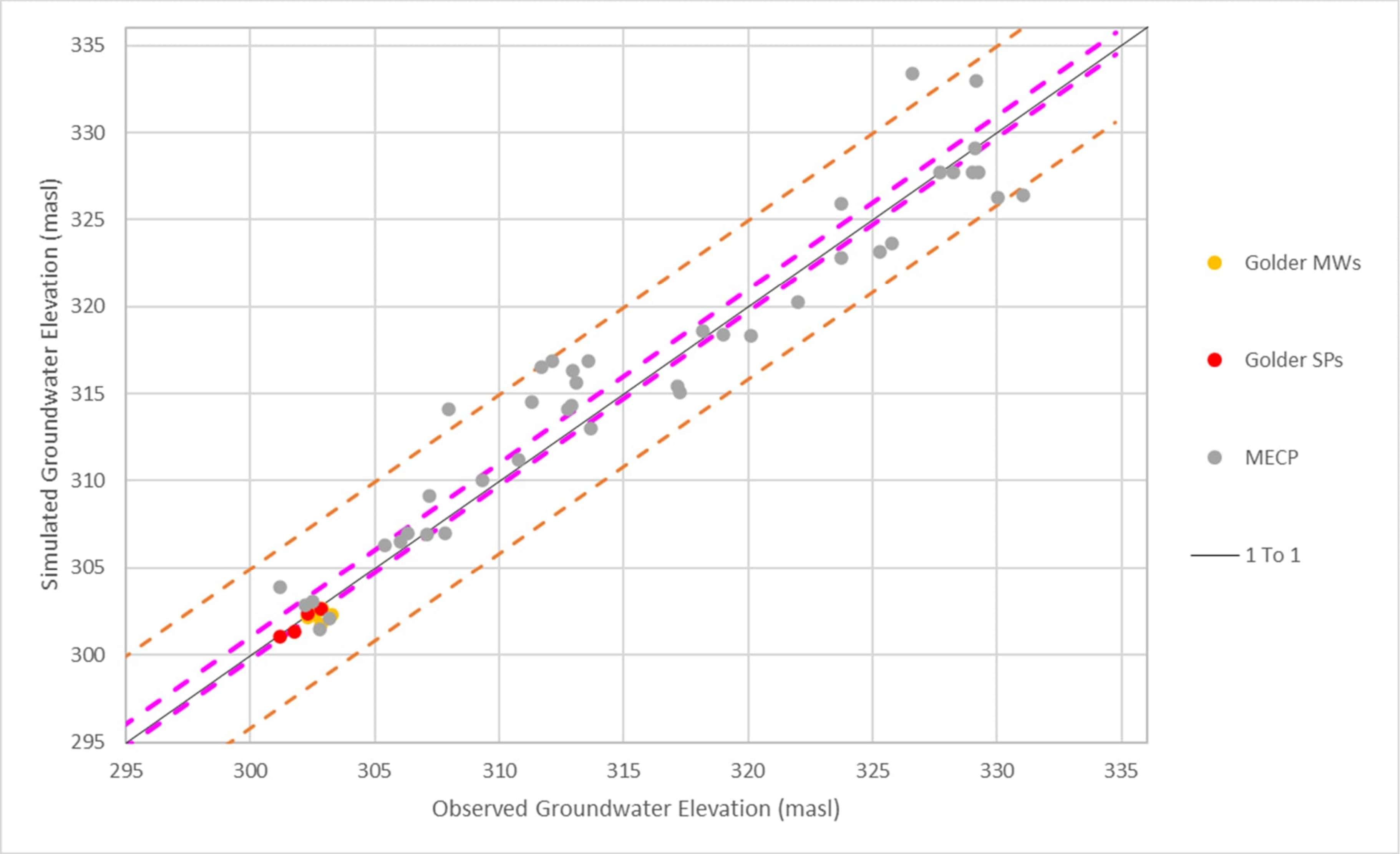

Note: Based on model described in the Water Report dated November 2023 (WSP 2023)

CLIENT
CBM AGGREGATES (CBM), A DIVISION OF ST. MARYS CEMENT INC. (CANADA)

CONSULTANT

YYYY-MM-DD	2025-04-07
PREPARED	BM
DESIGN	PGM
REVIEW	GWS
APPROVED	

PROJECT
ABERFOYLE SOUTH LAKE PIT LICENCE APPLICATION
Comment Responses

TITLE
Model Calibration 95% Confidence Intervals

PROJECT No.	PHASE	Rev.	FIGURE
1791470	**-**	**A**	**5**

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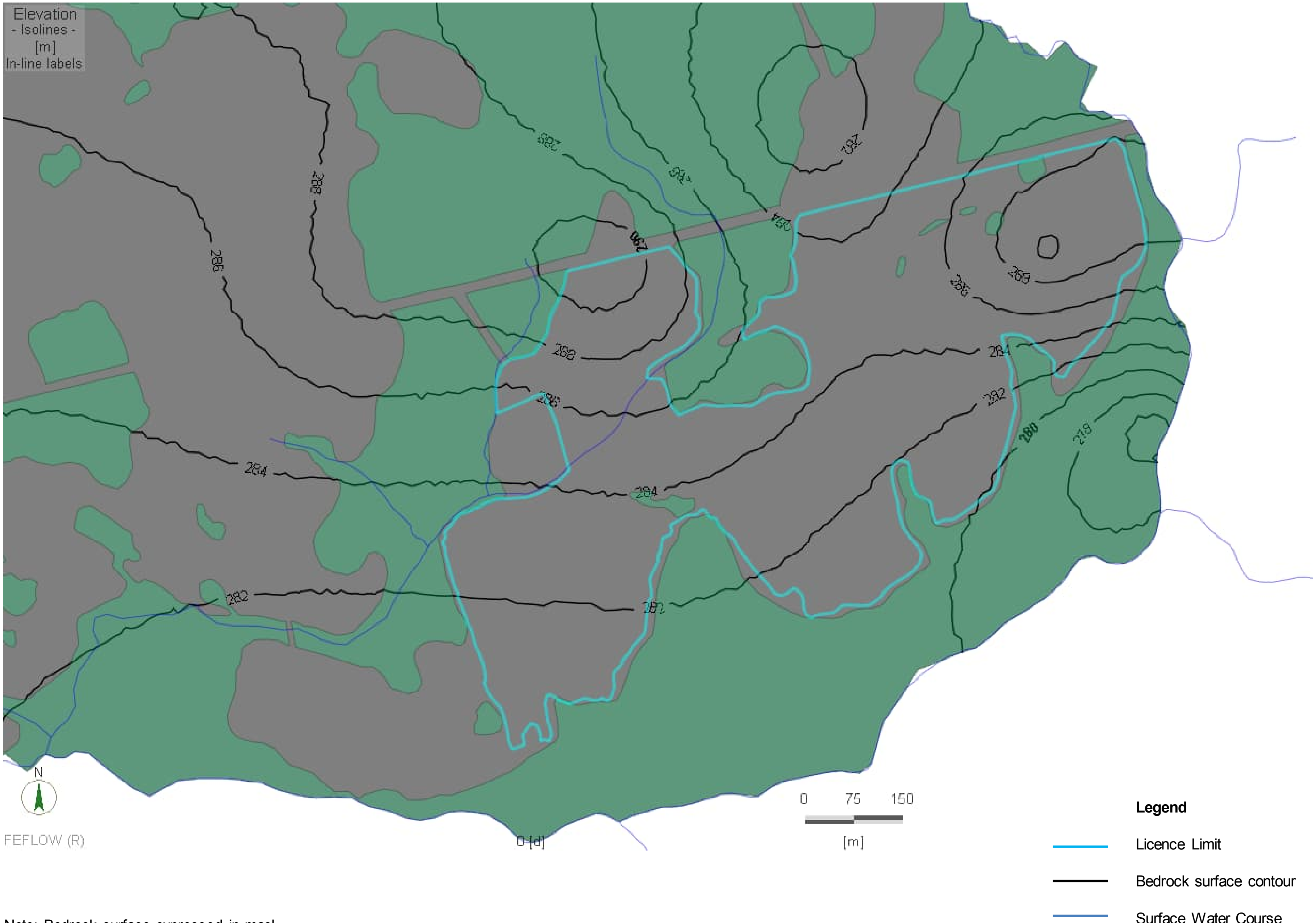

Note: Bedrock surface expressed in masl.
Based on model described in the Water Report dated November 2023 (WSP 2023)

CLIENT
CBM AGGREGATES (CBM), A DIVISION OF ST. MARYS CEMENT INC. (CANADA)

CONSULTANT
wsp

YYYY-MM-DD	2025-09-29
PREPARED	PGM
DESIGN	PGM
REVIEW	GWS
APPROVED	GWS

PROJECT
ABERFOYLE SOUTH LAKE PIT LICENCE APPLICATION
Comment Responses

TITLE
Modelled Bedrock Elevation

PROJECT No.	PHASE	Rev.	FIGURE
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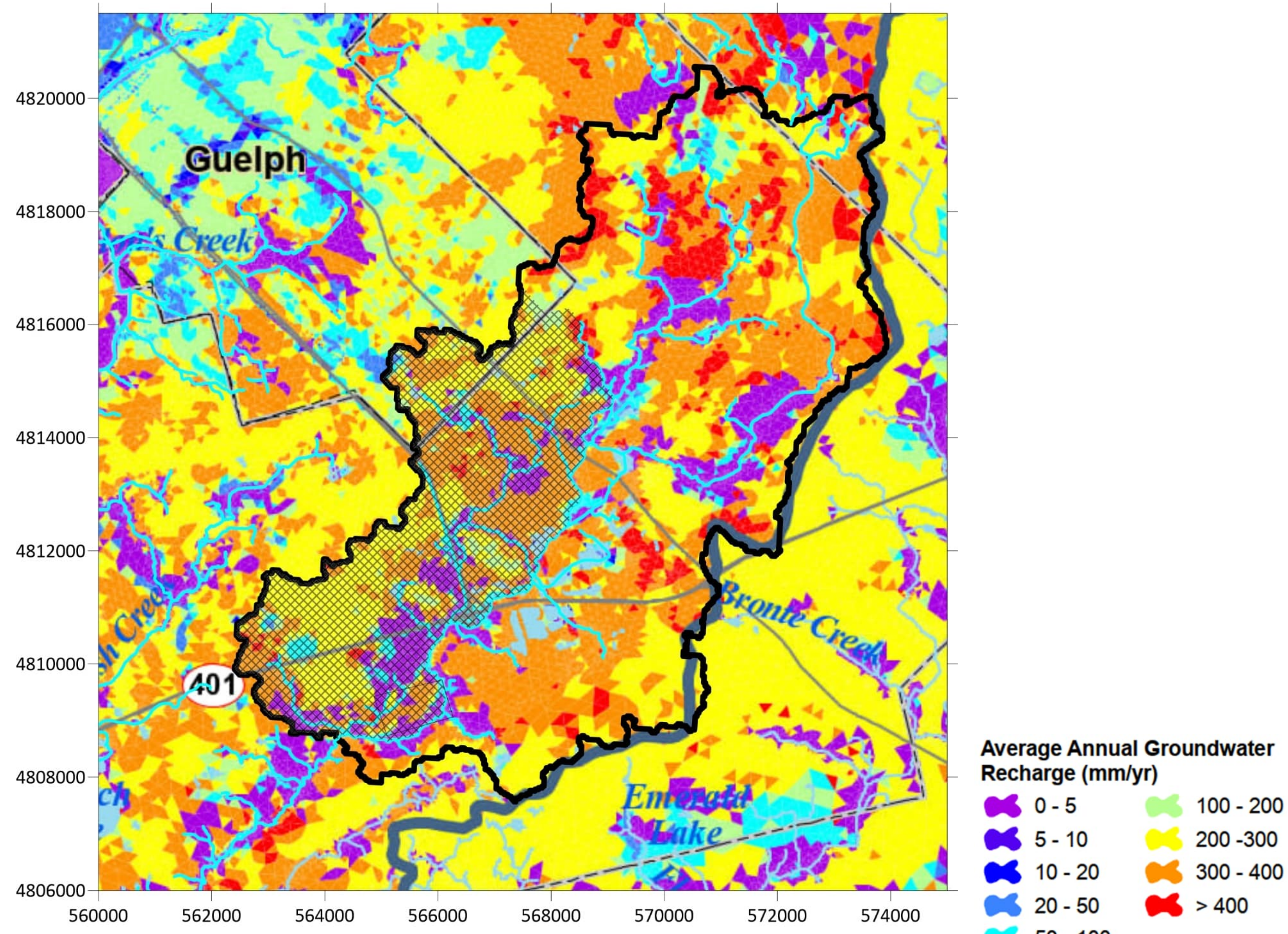
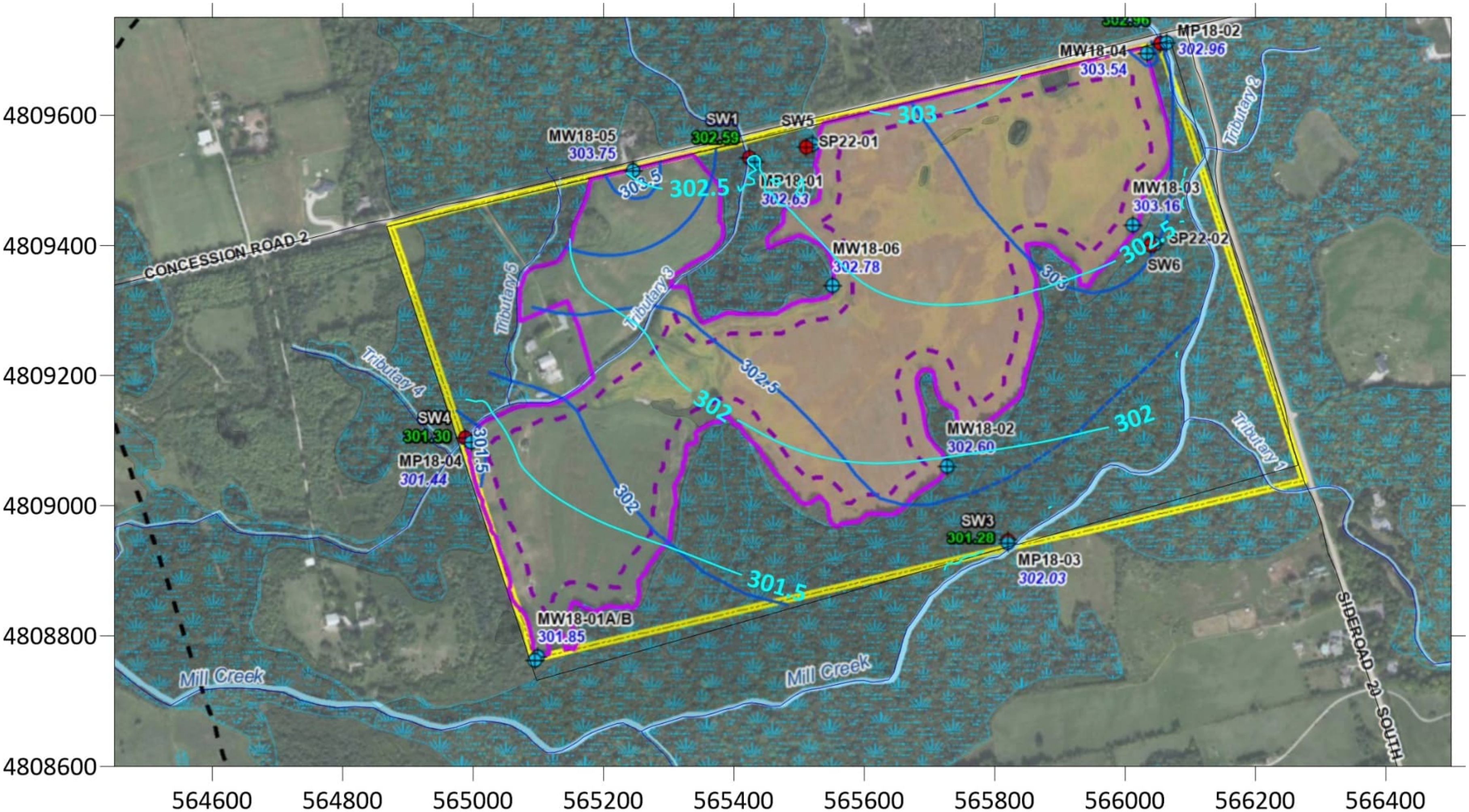


Note: Based on model described in the Water Report dated November 2023 (WSP 2023)

CLIENT CBM AGGREGATES (CBM), A DIVISION OF ST. MARYS CEMENT INC. (CANADA)	PROJECT **ABERFOYLE SOUTH LAKE PIT LICENCE APPLICATION** Comment Responses
CONSULTANT wsp YYYY-MM-DD 2025-04-08 PREPARED BM DESIGN PGM REVIEW GWS APPROVED	TITLE **Water Report Model Domain Superimposed on Tier 3 Model Recharge Distribution**
	PROJECT No. **1791470** PHASE **-** Rev. **A** FIGURE **7**



Notes:

1) Based on model described in the Water Report dated November 2023 (WSP 2023)
2) Simulated head contours shown in light blue / Observed head contours shown in dark blue.

CLIENT

CBM AGGREGATES (CBM), A DIVISION OF ST. MARYS CEMENT INC. (CANADA)

CONSULTANT

wsp

YYYY-MM-DD	2025-04-07
PREPARED	BM
DESIGN	PGM
REVIEW	GWS
APPROVED	

PROJECT

ABERFOYLE SOUTH LAKE PIT LICENCE APPLICATION

Comment Responses

TITLE

Model Simulated Head Contours vs. Average Observed Head Contours

PROJECT No.	PHASE	Rev.	FIGURE
1791470	-	A	8

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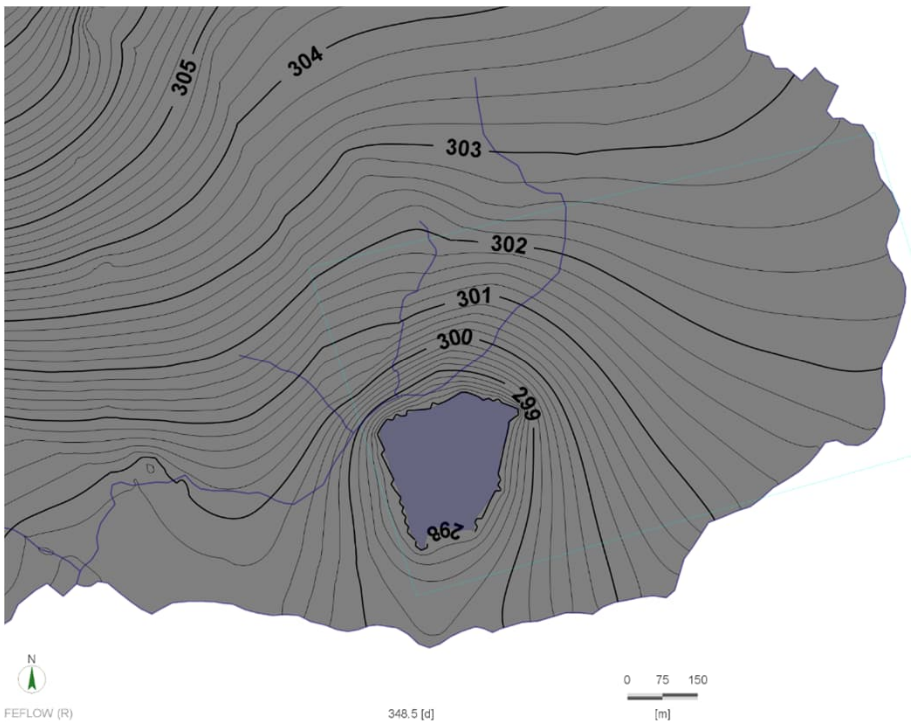
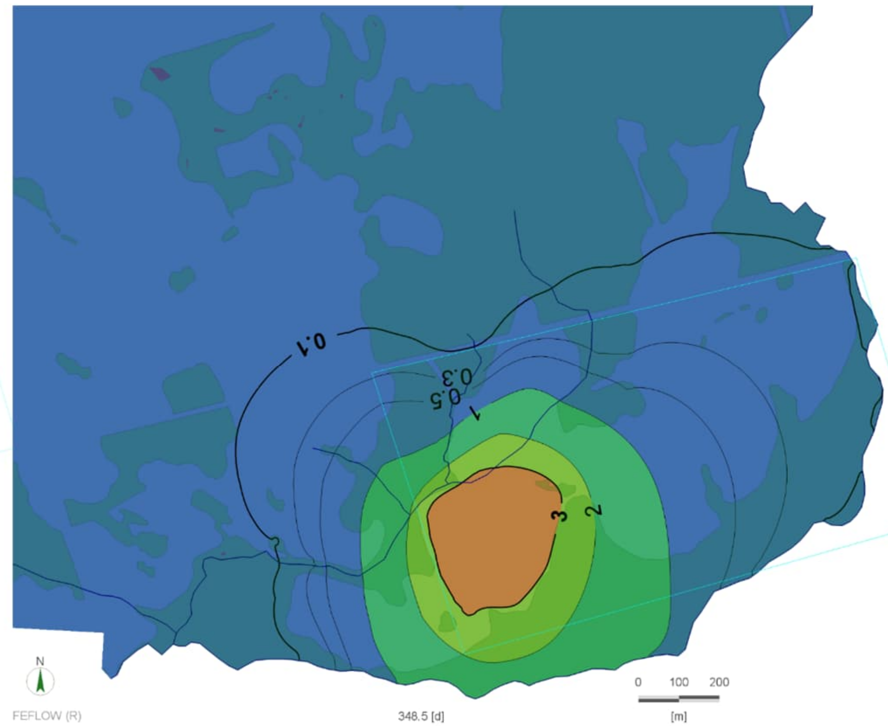
1 in

Model Predicted Head (masl)



Model Predicted Drawdown (m)



Note: Based on model described in the Water Report dated November 2023 (WSP 2023)

CLIENT CBM AGGREGATES (CBM), A DIVISION OF ST. MARYS CEMENT INC. (CANADA)	PROJECT **ABERFOYLE SOUTH LAKE PIT LICENCE APPLICATION** Comment Responses
CONSULTANT wsp YYYY-MM-DD 2025-04-07 PREPARED BM DESIGN PGM REVIEW GWS APPROVED	TITLE **Model Predicted Hydraulic Head and Drawdown at the End of Year 1 Operations**
	PROJECT No. **1791470** PHASE **-** Rev. **A** FIGURE **9**

ATTACHMENT 1

Potential Effects of Silt Deposition in the McNally Pond on Mill Creek Baseflow CBM McNally Pit - Aberfoyle Operations

REPORT

Potential Effects of Silt Deposition in the McNally Pond on Mill Creek Baseflow

CBM McNally Pit - Aberfoyle Operations

Submitted to:

CBM Aggregates, a Division of St. Marys Cement Inc. (Canada)

55 Industrial St.
Toronto, ON
M4G 2W9

Submitted by:

WSP Canada Inc.

6925 Century Avenue, Suite #100, Mississauga, Ontario, L5N 7K2, Canada

+1 905 567 4444

1774274A

January 2024

Distribution List

eCopy - CBM Aggregates

eCopy - WSP Canada Inc.

Table of Contents

TABLES

FIGURES (in order following text)

1.0 INTRODUCTION

WSP Canada Inc. (WSP) was retained by CBM Aggregates (CBM), a division of St. Marys Cement Inc. (Canada) to assess the potential for continued silt deposition in the aggregate wash ponds at the CBM McNally / Aberfoyle South Pits to adversely impact baseflow to Mill Creek. The McNally / Aberfoyle South pits are located northwest of the intersections of Concessions 2 and 7, Township of Puslinch, County of Wellington, Ontario (Figure 1).

1.1 Background

Baseflow is the groundwater contribution of total flow to a surface water feature. Changes to baseflow rates result from changes in groundwater and surface water elevations, changing the gradient between the groundwater system and the surface water feature, or changes in the hydraulic conductivity of the subsurface, resulting in higher or lower groundwater flow rates.

The potential concern of baseflow reduction to Mill Creek as a result of continued silt deposition was raised to the Township of Puslinch by Harden Environmental Services Ltd. (Harden) in their letter to the Township dated November 8, 2023 (Harden 2023). While Harden acknowledged that they generally concur with the hydrogeologic assessment presented by AECOM in their letter dated June 27, 2023 (AECOM 2023) that “aggregate activities have not significantly altered groundwater levels”, it is Harden’s opinion that continued silt deposition at the McNally / Aberfoyle South sites has yet to be adequately assessed and has the future potential to impact baseflow to specific reaches of Mill Creek.

1.2 Objective

The objective of this study was to review the most recent compilations of hydrogeologic data for the area (i.e. WSP 2023, AECOM 2023), develop a representative numerical groundwater flow model for the area of concern, and then utilize the model as a predictive tool to assess the potential for future baseflow changes to Mill Creek as a result of continued silt deposition in the CBM McNally and Aberfoyle Main pit ponds.

2.0 HYDROGEOLOGIC DATA REVIEW

2.1 AECOM (2023) - Response to Puslinch Township Review – CBM Aggregates McNally Pit Monitoring Report

A letter report dated June 27, 2023 was prepared by AECOM for CBM and provides a response to comments made by Harden on behalf of the Township of Puslinch regarding AECOM’s October 2022 monitoring report letter. In the June 27, 2023 response, AECOM presented a series of aerial images showing the development of pit operations in the Aberfoyle South Area from 2004 to 2022 and from that described a chronology of pit operations in the area. Their letter report also presented a series of hydrographs for monitoring wells in the area dating back to 2000 in some cases, along with precipitation records for the area over the same period of record.

AECOM assessed this information and found no correlation between aggregate washing operations in the McNally Pit and changes in groundwater or surface water levels or interactions. WSP reaches the same conclusion based our review of the data set presented by AECOM.

2.2 Dufferin Mill Creek Monitoring Report

The 2022 Coordinated Monitoring Report for the Dufferin Aggregates Mill Creek Pit and Appendices (WSP 2023) were reviewed. Key findings in the 2022 monitoring report are summarized as follows:

- Hydrology – Stream flow in Mill Creek responded to climatic conditions, including precipitation events, periods of snow melt and periods of low precipitation. Flow rates were observed to be within historical range observed since 2000. There was no indication that aggregate extraction has affected stream flow in Mill Creek.
- Groundwater – Groundwater levels, groundwater gradients, and baseflow to Mill Creek were found to be within historical ranges. There was one hydraulic gradient action threshold triggered in 2022, but it was triggered by a precipitation event and was not attributable to aggregate operations. Groundwater temperatures were influenced by the pit ponds; however, these effects were localized and there were no thermal impacts to Mill Creek. Groundwater quality remained consistent with previous years and there were no impacts attributable to aggregate operations.
- Fisheries – No impacts to the trout fishery in Mill Creek were identified.
- Conclusions and Recommendations – The available monitoring data do not indicate that the Mill Creek aggregate operation negatively impacted the local environment in 2022.

The Hydrogeology Report Appendix provided baseflow data for Mill Creek generally proximal and downstream of the CBM McNally Pit, of which the following was used as the calibration target for the numerical groundwater flow model to Mill Creek (Figure 2).

- Monitoring Sections DP19 to DP18 relate to modelled Mill Creek "Segment 3".
- Monitoring Sections DP17 to DP21, DP21 to DP20, and DP20 to DP19 relate to modelled Mill Creek "Segment 4".
- Baseflow estimates were provided for areas both North and South of Mill Creek; the South baseflow data was used as a calibration target for the numerical groundwater flow model.
- Historic Average Baseflow period covered the period of record from 1992 to 2021.

It is noted that average annual baseflow and seasonal baseflow has shown very significant variability over the period of record, and baseflows have been observed to vary by more than 100% from the long-term annual average.

3.0 GROUNDWATER FLOW MODEL

3.1 Overview

A 3D groundwater flow model was constructed using the control volume finite difference modelling code MODFLOW-USG. The groundwater flow model was conceptualized to represent a generalized version of site conditions and constructed / calibrated to hydrogeological conditions in the area. The groundwater flow model encompasses an area south of Mill Creek, including McNally Pond and some of the adjacent ponds, and includes hydrostratigraphic layering and pond bathymetry across the model footprint, as described below.

3.2 Assessment Approach and Numerical Model Construction

The 3D groundwater flow model was initially developed to simulate the current generalized site conditions and later, to assess the potential of impacts on the groundwater flow system by simulating continued silt deposition in the McNally Pond. Model calibration was completed with the primary focus to match historic baseflow estimates along sections of Mill Creek adjacent and proximal to McNally Pond as presented in the 2022 Mill Creek Aggregates monitoring report (WSP 2023). Hydrostratigraphy and boundary conditions in the model were selected to be representative of the key hydraulic features of interest in this predictive exercise.

3.2.1 Model Domain and Hydrostratigraphy

The numerical model domain covers an area of 10.9 km^2 as shown on Figure 1. The model footprint extends to Mill Creek in the north and the west, and extends a sufficient distance beyond the McNally / Aberfoyle South pit sites to the east and south to limit any potential influence of model boundaries on modelling results in the area of interest.

The model grid spacing used across the entire domain was 20 by 20 m. Vertically, the model layers were assigned hydraulic properties so as to represent the three major hydrostratigraphic units in the area (from ground surface downwards):

- A shallow overburden unit consisting primary of weathered till and coarse sand and gravel deposits.
- A basal till unit overlying the bedrock.
- A weathered bedrock unit overlying competent a bedrock unit.

Additional vertical discretization within these units was included in the model to allow the assignment of boundary conditions and material properties representing the pit ponds and silt deposits within the ponds across the model domain, where ponds and silt deposits were present.

The ground surface in the model was constructed using 0.5m resolution LiDAR DEM data for the area (MNRF 2019). The DEM was upscaled to a 10 m resolution for application herein. Within the McNally Pond, the pond bathymetry had been surveyed in 2021, and this bathymetric surface (Golder 2021) was used to represent the base of the pond.

3.2.2 Boundary Conditions

The perimeter of the model was assigned as a no-flow boundary, except where surface water features were present. Within the surface layer, Mill Creek was assigned as a constant elevation boundary with flow allowed to discharge to the Mill Creek from the groundwater system. All other surface water features (primarily pit ponds) were assigned a representative constant head water level based on available surface water survey information.

Model recharge was assigned based on the overburden material present in Model Layer 1. Regions within the model that were underlain by sand and gravel were expected to experience higher rates of recharge than those underlain by till and organic deposits. Recharge was applied as a specified flux boundary condition varying from 100 to 350 mm/year, with rates adjusted through the model calibration process.

Other pit ponds represented within the model domain were incorporated into the model by creating zones of greatly increased hydraulic conductivity where the ponds are located (i.e. to approximate the absence of solids in these ponds). These other pit ponds were assigned representative water depths varying between 5 and 15 m deep, as detailed bathymetric data was only available for the McNally Pond.

3.2.3 Model Parameters

Hydraulic conductivity values for the hydrostratigraphic units were initially assigned based on available hydrogeologic data for the area. During calibration, these hydraulic conductivities were refined to fit the observed baseflow estimates near the McNally Pond as stated in the 2022 Mill Creek Aggregates monitoring report (WSP 2023) and summarized in Table 1 below. Vertical anisotropy was assigned to the hydraulic conductivity of the overburden units to represent the presence of thin interbedded silt and clay layers within the native overburden and basal till units. Areas within the model domain where aggregate extraction has previously taken place and have been backfilled with finer grained materials, such as the Farhi Holdings property north of Mill Creek and west of Concession Road 7, were represented in the model as silt zones having a lower hydraulic conductivity.

Table 1: Layer Hydraulic Conductivities Utilized in the Groundwater Flow Model

Hydrostratigraphic Unit	K_{HOR} (m/s)	K_{VERT} (m/s)
Upper Overburden	1x10-5 to 2x10-4	2x10-6 to 1x10-4
Silt	1x10-6	1x10-6
Basal Till	2x10-8	2x10-9
Weathered Bedrock	1x10-5	1x10-5

3.2.4 Model Calibration to Baseflow

Numerical model calibration involved the systematic adjustment of material properties and/or boundary conditions to produce an acceptable match to observed groundwater conditions. **In this model, the main focus of calibration was to adjust the hydraulic conductivities and surface water boundary conditions to best match observed historic groundwater discharge (baseflow) conditions along Mill Creek proximal to the McNally Pond.** The baseflow calibration targets used for this predictive modelling exercise was the historical estimated average baseflow (1992 to 2021) rates discharging to Mill Creek from the south side of the creek along "Segment 3" and "Segment 4" of 80 and 380 m^3/day, respectively, as shown on Figure 2.

Table 2 presents a comparison of the average historic baseflow to the simulated baseflow in the base case model along Mill Creek Segments 3 and 4. While not an exact match, the simulated baseflow for the base case model reasonably approximates the historical average baseflows, although it under-simulates the baseflow in Segment 3 by ~26% while over-simulating the baseflow in Segment 4 by ~19%. Combining Segments 3 and 4 together, the base case model over-simulates the average annual baseflow to Mill Creek by 12%.

Table 2: Average Historic Baseflow vs. Simulated Baseflow (Base Case)

Mill Creek Segment	Average Historic Baseflow Estimate (m^3/day)	Simulated Baseflow (m^3/day)	% difference
Segment 3	80	59	-26%
Segment 4	380	454	+19%
Segments 3 & 4	460	513	+12%

While the model calibration is not exact, the base case model is sufficiently similar to average historic baseflows along these segments of Mill Creek to use the model as a predictive tool to evaluate potential changes in baseflow for silt deposition scenarios of interest.

3.3 Predictive Model Simulations

Following initial construction and calibration, the 3D groundwater flow model described above was used as the base case model to create predictive scenarios that simulated various silt deposition configurations within the McNally Pond, in order to see what the predicted changes to baseflow in Segments 3 and 4 of Mill Creek would be. To simulate various silt deposition scenarios in the model, the McNally Pond was first divided into three zones in plan view from east to west, designated Zones A, B and C, as shown on Figure 3, allowing these zones within the pond to be configured individually to create various silt deposition scenarios.

While a number of scenarios were simulated in this study, the following three scenarios emerged as being the most informative:

- Scenario 1 – Zones B and C partly filled with silt – This scenario simulates the entire base of the pond filled with a 2 m thick layer of silt, reducing the hydraulic connection between the pond and the underlying overburden and bedrock, but maintaining the lateral hydraulic connection between the pond and the adjacent overburden unit. This scenario is reflective of the Major Site Plan Amendment where Zone A is completely filled and settling of the silt beyond Zone A may occur as a result of the deposition (conservatively extending to Zone C).
- Scenario 2 – Zone B completely filled with silt; Zone C unfilled – This scenario simulates a larger portion of the pond being completely filled with silt, but Zone C is left unfilled, maintaining the hydraulic connection between the pond and adjacent and underlying overburden units. This scenario is possible but may be more difficult to achieve without the construction of a containment feature that prevents settling beyond Zone B.
- Scenario 3 – Zones B and C completely filled with silt – This scenario simulates the entire pond being filled with silt, displacing all the water in the pond. This scenario was completed as a bounding exercise to show the overall sensitivity to pond infilling in this area.

Note that in all cases (including the base case) Zone A was modelled as being completely filled with silt.

3.3.1 McNally Pond Scenario 1 – Zones B and C partly filled with silt

Scenario 1 includes the addition of ~2m of new silt deposited across the entire bottom of the McNally Pond in addition to the complete filling of Zone A. This scenario evaluates the groundwater flow system following silt deposition to limit the direct vertical connection between McNally Pond and the underlying overburden unit. Table 3 presents the change in baseflow observed at Mill Creek Segments 3 and 4. The combined change to baseflow along the Mill Creek segments of interest is an overall reduction in baseflow of -0.4%.

Table 3: Baseflow Comparison - Scenario 1 vs Base Case

Mill Creek Segment	Base Case (m^3/day)	Scenario 1 Baseflow (m^3/day)	% difference
Segment 3	59	59	+0.2%
Segment 4	454	452	-0.5%
Segments 3 & 4	513	511	-0.4%

3.3.2 McNally Pond Scenario 2 – Zone B completely filled with silt; Zone C unfilled

Scenario 2 includes the filling of the middle third of McNally Pond (Zone B) with silt (a thickness of ~10m) in addition to the complete filling of Zone A. This scenario evaluates the groundwater flow system following the removal of the lateral and vertical connection between the middle third of McNally Pond and the underlying overburden unit. Table 4 presents the change in baseflow observed at Mill Creek segments 3 and 4. Segment 3 shows increased baseflow compared to the base case while the combined change to baseflow along the Mill Creek segments of interest are an increase in baseflow of +0.6%.

Table 4: Baseflow Comparison - Scenario 2 vs Base Case

Mill Creek Segment	Base Case (m^3/day)	Scenario 2 Baseflow (m^3/day)	% difference
Segment 3	59	62	+5.0%
Segment 4	454	454	0%
Segments 3 & 4	513	515	+0.6%

3.3.3 McNally Pond Scenario 3 – Zones B and C completely filled with silt

Scenario 3 includes the filling of all of the McNally Pond (Zones A, B and C) with silt (a thickness of ~10m). This scenario evaluates the groundwater flow system following the removal of the lateral and vertical connections between the McNally Pond and the overburden unit. Table 5 presents the change in baseflow observed at Mill Creek segments 3 and 4. Scenario 3 results in similar reductions to baseflow in both Mill Creek Segment 3 and 4, with combined reduction to baseflow along the Mill Creek segments of interest of -3.8%.

Table 5: Baseflow Comparison - Scenario 3 vs Base Case

Mill Creek Segment	Base Case (m^3/day)	Scenario 3 Baseflow (m^3/day)	% difference
Segment 3	59	57	-3.0%
Segment 4	454	436	-3.9%
Segments 3 & 4	513	493	-3.8%

3.4 Supplemental Scenario – Infilling of the North Pond

A supplemental silt deposition scenario was also simulated, following discussions with CBM. In this supplemental scenario, assuming the starting conditions of the worst case scenario, Scenario 3 (McNally Pond completely filled), the wash pond on the northern part of the Aberfoyle South pit (the “North Pond”, Figure 1) was also completely filled with silt, and the predicted baseflow compared to Scenario 3.

The results for the additional infilling of the North Pond are presented in Table 6 and suggest that silt deposition in the North Pond has a negligible effect on the baseflow in Segments 3 and 4 of Mill Creek.

Table 6: Baseflow Comparison - Supplemental Scenario – Additional Infilling of North Pond vs Scenario 3

Mill Creek Segment	Scenario 3 (m^3/day)	Additional Infilling of North Pond - Baseflow (m^3/day)	% difference
Segment 3	57	56	-1.2%
Segment 4	436	439	+0.7%
Segments 3 & 4	493	495	+0.4%

4.0 SUMMARY

WSP's review of the hydrogeologic data presented in the AECOM (2023) and WSP (2023) reports for monitoring at the CBM McNally Pit and the Dufferin Mill Creek Pit sites indicates that aggregate extraction and washing activities in the Aberfoyle South area have not had a significant impact on groundwater levels in the area or baseflow to Mill Creek. This conclusion is consistent with that stated by others (e.g. AECOM 2023, WSP 2023, Harden 2023).

Predictive models were used to simulate future silt deposition scenarios in the McNally Pond and these simulations predicted only a worse case ~3.8% potential reduction in baseflow to Mill Creek in the scenario where the McNally Pond was completely filled with silt from aggregate washing. This predicted reduction in baseflow is very small when compared to the natural variation in baseflow in these areas of Mill Creek that occurs seasonally and year over year during the last 20-year period. The data clearly shows that groundwater levels and baseflow are primarily influenced by climate inputs (i.e., precipitation) and slight changes to the groundwater flow system as a result of silt deposition into the CBM pit ponds are not a significant factor by comparison. The reflective Major Amendment scenario, yet still conservative due to the assumption of migrating silt into Zones B and C, Scenario 1, indicates essentially no change to baseflow with the results showing an overall potential reduction of ~0.4%.

5.0 REFERENCES

AECOM Canada Ltd., 2023. Response to Puslinch Township Review – CBM Aggregates McNally Pit Monitoring Report – October 12, 2022. Letter report dated June 27, 2023. 22p.

Golder Associates Ltd. (Golder), 2021. Aberfoyle Property Bathymetric Survey. Report dated June 23, 2021. 13p.

Harden Environmental Services Ltd. (Harden), 2023. McNally Pit Monitoring Report Update – Lanci Expansion Area Processing Issue. Letter dated November 8, 2023. 3p.

Ontario Ministry of Natural Resources and Forestry (MNRF), 2019. Base Data – Land Information Ontario, Ontario Digital Terrain Model (Lidar-derived).

WSP Canada Inc. (WSP), 2023. Mill Creek Aggregates Pit - 2022 Coordinated Monitoring Report / Mill Creek Aggregates Pit Hydrogeology – Appendix B. Prepared for Dufferin Aggregates, A division of CRH Canada Inc. Project No.: 111-52958-14-100. March 29, 2023.

Signature Page

We trust that this report meets your current needs. If you have any questions or require additional information, please contact the undersigned at your earliest convenience.

WSP Canada Inc.

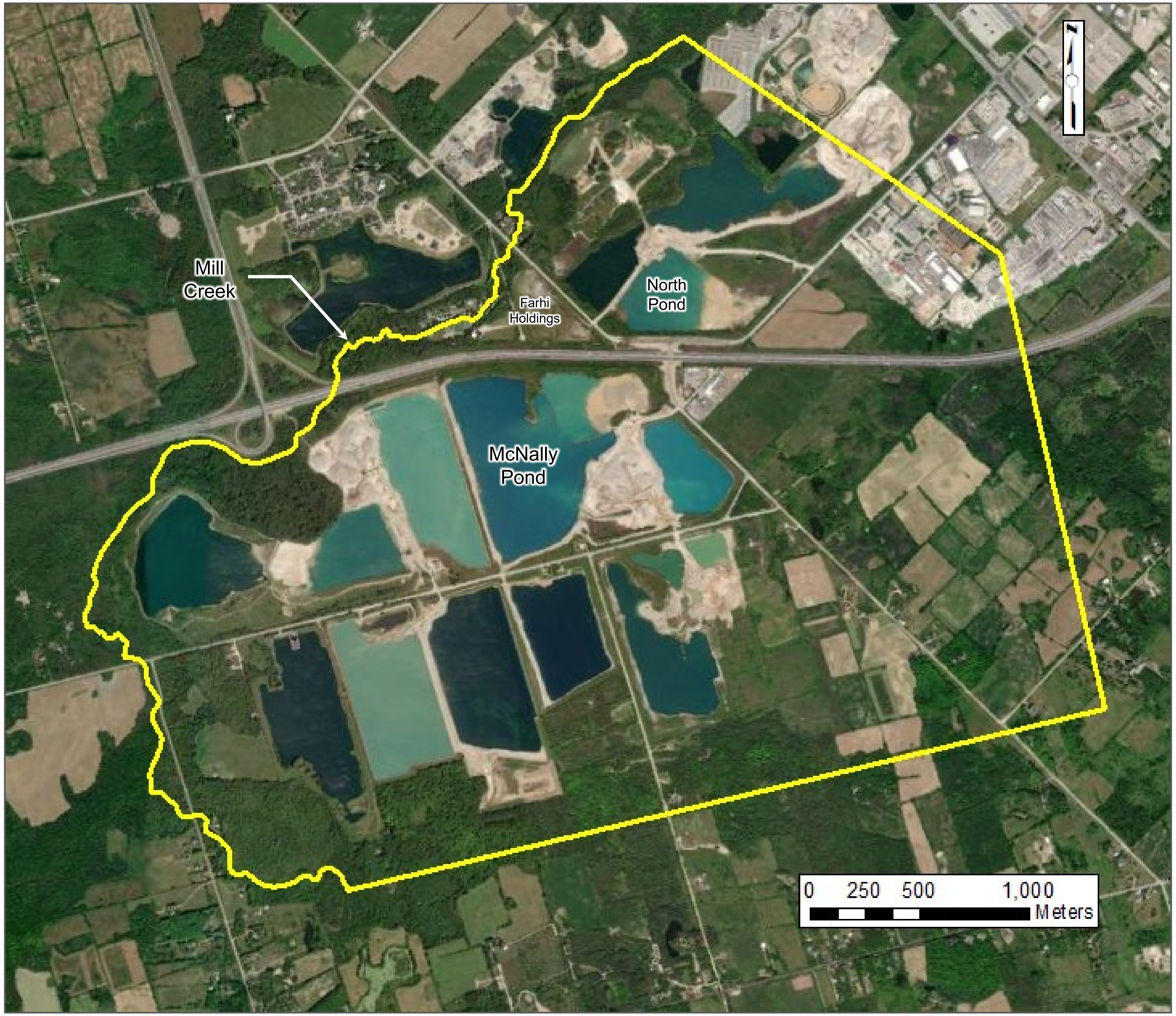
[redacted] [redacted]

Jeff Randall P.Eng.
Senior Hydrogeologist

George Schneider P.Geo.
Senior Geoscientist

SK/JR/GWS/

https://golderassociates.sharepoint.com/sites/11897g/1774274a/10 mcnally pit silt issues/09_reporting/1774274a rpt cbm mcnally silt ponds jan2024 r1a.docx



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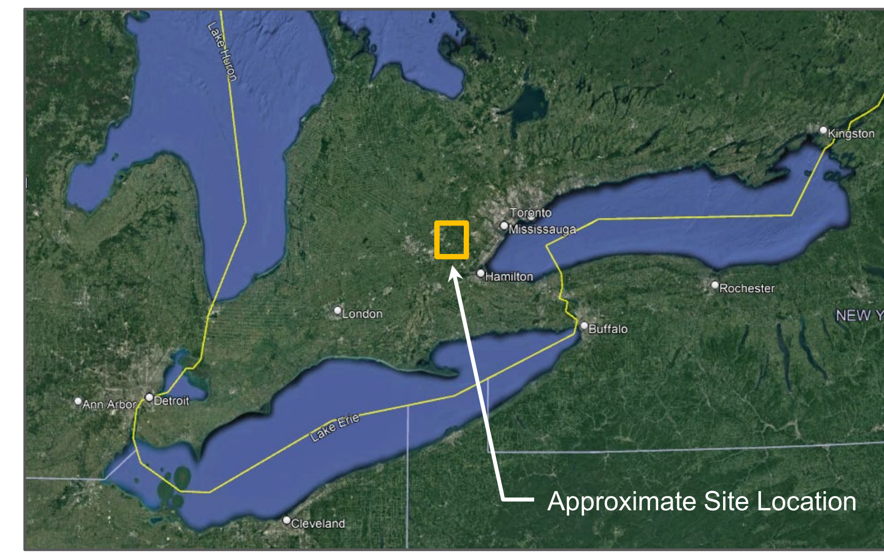
Area of Interest / Numerical Model Boundary



REFERENCES

1. Imagery Credits: ArcGIS Online Basemap, Google Earth
2. Coordinate System: NAD 1983 UTM Zone 17N
3. Vertical Datum: CGVD28

NOTES

1. All locations are approximate

CLIENT
CBM Aggregates

PROJECT
CBM McNally / Aberfoyle South Pit
McNally Pond Silt Deposition

CONSULTANT

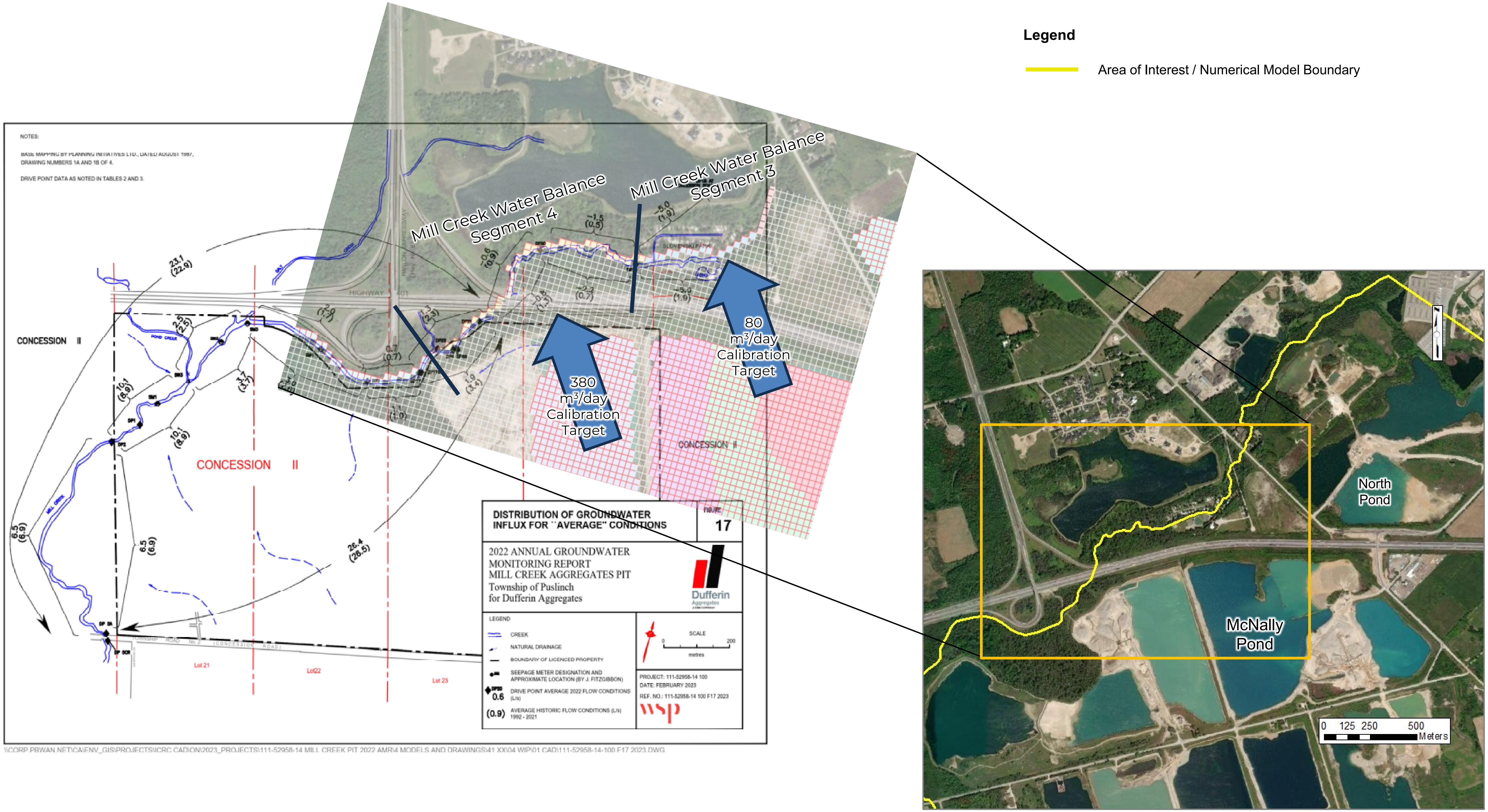
YYYY-MM-DD	2024-01-17
PREPARED	JER
DESIGN	JER
REVIEW	GWS
APPROVED	GWS

TITLE
MCNALLY / ABERFOYLE SOUTH STUDY AREA AND MODEL DOMAIN

PROJECT No. 1774274A
Rev. A
FIGURE 1

Legend

Area of Interest / Numerical Model Boundary



REFERENCES	NOTES
1. Imagery Credits: ArcGIS Online Basemap	1. Baseflow calibration targets for Water Balance Segments 3 and 4 were established based on historical (1992-2021) baseflow conditions from the south of Mill Creek (Table 3, Appendix B - WSP, 2023)
2. Coordinate System: NAD 1983 UTM Zone 17N	
3. Vertical Datum: CGVD28	

CLIENT
CBM Aggregates

PROJECT
CBM McNally / Aberfoyle South Pit
McNally Pond Silt Deposition

CONSULTANT

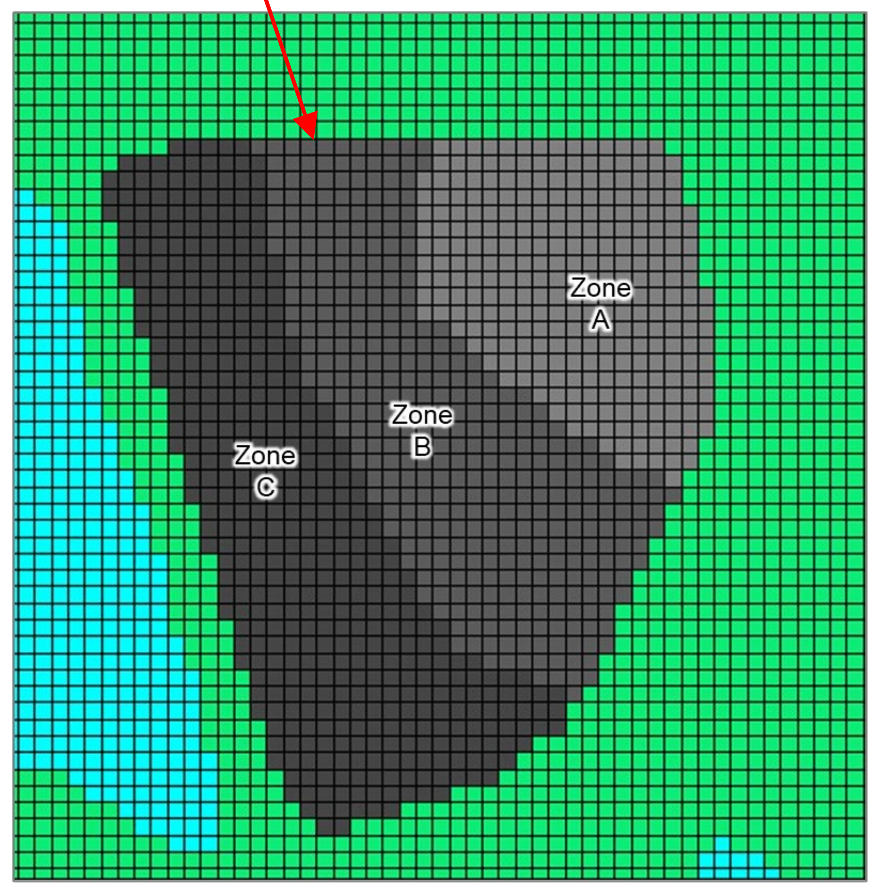
wsp

YYYY-MM-DD	2024-01-17
PREPARED	JER
DESIGN	JER
REVIEW	GWS
APPROVED	GWS

TITLE
MILL CREEK SEGMENTS 3 AND 4 WITH BASEFLOW CALIBRATION TARGETS

PROJECT No. 1774274A Rev. A

McNally Pond Silt Zones



Base Case – Current Conditions (Zone A filled with silt)

	Zone C	Zone B	Zone A
Model Layer 1	Pond (water)	Pond (water)	Silt
Model Layer 2	Pond (water)	Pond (water)	Silt
Model Layer 3	Pond (water)	Pond (water)	Silt
Model Layer 4	Pond (water)	Pond (water)	Silt
Model Layer 5	Pond (water)	Pond (water)	Silt
Model Layer 6	Overburden	Overburden	Overburden

Scenario 1 – Zones B and C filled with 2m of silt

	Zone C	Zone B	Zone A
Model Layer 1	Pond (water)	Pond (water)	Silt
Model Layer 2	Pond (water)	Pond (water)	Silt
Model Layer 3	Pond (water)	Pond (water)	Silt
Model Layer 4	Pond (water)	Pond (water)	Silt
Model Layer 5	Silt	Silt	Silt
Model Layer 6	Overburden	Overburden	Overburden

Scenario 2 – Zone B filled with silt

	Zone C	Zone B	Zone A
Model Layer 1	Pond (water)	Silt	Silt
Model Layer 2	Pond (water)	Silt	Silt
Model Layer 3	Pond (water)	Silt	Silt
Model Layer 4	Pond (water)	Silt	Silt
Model Layer 5	Pond (water)	Silt	Silt
Model Layer 6	Overburden	Overburden	Overburden

Scenario 3 – Zones B and C filled with silt (pond completely filled)

	Zone C	Zone B	Zone A
Model Layer 1	Silt	Silt	Silt
Model Layer 2	Silt	Silt	Silt
Model Layer 3	Silt	Silt	Silt
Model Layer 4	Silt	Silt	Silt
Model Layer 5	Silt	Silt	Silt
Model Layer 6	Overburden	Overburden	Overburden

NOTES AND REFERENCES

1. Imagery Credits: ArcGIS Online Basemap
2. Coordinate System: NAD 1983 UTM Zone 17N
3. Vertical Datum: CGVD28

LEGEND

- Pond (water)
- Silt
- Overburden

CLIENT
CBM Aggregates

PROJECT
CBM McNally / Aberfoyle South Pit
McNally Pond Silt Deposition

CONSULTANT
wsp

YYYY-MM-DD	2024-01-17
PREPARED	JER
DESIGN	JER
REVIEW	GWS
APPROVED	GWS

TITLE
MCNALLY POND SILT ZONES A, B AND C AND PREDICTIVE MODEL SCENARIOS

PROJECT No. 1774274A
Rev. A

ATTACHMENT 2

Supplemental Assessment and Mitigation of Post-Rehabilitation Groundwater Uplift - Proposed CBM Aberfoyle South Lake Pit

TECHNICAL MEMORANDUM

DATE October 21, 2025 **Project No.** CA-GLD-1791470A-VCNA

TO Andreanne Simard - Director of Lands, Resources and Environment,
Stephen May - Lands Manager, Western Region
CBM Aggregates
CC George Schneider, Daniel Eusebi

FROM Paul Menkveld **EMAIL** Paul.Menkveld@wsp.com

SUPPLEMENTAL ASSESSMENT AND MITIGATION OF POST-REHABILITATION GROUNDWATER UPLIFT – PROPOSED CBM ABERFOYLE SOUTH LAKE PIT

In December 2023, CBM Aggregates (CBM), a division of St. Marys Cement Inc. (Canada) submitted an Aggregate Resources Act application to licence the proposed Aberfoyle South Lake Pit, located at 6947 Concession Road 2, in the Township of Puslinch, County of Wellington, Ontario. WSP Canada Inc. (WSP) prepared a Level 1/2 Water Report (Water Report) and Natural Environment Report to support this application. Stakeholder comments have been received pertaining to various aspects of the application and reports.

In response to Stakeholder comments, this technical memorandum provides a supplemental assessment and mitigation plan to address the predicted increase in post-rehabilitation groundwater levels ("groundwater uplift") immediately downgradient of the pit pond, which has the potential for occasional flooding to occur on low lying adjacent lands during periods of high groundwater levels (e.g. during the spring freshet).

BACKGROUND

As discussed in the Water Report, during aggregate extraction below the water table, a pit pond is gradually formed as extraction proceeds, which typically results in a "flattening" of the water table relative to pre-extraction conditions, with drawdown on the upgradient side, and groundwater uplift on the downgradient side. Water table flattening that is predicted to occur at the site is presented on Figure 14b in Appendix G of the Water Report, and again on Figure 1 below.

Numerical modelling simulations predict post-rehabilitation groundwater uplift at the site of approximately 0.6 m to occur immediately southwest of the proposed pit pond beyond the property limits, as shown on Figure 1. While the steady state groundwater level in this area is predicted to be below the ground surface, when seasonal variability is considered (approximately +/- 0.3 m annually at nearby MW18-01B) there is a potential for occasional flooding to occur on adjacent low lying lands during periods of high groundwater levels (e.g. during the spring freshet).

SUPPLEMENTAL ASSESSMENT AND PROPOSED MITIGATION

To address this potential impact, the installation of a tile drain is proposed in this area as a mitigation measure, to reduce the risk of occasional flooding on the neighbouring property, as shown on Figure 2. The tile drain would be installed in the setback area, between the pit pond to the east and the licence / property limit to the west.

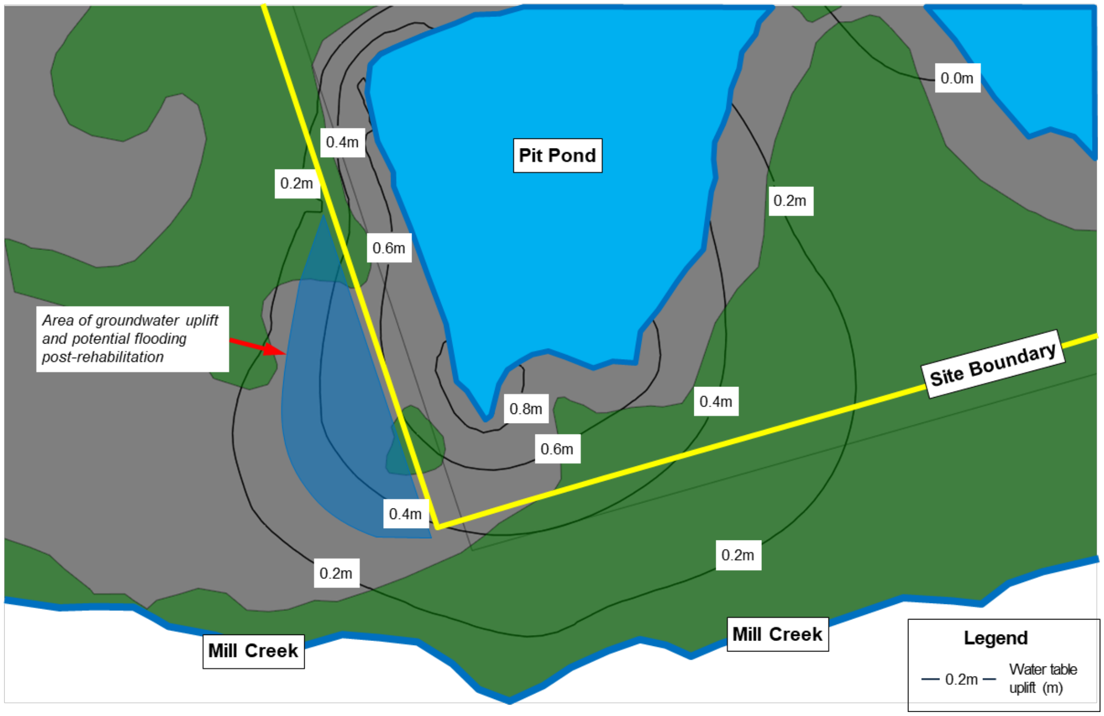


Figure 1: Numerical simulation results predicting an area of post-rehabilitation groundwater uplift, which could create minor flooding in during seasonal periods of a high water table.

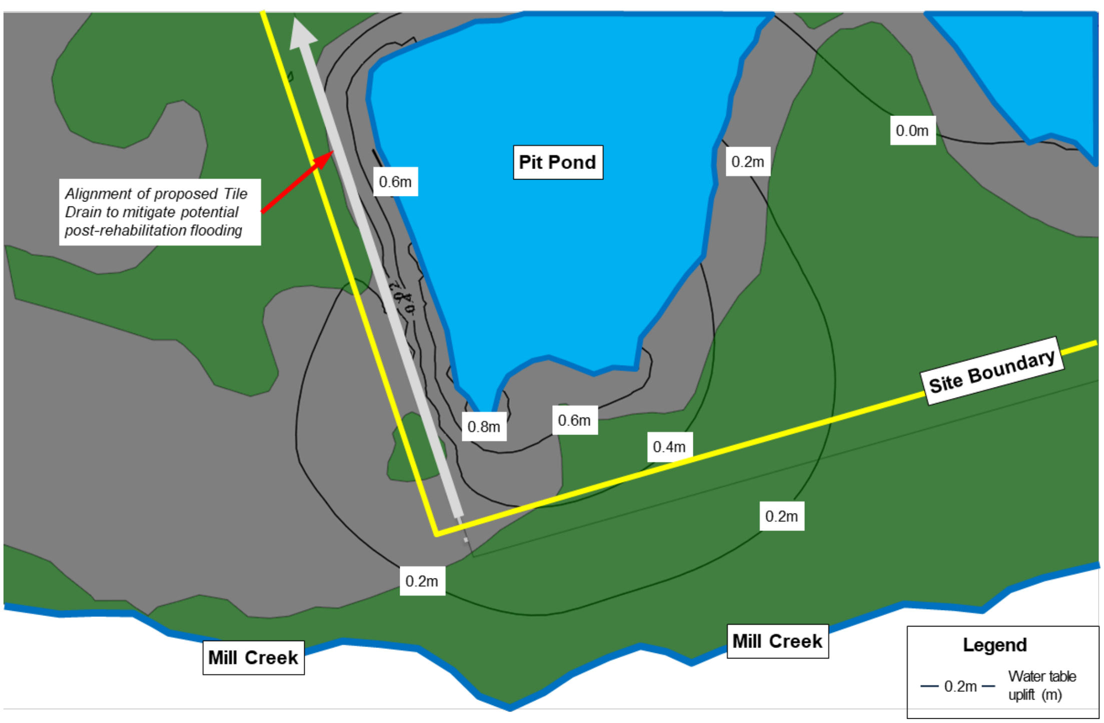


Figure 2: Numerical simulation of the installation of a tile drain to alleviate localized post-rehabilitation groundwater uplift and mitigate the potential for flooding during periods of a high water table.

This tile drain would convey excess groundwater through the subsurface during high water table periods in a northward direction, with excess groundwater reporting to Tributary 3 as additional baseflow. A detailed plan view of the proposed tile drain alignment, and a schematic cross section of the tile drain's configuration are shown on Figure 3 and would generally be constructed as follows.

- Excavation of V-shaped trench with 1:1 side slopes to an elevation of 301.25 masl, with a 200 to 300 mm perforated tile drain placed near the base of the trench.

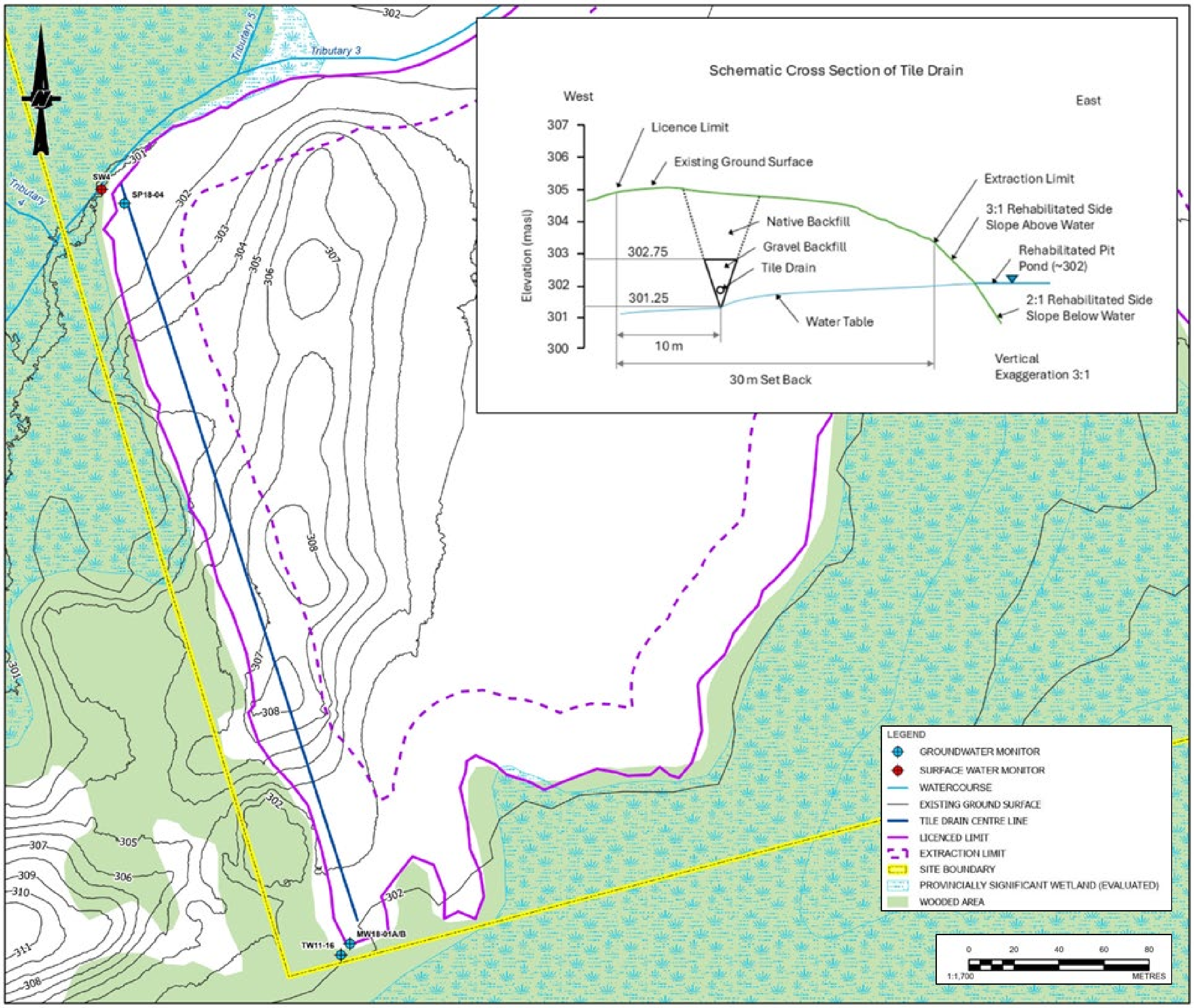


Figure 3: Proposed Tile Drain Alignment and Cross Section Detail

- The ground surface along the alignment ranges from approximately 301.25 masl at the northern end to approximately 308 masl at the crest of a hill, back down to 302 masl at the south end of the tile drain.

- The tile drain will be approximately 350 m long and positioned in the setback area approximately 10 m east of the western licence limit.
- The trench walls will be lined with a non-woven geotextile liner and backfilled with a clean coarse grained granular material (e.g. 19 mm clear stone) up to a height of 1.5 m from the bottom of the trench.
- Non-woven geotextile liner will also be placed on top of the backfill to prevent fines from above entering the tile drain.
- The trench will be backfilled above the non-woven geotextile with native materials removed from the setback, such that no extraction is taking place in the set backs.
- The toe of the tile drain will terminate proximal to Tributary 3 on a rip-rap outfall apron, allowing excess water discharge to the stream as baseflow. No adverse impact to surface water quality in Tributary 3 is anticipated as the tile drain will receive clean cool groundwater from the subsurface and transmit it along.
- It is proposed that the drain will be constructed prior to the commencement of operations, to permit the naturalization of the setbacks during the operational period, without the need to disturb the setback in this area during rehabilitation. As groundwater uplift is not predicted during operations, the tile drain is not predicted to consistently convey water during the operational period and would begin to passively operate once aggregate extraction ceases and groundwater levels increase toward their post-rehabilitation levels.

Additional numerical modelling simulations were run for post-rehabilitation conditions with the tile drain in place, and the simulations show that the tile drain will limit groundwater levels to 301.25 masl along the alignment and thereby limit potential off-site groundwater uplift to approximately 0.25 m. Groundwater inflow to the tile drain is predicted to be approximately 212 m^3/day in a steady state.

The implications of the installation of a tile drain to baseflow along reaches of Tributary 3 and Mill Creek were also evaluated as part of the numerical modelling simulations under post-rehabilitation conditions.

- With reference to Figure 4 and Table 1, the numerical simulations suggest that of the groundwater that reports to the tile drain (212 m^3/day), most of that groundwater would have otherwise discharged to the low-lying area of groundwater uplift and 6 m^3/day would have reported to Mill Creek as groundwater discharge.
- The implementation of the tile drain mitigation effectively transfers a small portion of groundwater from Mill Creek to Tributary 3 along the reach between the toe of the drain (near SW4), and the confluence of Tributary 3 and Mill Creek (approximately 750 m downstream at SW-M1 to SW-M3).
- When compared to the original post-rehabilitation scenario (i.e. with no tile drain), there is an increase in baseflow of 14% predicted to Tributary 3 (at SW-M1) and negligible decrease in Mill Creek upstream of the confluence (at SW-M2). The downstream of the confluence (at SW-M3) the tile drain scenario results in a slight net increase in baseflow (1.4%) to the overall system.

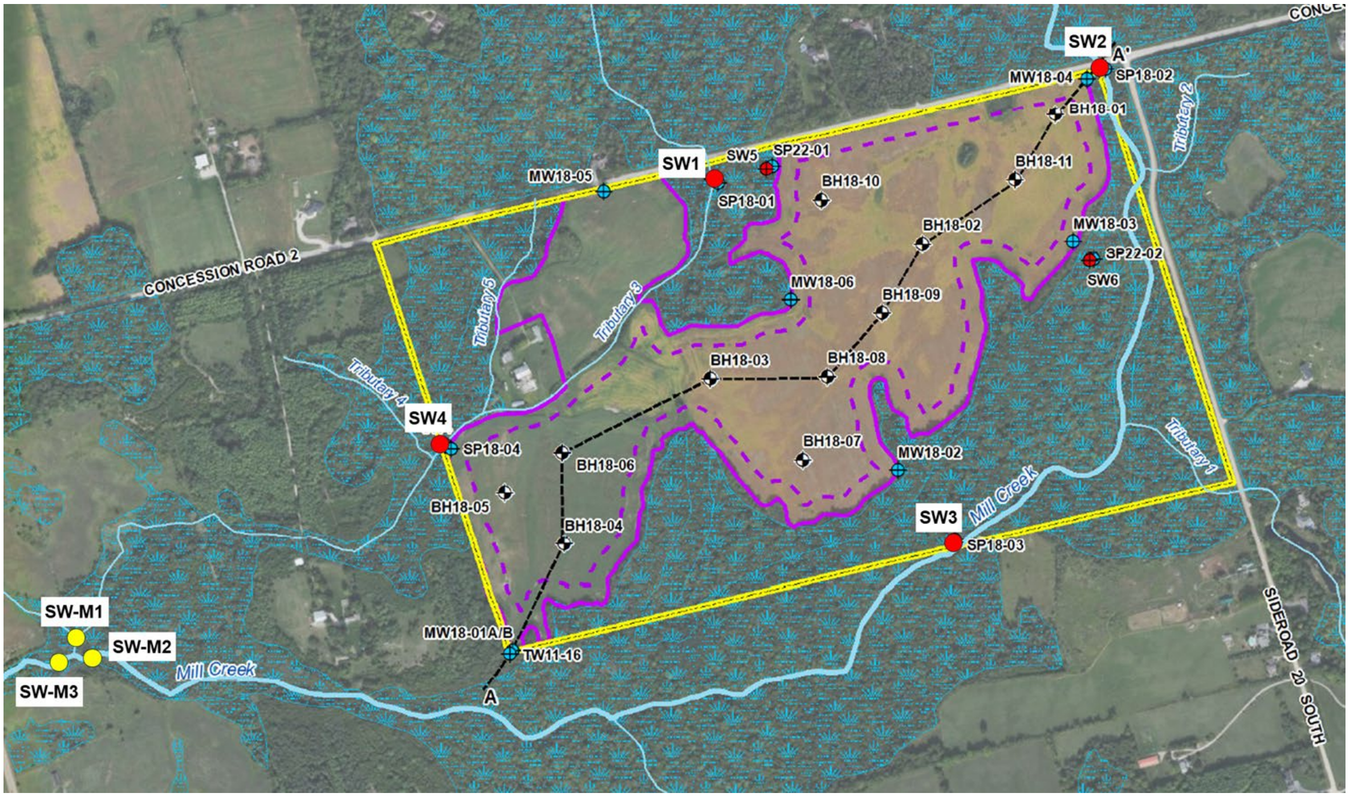


Figure 4: Surface Water Stations on Mill Creek and Tributary 3 (SW1 to SW4), and modelled surface water stations (SW-M1 to SW-M3) at the confluence of Tributary 3 and Mill Creek.

Table 1: Simulated Baseflow at Mill Creek and Tributary 3 Surface Water Stations - Current Conditions and Post-Rehabilitation with Tile Drain Mitigation.

	Station ID	Description	Pre-Pit Baseflow Contribution (m^3/day)	Rehabilitated			Rehabilitated with Tile Drain Mitigation		
				Baseflow (m^3/day)	Change in Baseflow (m^3/day)		Baseflow (m^3/day)	Change in Baseflow (m^3/day)	
Tributary 3	SW1	Upper Tributary 3	611	561	- 50	-8%	561	-50	-8%
	SW4	Site Boundary Tributary 3	1,072	1,033	-39	-4%	1,223	151	14%
	SW-M1	Downstream Tributary 3	1,303	1,393	90	7%	1,583	280	21%
Mill Creek	SW2	Upper Mill Creek	9,741	9,686	-55	-1%	9,686	-55	-1%
	SW3	Site Boundary Mill Creek	9,870	8,725	-1145	-12%	8,725	-1145	-12%
	SW-M2	Mill Creek Downstream of Site Boundary (upstream of Tributary 3)	10,284	10,209	-75	-1%	10,203	-81	-1%
Mill Creek and Tributary 3	SW-M3	Mill Creek Downstream of Tributary 3 Confluence	13,677	13,689	12	0.1%	13,873	196	1.4%

IMPACTS ON BUFFER ZONE

The current buffer area is an active crop production area that is subject to annual ploughing, cultivating, and planting. The area occurs on a higher elevation of land relative to the surrounding lands. The proposed tile drain alignment would be installed in a trench at depth as shown as Figure 3 prior to the on-set of operation and prior to the need for the buffer. The area would be excavated to the noted depth, the tile drain installed, and the material replaced its original elevation and topography. Generally, there are no concern with this pre-operations work in this agricultural setting, and the installation would be generally consistent with activities that are actively undertake year to year under current agricultural practice with the implementation of several mitigation measures as follows:

- Strip topsoil and temporarily store separately from subsoils
- Spoils pile should be stored on the east side of the trench away for the woodland and wetland edge
- Erosion control setting silt fencing should be installed as required to ensure no erosion or sediment transport for the temporary spoils piles enter the wetland areas.
- Work to be completed in the shortest period possible, limiting the period of open trench and spoil piles.
- Work to be scheduled during period of forecasted low, or preferably no, precipitation periods.
- Backfilling the original grade to be completed immediately after drain installation and subsoil replaced and topsoil used to cap the trench area.
- The rehabilitation of the trench area and temporary work area be restored and managed as outline in the following section of this technical memorandum.

REHABILITATION AND ENHANCEMENT PLAN

The area of the trench and temporary work area within the future buffer area will be created similar to other buffer areas on the Site, to offer an enhancement to the area and surrounding landscape. Principle initiatives to create a stable and improved near wetland environment are as follows:

- In areas where subsoil with low organic content are exposed to the surface, ensure topsoil is replaced over the excavation to allow for a good growing media and reduce the propagation of invasive species that can out compete other plants;
- Install temporary silt fencing as necessary until the proposed plantings become established and self-sustaining within the vicinity of the trench;
- Plant exposed soils with an oat cover crop for temporary stabilization;
- Plant entire buffer with a native seed herbaceous cover mix for upland areas and addition of milk weed to enhance area for Monarch Butterfly habitat;
- Plant a low-density native shrub and tree compliment within the buffer zone to supplement the native herbaceous plantings;
- Transfer the currently proposed wetland enhancement in the southwest buffer area to a new proposed location coincident with and adjacent to with wetland feature to the east of the trench and in the open agricultural field, as shown on the revised Site Plans;
- Monitor the site for signs of rill and other erosion until the area has stabilized and vegetation within the buffer has become established and self-sustaining;
- Monitor wetland edge for signs of erosion and sedimentation. Correct any potential issue and restabilize and plant areas; and
- Monitor the newly planting buffers for invasive species and if needed initiate an invasive species control program.

SUMMARY

A tile drain is proposed as a mitigation to address post-rehabilitation groundwater uplift downgradient and west of the site and thereby limit the potential for flooding to occur in low-lying areas on the adjacent property during high groundwater table periods. The tile drain will also have the net benefit of increasing baseflow to Tributary 3 and will also result in a slight net increase in baseflow to Mill Creek, as simulated downgradient of the site at the confluence of Tributary 3 and Mill Creek.

The tile drain system will be installed as pre- operation activity within the currently active farm field. During construction, standard mitigation measures related to sediment and erosion control will be implemented to protect the adjacent feature and work will be completed in expediate manner to reinstate general topography and reduce the period of construction. The trench area will be restored and rehabilitated, as part of the buffer creation process, will involve the planting of native flora, enhancement planting such a milkweed and a monitoring program to assess the success of the plantings, monitor for erosion and sediment transport, and invasive species control. Agricultural activities will no longer occur with the buffer area, and this area will be permanently part of the natural heritage wetland/woodland area. A wetland pocket will be created along the wetland/woodland edge directly to the east of the lower trench area, coincident with the natural heritage feature edge on the east side on the agricultural field.

CLOSURE

We trust that this technical memorandum meets your current needs. If you have any questions or require clarification, please contact the undersigned at your earliest convenience.

WSP Canada Inc.

[redacted] [redacted]

Paul Menkveld, M.Sc., P.Eng.
Hydrogeological Engineer

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PGM/GWS/DE/rk

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ATTACHMENT 3

Supplemental Assessment of Potential Impacts to Baseflow in Mill Creek and Tributary 3 – Proposed CBM Aberfoyle South Lake Pit

TECHNICAL MEMORANDUM

DATE October 21, 2025 **Project No.** CA-GLD-1791470A-VCNA

TO Andreanne Simard - Director of Lands, Resources and Environment
Stephen May - Lands Manager, Western Region
CBM Aggregates
CC George Schneider, Dan Eusebi, Warren Aken

FROM Paul Menkveld **EMAIL Paul.Menkveld@wsp.com**

SUPPLEMENTAL ASSESSMENT OF POTENTIAL IMPACTS TO BASEFLOW IN MILL CREEK AND TRIBUTARY 3 – PROPOSED CBM ABERFOYLE SOUTH LAKE PIT

In December 2023, CBM Aggregates (CBM), a division of St. Marys Cement Inc. (Canada) submitted an Aggregate Resources Act application to licence the proposed Aberfoyle South Lake Pit, located at 6947 Concession Road 2, in the Township of Puslinch, County of Wellington, Ontario. WSP Canada Inc. (WSP) prepared a Level 1/2 Water Report (Water Report) and Natural Environment Report to support this application. Stakeholder comments have been received pertaining to various aspects of the application and reports.

A number of comments from stakeholders expressed concern regarding the potential for impacts to baseflow in Mill Creek and Tributary 3 as a result of the proposed aggregate pit development post-rehabilitation. This technical memorandum provides a supplemental assessment of these potential impacts, in order to provide clarity and context to the predicted changes to baseflow.

BACKGROUND

During hydrological and hydrogeological investigations at the Site, surface water monitoring stations were established along Mill Creek (SW2 and SW3) and Tributary 3 (SW1 and SW4) at the locations shown on Figure 1. The purpose of these stations was to gather baseline data on the site including stream levels, stream flows, shallow groundwater levels, and water temperatures. A groundwater flow model was developed for the site and was calibrated groundwater levels under current conditions. The groundwater flow model was also used to estimate baseflow at these surface water stations under current conditions, and under rehabilitation conditions (i.e. aggregate extraction has been completed).

A key findings of the model simulations presented in the Water Report was that baseflow (i.e. groundwater discharge to surface water features) is redistributed along Tributary 3 and Mill Creek under post-rehabilitation relative to current conditions, but the overall change in baseflow within the system as a whole as a result of the proposed aggregate development was small. Post-rehabilitation baseflow decreases in the reach of Mill Creek between SW2 and SW3 and increases in the reach of Mill Creek downstream of SW3. Similarly, post-rehabilitation baseflow in Tributary 3 decreases in the reach between SW1 and SW4 and increases in the reach between SW4 and Mill Creek.

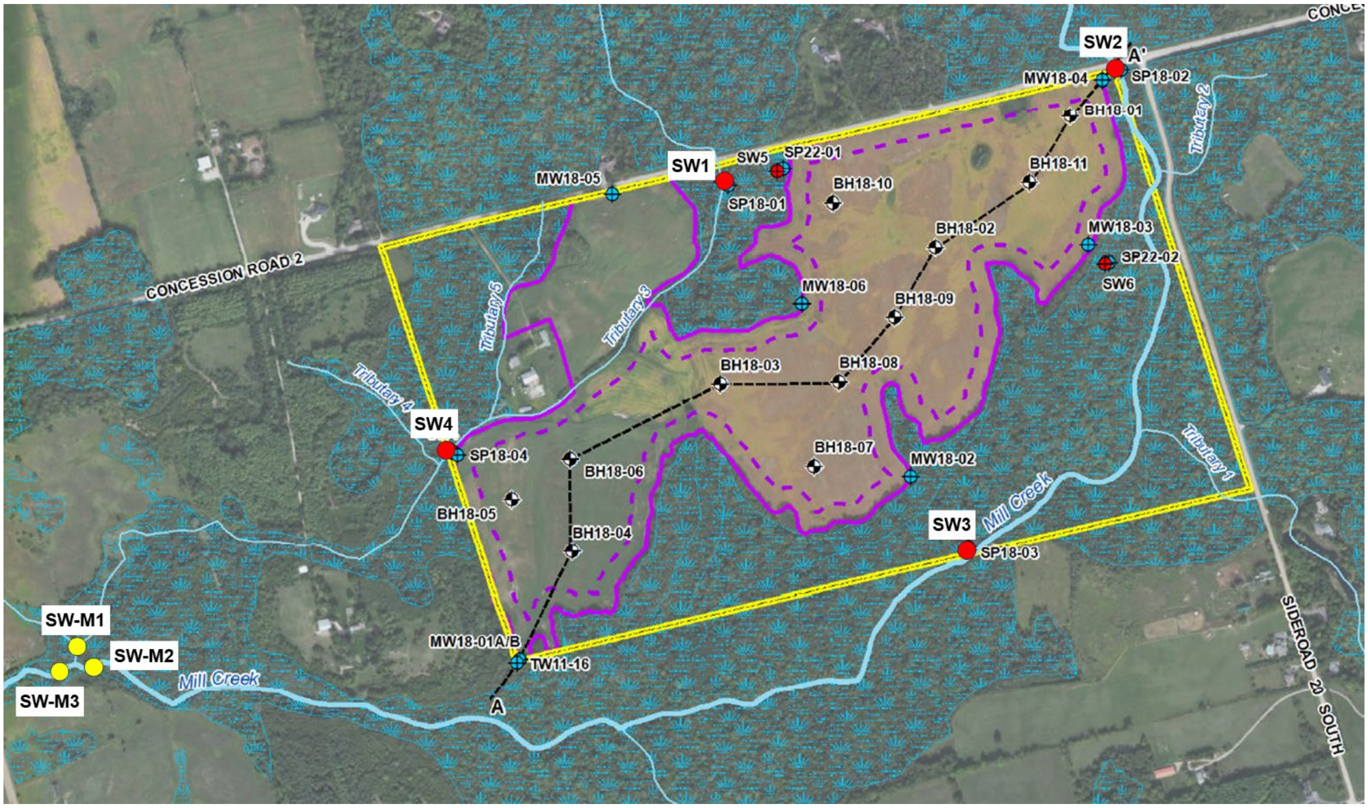

Figure 1: Surface Water Stations on Mill Creek and Tributary 3 (SW1 to SW4), and modelled surface water stations (SW-M1 to SW-M3) at the confluence of Tributary 3 and Mill Creek.

SUPPLEMENTAL ASSESSMENT

To clarify and further illustrate the redistribution of baseflow as originally described in the Water Report, modelled surface water stations (SW-M1, SW-M2, and SW-M3) were introduced at the confluence of Tributary 3 and Mill Creek, downstream of the area of redistributed baseflow, at the locations shown on Figure 1. These simulated stations were added without any alteration or recalibration to the model. The resulting baseflow predictions for the previous and new modelled surface water stations under current conditions and post-rehabilitation are shown in Table 1 and discussed below.

With reference to Table 1, the redistribution of baseflow from upstream portions of Tributary 3 and Mill Creek to downstream portions of Tributary 3 and Mill Creek is again evident, but most importantly, the following is noted:

- At SW-M1, downstream of SW4 on Tributary 3, baseflow increases by 90 m^3/day, an increase of 7% in post-rehabilitated conditions compared to current conditions.
- At SW-M2, downstream of SW3 on Mill Creek, but above the confluence of Tributary 3 and Mill Creek, baseflow decreases by 75 m^3/day, a 1% decrease in post-rehabilitated conditions compared to current conditions.

- At SW-M3, downstream of the confluence of Tributary 3 and Mill Creek, there is essentially no net change in baseflow (0.1% increase between existing and rehabilitated conditions).

Table 1: Simulated Baseflow at Mill Creek and Tributary 3 Surface Water Stations - Current Conditions and Post-Rehabilitation

	Station ID	Description	Pre-Pit Baseflow Contribution (m^3/day)	Rehabilitated Baseflow (m^3/day)	Rehabilitated Change in Baseflow (m^3/day)	
Tributary 3	SW1	Upper Tributary 3	611	561	-50	-8%
	SW4	Site Boundary Tributary 3	1,072	1,033	-39	-4%
	SW-M1	Downstream Tributary 3	1,303	1,393	90	7%
Mill Creek	SW2	Upper Mill Creek	9,741	9,686	-55	-1%
	SW3	Site Boundary Mill Creek	9,870	8,725	-1145	-12%
	SW-M2	Mill Creek Downstream of Site Boundary (upstream of Tributary 3)	10,284	10,209	-75	-1%
Mill Creek and Tributary 3	SW-M3	Mill Creek Downstream of Tributary 3 Confluence	13,677	13,689	12	0.1%

SUMMARY

As discussed in the Water Report and further illustrated through the introduction of new modelled surface water stations, there will be a localized redistribution of baseflow along reaches of Tributary 3 and Mill Creek post-rehabilitation relative to current conditions. There will be short reaches that experience a decrease in baseflow and short reaches that experience an increase in baseflow, both on Mill Creek and on Tributary 3.

Overall, the net change in baseflow to the system as a whole in the vicinity of the site as simulated at the confluence of Tributary 3 and Mill Creek is predicted to very small, about 0.1%.

CLOSURE

We trust that this technical memorandum meets your current needs. If you have any questions or require clarification, please contact the undersigned at your earliest convenience.

WSP Canada Inc.

[redacted]

[redacted]

Paul Menkveld, M.Sc., P.Eng.
Hydrogeological Engineer

George Schneider, M.Sc., P.Geo.
Senior Geoscientist

PGM/GWS/DE/rk

https://wsponline.sharepoint.com/sites/gld-21291g/deliverables/01 agency comments/00b water attachments for comment responses/attachments (master)/baseflow comments/1791470-tm-rev0-cbm ab south lake pit baseflow_21oct2025.docx

ATTACHMENT 4

Supplemental Assessment of Potential Impacts to Provincially Significant Wetlands - Proposed CBM Aberfoyle South Lake Pit

TECHNICAL MEMORANDUM

DATE October 21, 2025 **Project No.** CA-GLD-1791470A-VCNA

TO Andreanne Simard - Director of Lands, Resources and Environment
Stephen May - Lands Manager, Western Region
CBM Aggregates
CC George Schneider, Daniel Eusebi

FROM Paul Menkveld **EMAIL Paul.Menkveld@wsp.com**

SUPPLEMENTAL ASSESSMENT OF POTENTIAL IMPACTS TO PROVINCIALLY SIGNIFICANT WETLANDS – PROPOSED CBM ABERFOYLE SOUTH LAKE PIT

In December 2023, CBM Aggregates (CBM), a division of St. Marys Cement Inc. (Canada) submitted an Aggregate Resources Act application to licence the proposed Aberfoyle South Lake Pit, located at 6947 Concession Road 2, in the Township of Puslinch, County of Wellington, Ontario. WSP Canada Inc. (WSP) prepared a Level 1/2 Water Report (Water Report) and Natural Environment Report to support this application. Stakeholder comments have been received pertaining to various aspects of the application and reports.

Stakeholders have expressed concern regarding the potential for impacts to Provincially Significant Wetlands (PSWs) as a result of the proposed aggregate pit development during operations and post-rehabilitation. This technical memorandum provides a supplemental assessment of these potential impacts, in order to provide clarity and context to the predicted changes to wetland hydrology and ecology as a result of this proposed aggregate extraction development, and accordingly provides supplemental impact assessment.

BACKGROUND

Hydrological and hydrogeological investigations at the Site, presented in the Water Report (WSP 2023), characterized the PSWs by:

- Hydrological analysis of the PSWs presented in the Site Water Balance (Section 6 of the Water Report);
- Hydrogeological analysis of PSWs including:
  - Collection of groundwater levels in the water table aquifer to observe interactions of the groundwater flow system with hydrological features and the ground surface;
  - Establishment of specific wetland monitoring stations (SW5 and SW6), each including monitoring of surface water and shallow groundwater levels; and
  - Consideration of the PSWs in the numerical groundwater flow model by quantifying predicted changes to groundwater discharges to specific PSW zones relative to current conditions.
- Wetland Analysis of PSW
  - Review the existing conditions and Ecological Land Classification (ELC) designations of wetland communities and their associated moisture regime.

- Confirm wetland boundaries using Ontario Wetland Evaluation System (OWES).
- Review small pockets of wetland exhibiting proliferation of invasive species in the agricultural fields proposed for removal; and,
- Assess the proposed wetland buffers that are currently subject to agricultural ploughing and annual crop production (row crops – corn, wheat and soya beans) and potential for any Critical Function Zones in and around the wetlands and within the proposed buffer setbacks.
- Assess potential impacts to wetlands vegetation and fauna based on wetland conditions and wetland knowledge and potential changes in water regime and hydroperiods presented in the water analysis technical assessments.

Hydrological Water Balance

The hydrology of the Site is quantitatively considered by the Water Balance, which considers precipitation minus evapotranspiration to be the surplus based on land type and use. Surplus is then allocated to infiltration or runoff to model the hydrology of the Site. The water balance also considers water holding capacity (WHC) of different land uses and soil types, which represents the ability of the shallow soils to retain water.

As summarized in Tables 13 and 14 of the Water Report, the Water Balance of the Site considers the majority of the PSWs to be a forested swamp, with an annual surplus of 276 mm and a WHC of 300 mm, and a minority of the PSWs to be a marsh with a surplus of 303 mm and a WHC of 150 mm. The Water Balance shows an annual surplus which suggests that the PSWs can be supported in their current condition by precipitation combined with the WHC of their soils, particularly the high WHC of the forested swamps, which allows PSWs of this type to retain water accumulated during wet portions of the year that then supports these ecological features during extended dry periods.

The surplus in the PSWs is divided between the infiltration (67%) and runoff (33%) (as a weighted average of the two land use types), showing that on an annual average, the PSWs contribute to local groundwater recharge and contribute runoff to surface water features.

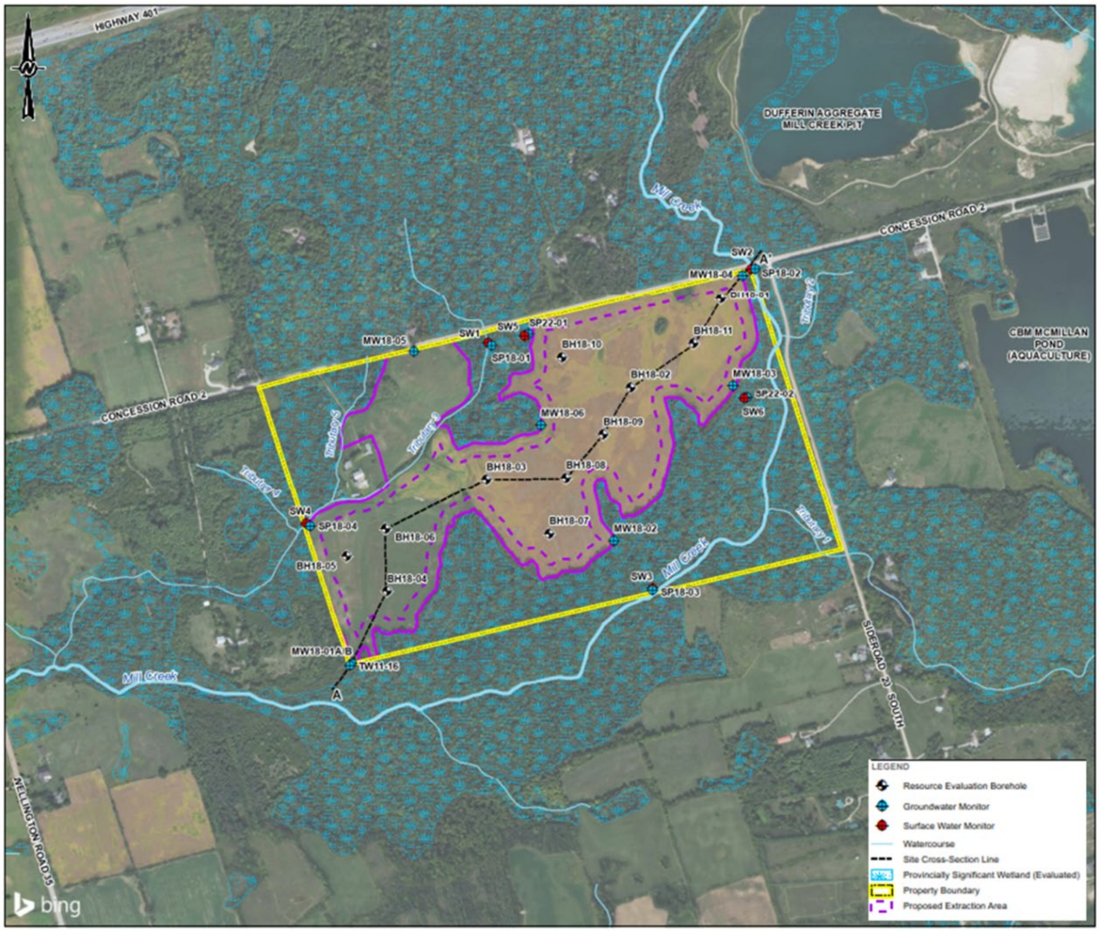

Figure 1: Site Location Plan showing Surface Water Monitors, Groundwater Monitors and PSWs

Hydrogeological Characterization of the PSWs

Groundwater levels monitored on the Site showed that the water table in portions of the Site, is near the ground surface during wet periods of the year and seasonally drop below ground surface, with overall groundwater flow through the water table aquifer being from the north to southwest with groundwater discharging to Mill Creek and Tributary 3, as discussed in detail in Section 5.2 and 5.7 of the Water Report.

Surface water monitoring locations SW5 and SW6 (Figure 1) were established to support the conceptualization of the PSWs surrounding the Site, observe hydroperiod, and groundwater gradients. Monitoring results at these locations during 2022 are presented in the Water Report, and subsequent monitoring data for 2023 to 2024 period are presented herein.

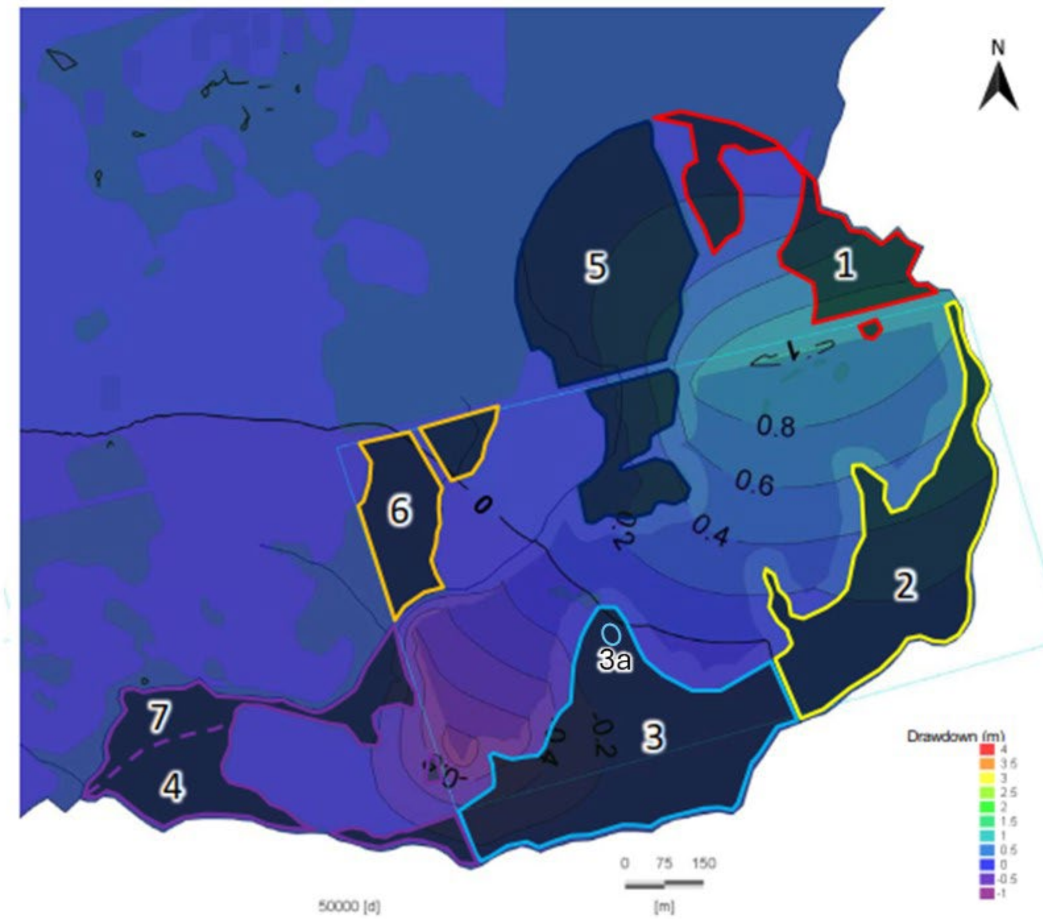

Figure 2: PSW Zonation and Groundwater Drawdown under Rehabilitated Conditions

In addition to direct observations of the Site's hydrogeology, the numerical groundwater flow model, presented in Appendix G of the Water Report, supports the understanding of groundwater interaction with the PSWs. It is important to note that the purpose of the numerical groundwater flow model is to provide a consistent interpretation of the groundwater flow system, as a basis for predicting potential impacts of changes in groundwater flow during operations and post-rehabilitation conditions, such as changes in stream baseflow and changes in groundwater levels at private water wells. The groundwater flow model is also a useful tool in representing groundwater interactions with PSWs, however the model cannot simulate hydrologic processes, such as those described in the Water Balance, which are important in understanding the overall behavior of a wetland system.

As described in the Water Report, to support the assessment of impacts on PSWs, exceptionally conservative boundary conditions were selected and the PSWs were divided it into seven zones, shown on Figure 2. A drainage boundary condition was used to represent Mill Creek (which specifies Mill Creek can receive groundwater discharge but not recharge groundwater) when assessing impacts to groundwater conditions around the PSW (as presented in Section 3.5.3 of Appendix G, in the Water Report). This assessment is an exceptionally conservative as it assumes Mill Creek will not provide any recharge and therefore overestimates drawdown and predicted impacts on the PSW. The predicted groundwater drawdown relative to current conditions is presented for during extraction operations at the end of Operational Years 2, 4 and 6 (Figure 3) and post-rehabilitation (Figure 2).

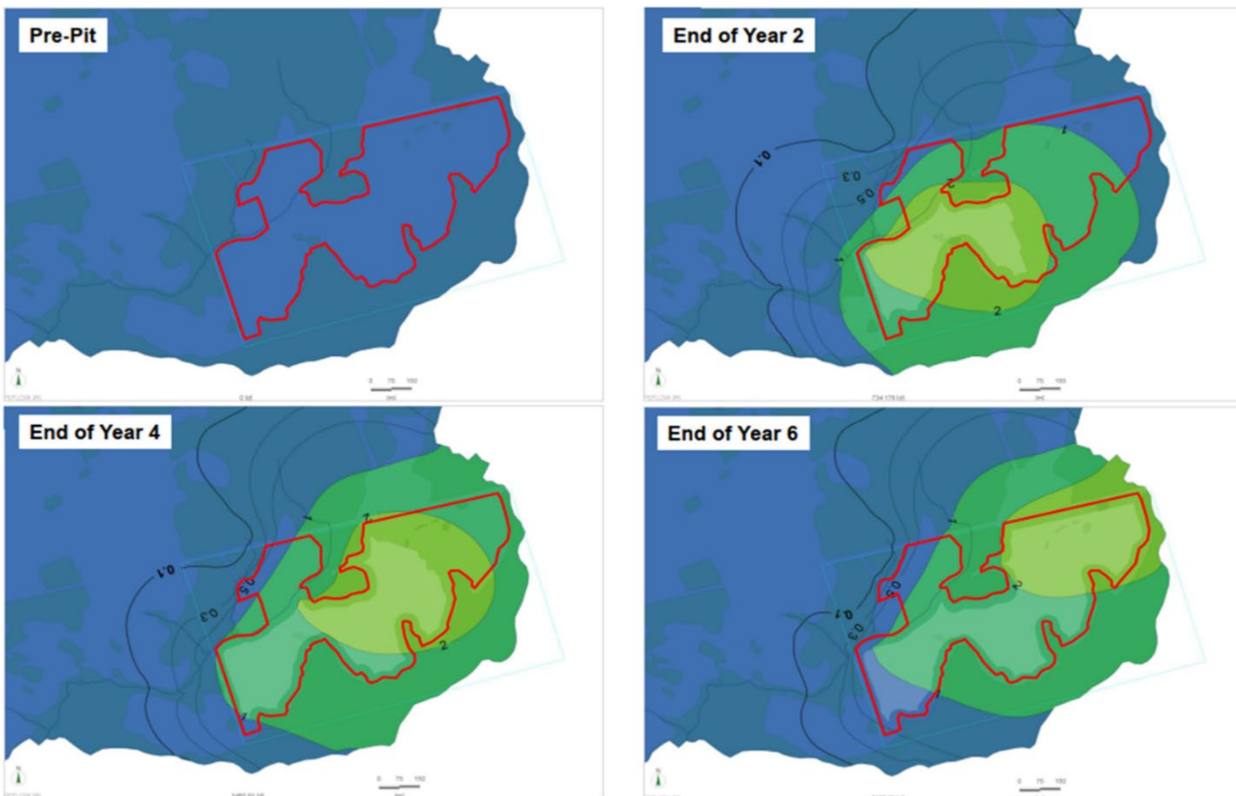

Figure 3: Predicted Groundwater Drawdown during Operation relative to Current Conditions

Table 1 presents the changes groundwater discharge relative to current conditions for each PSW zone, during operations and in post-rehabilitated conditions (based on Appendix G, Section 4.2.3 of the Water Report).

Table 1: Predicted Changes to Groundwater Discharge to Wetlands by PSW Zone

Zone	Predicted PSW Zone Discharge (mm/yr)							Area (hectares)
	Pre-Pit	Operational				Post-Rehabilitated		
		Year 2	Year 4	Year 6	Max. Difference	Flux	Difference	
Zone 1	164	62	14	6	-158	65	-99	11.2
Zone 2	266	0	0	0	-266	155	-111	14.1
Zone 3	142	0	0	6	-142	311	168	16.2
Zone 4	413	170	205	245	-243	671	258	6.7

Zone	Predicted PSW Zone Discharge (mm/yr)							Area (hectares)
	Pre-Pit	Operational				Post-Rehabilitated		
		Year 2	Year 4	Year 6	Max. Difference	Flux	Difference	
Zone 5	174	0	0	0	-174	0	-174	23.3
Zone 6	768	4	30	118	-765	885	116	6.1
Zone 7	816	335	404	485	-481	1326	511	4.8

Numerical modelling simulations predict that some PSW zones will receive reduced groundwater inputs during some stages of operations and in post-rehabilitated conditions, which could potentially lead to impacts to the PSWs. To further assess the potential for impacts to the PSWs as a result of the predicted changes in groundwater levels, a supplemental assessment was undertaken utilizing the additional monitoring data for 2023 to 2024, and additional site reconnaissance undertaken by natural environment, hydrology and hydrogeology team members in the spring of 2025.

SUPPLEMENTAL WETLAND HYDROLOGY AND IMPACT ASSESSMENT

To build on the characterization of the PSWs and impact assessment presented in the Water Report, the following steps are presented in this Technical Memorandum.

1) Wetland Hydrology Characterization: This section describes the hydrology of each wetland zone with consideration given to the varied water inputs and their relative significance in each zone of the PSW.

2) Hydrological Potential for Impact: The refined hydrological impact assessment identifies changes to the hydrology of the wetland features on a zone by zone and input by input basis to identify the degree of potential impact each zone experiences based on the hydrology of the feature.

3) Ecological Impact Assessment: The hydrological information serves to support ecological interpretations of impact on the feature.

4) Monitoring Recommendations: To mitigate potential for impacts to the wetland and verify that no negative impacts take place, enhanced monitoring is recommended, an approach to setting Trigger Setting to proactively identify potential for impacts is proposed, and corrective actions are identified.

WETLAND HYDROLOGY CHARACTERIZATION

To assess the potential impacts of changes in groundwater levels on the PSW, an assessment of wetland hydrology in each zone of the PSW was conducted. The assessment considered the relative magnitude of the sources of water maintaining the wetland feature (i.e., surface water inputs and groundwater inputs) and the potential for adverse impact on the PSW from changes to those inputs, similar to the model of wetland hydrology outlined by the TRCA (2020).

In general, wetland hydrology can be represented by fluxes in and out of a wetland system resulting in a change in storage in the wetland. Figure 4 shows a typical schematic of fluxes into and out of a wetland based on work by Hayashi, van der Kamp, and Rosenberry (2016).

The inputs considered for each wetland zone at the Site include:

- Direct Precipitation. Precipitation reporting directly to the wetland. Precipitation data presented in the Water Report indicates the annual average precipitation in the area of the Site is approximately 871 mm/year.
- Runoff. Overland flow can occur from adjoining features into wetlands under specific hydrological conditions, such as the spring freshet or during intense rainfall.
- Surface Water. Where present, channelized features can overflow the banks and inundate (i.e. flood) nearby wetland areas during intense hydrological events. This condition is referred to as a surface water input to the wetland and is considered to be distinct from overland flow / runoff.
- Groundwater Discharge. Groundwater discharge to the ground surface within wetlands can support wetland features.

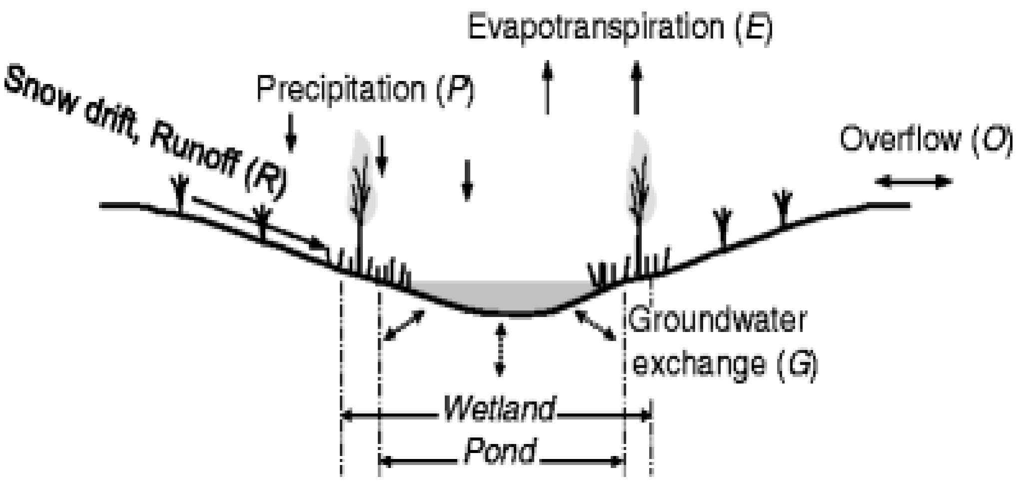

Figure 4: Wetland Hydrology Schematic (after Hayashi, van der Kamp, and Rosenberry 2016)

Direct precipitation and groundwater discharge provide water inputs to wetlands throughout the year, while event base hydrology inputs like increased surface water levels, contribute to wetland infrequently, fill storage in the wetland and can be significant factor in the annual water inputs for a wetland feature.

Outflows from wetland features include:

- Evapotranspiration. Evaporation and transpiration of the plant community, assessed to be 595 mm/year in forested swamps by the Water Balance in the Water Report.
- Runoff. Wetland features surrounding the Site are drained by surface water features, which receive runoff from the PSW.
- Infiltration. Where and when downward hydraulic gradients exist, water in the wetland infiltrates into the underlaying water table aquifer and recharges the groundwater system.

The hydrologic assessments for each PSW zone presented in the subsection below are based on observations made during more than 60 site visits over a 7 year period, continuous water level monitoring data at key surface water and groundwater stations across the Site, and a detailed understanding of topography and surface water conditions.

Qualitative Description of Wetland Water Inputs

The water inputs to the PSWs are a critical factor in the hydrology of each wetland zone, as discussed below and summarized in Table 2 at the end of this subsection.

Figure 5: Photos of PSW Zone 1 Surface Water Conditions

(Note: photos taken on April 1, 2025, Pane A: Beaver dam on Mill Creek viewed from Concession Road 2 bridge, Pane B, C, portions of Zone 1 inundated by high levels resulting from the beaver dam, Pane D: Upland area in the western portion of Zone 1, unimpacted by high surface water levels.)

- Zone 1: Hydrology of PSW Zone 1 is currently dominated by surface water inputs due to beaver activity along Mill Creek, which has caused the inundation of some of the zone (Figure 5). Direct precipitation is also a significant source of water in this zone.
- Zone 2: Located to the east of the proposed area of extraction, PSW Zone 2 is monitored at SW6 which shows periodically small upward (often during wet conditions in the spring) and small downward gradients, as shown on Figure 6. The hydroperiod is short and associated with the wet part of the year. This wetland area is

supported largely by direct precipitation inputs, with minor contributions from runoff and groundwater discharge.

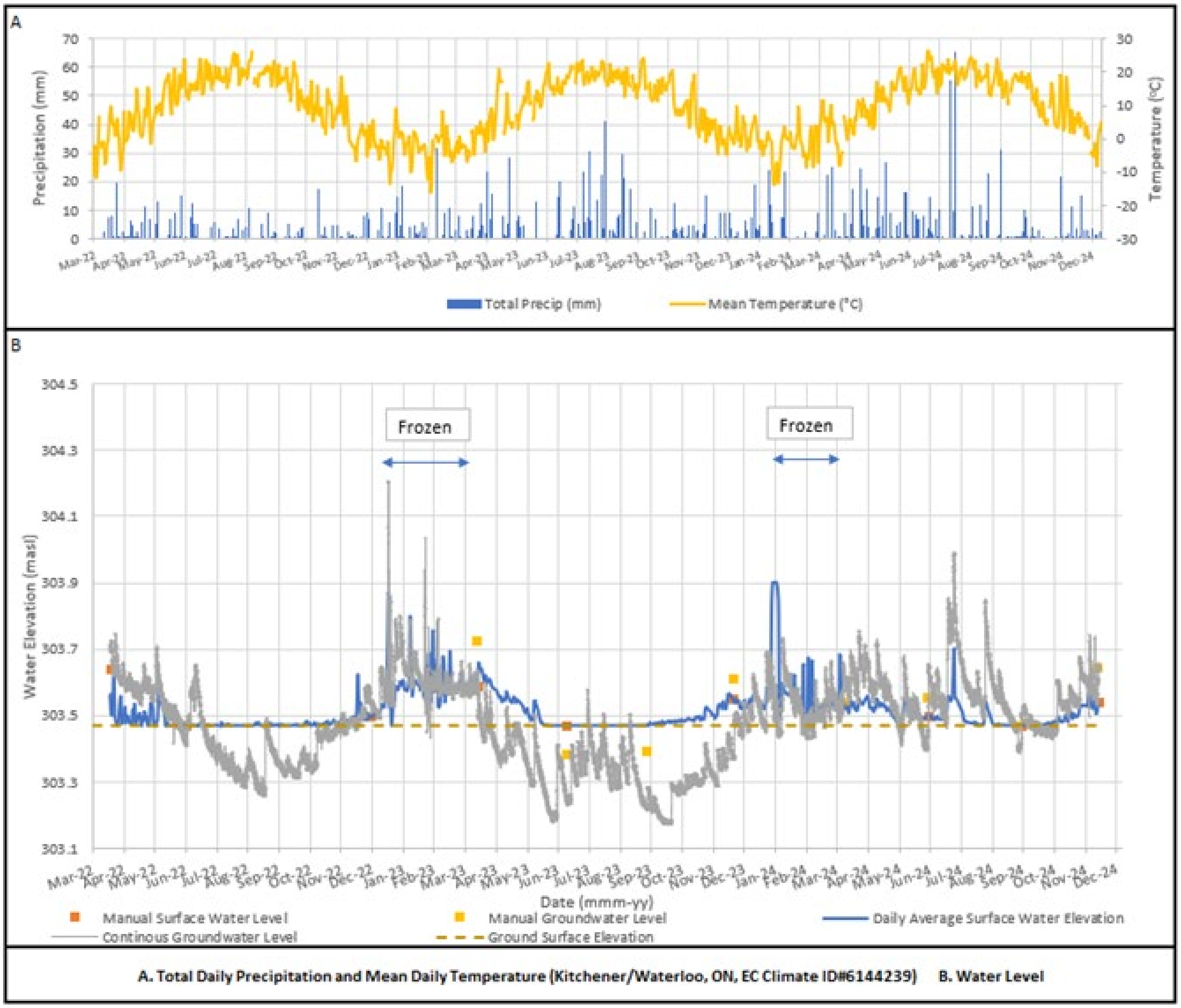

Figure 6: PSW Zone 2 Hydrograph (SW6)

- Zone 3: Located in the southern portion of the Site, is similar to Zone 2, the hydroperiod is short and associated with the wet part of the year. This wetland is supported largely by direct precipitation inputs, with minor contributions from runoff and groundwater discharge, except for Zone 3a discussed below.
- Zone 3a: Is a closed depression in the ground surface (Figure 7) located within Zone 3, which is inferred to intercept the water table and stays wetted for a longer time than the surrounding Zone 3 area. This area

receives runoff from the surrounding Zone 3 and presumably retains it above a layer of organic or fine grain material accumulated in the depression. This zone may also receive some groundwater inputs.

Figure 7: Photo of PSW Zone 3a Surface Water Conditions

(Note: photo taken on April 1, 2025)

- Zone 4: Is located in the southwest of the Site and is drained by Tributary 3. It receives water from direct precipitation and may receive minor inputs from surface water in Tributary 3, runoff, and groundwater discharge.
- Zone 5: Is significantly influenced by Tributary 3, the Concession Road 2 embankment bisecting the zone, and the culvert that transfers water beneath the road. Water levels in Zone 5 (Figure 8) are monitored at SW5, located south of Concession Road 2). The zone is considered in two portions:
  - North of Concession Road 2, surface water from a significant catchment extending more than 900 m north to Highway 401, reports to Tributary 3. The road embankment and culvert retain water north of the

road with little channelization to convey the water to the culvert, as shown on Figure 9. North of the road Zone 5 receives significant water inputs from direct precipitation and Tributary 3’s poorly defined channel wetting the area. The road and culvert structure retain surface water at an elevation greater than those observed on the south side of the road. This site condition is expected to influence local surface water and groundwater conditions within portions of Zone 5.

- South of Concession Road 2, Zone 5 receives significant water inputs from direct precipitation, Tributary 3 overtopping its banks during hydrological events, and moderate water input from groundwater discharge. Tributary 3 is monitored in Zone 5 at SW1, which has been observed to periodically overtop its banks. Additionally, it is noted that water levels during high flow events at SW1 are higher than those observed at SW5 and ground elevation in the wetland. This observation suggests that during high water events, Zone 5 receives significant amounts of water from Tributary 3. It is noted that shallow groundwater has a small upward gradient there throughout most of the monitoring period at SW5. This is influenced by the surface water head built up to the north of the Site as a result of the road embankment.

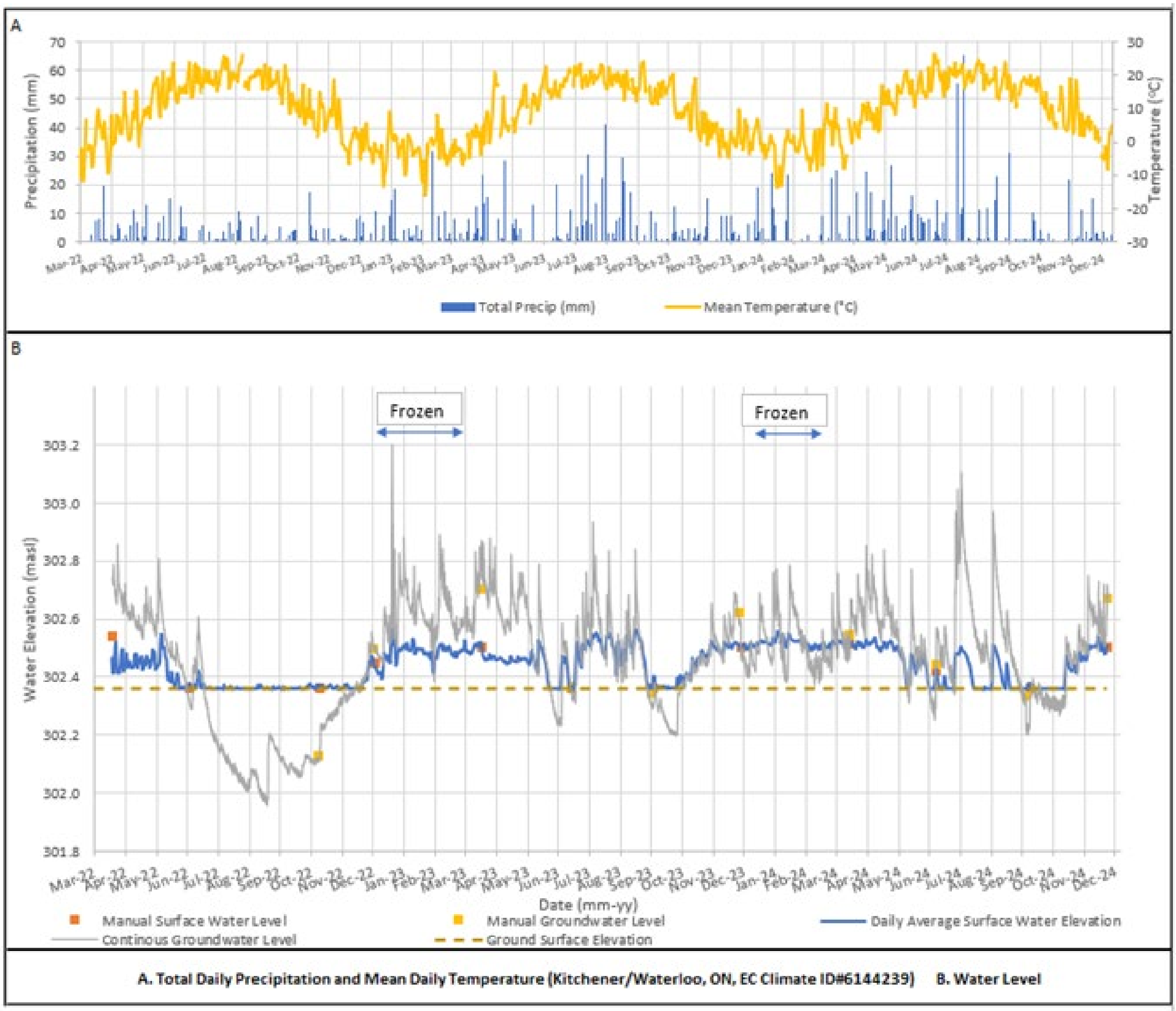

Figure 8: PSW Zone 5 Hydrograph (SW5)

Figure 9: Photo of Tributary 3 Upstream of the Culvert at Concession Road 2

(Note: photo taken on April 1, 2025)

- Zone 6: Is supported by significant water inputs from direct precipitation and surface water from Tributary 5 wetting the area. Tributary 5 has low banks, as shown on Figure 10, and water levels in the stream frequently flood over its banks and inundate the surrounding wetland zone.
- Zone 7: Similar to Zone 4, Zone 7 is located to the southwest of the and is drained by Tributary 3. It receives water from direct precipitation and may receive minor inputs from surface water in Tributary 3, runoff, and groundwater discharge.

Figure 10: Photo of Tributary 5 South of Concession Road 2

(Note: photo taken on April 1, 2025, looking south from the Tributary 5 culvert beneath Concession Road 2)

Wetland Organic Layer

As is typical of mature wetlands (USEPA, 2008), the surficial soils underlying the PSWs at the Site include a characteristic upper organic layer, which is composed of fine sediment and many years of accumulated organic material. This organic layer is effective at retaining water and generally has a low permeability in comparison to the underlying coarser grained soils.

The presence of this low permeability upper organic layer in the wetlands is consistent with the hydrologic behavior observed on the Site, i.e. very slow response of surface water levels to downward hydraulic gradients, as observed in the hydrographs on Figure 6 and Figure 8). It is also consistent with the Site Water Balance, which assigns a water holding capacity of 300 mm to the forested wetland land type. In addition to the water holding capacity, which considers the potential of shallow soils to hold water, the irregular and "potholed" surface of the wetland enhances its ability to retain water. This understanding of the organic layer's function is similar to that of the TRCA's (2020) conceptualization of a mature wetland.

In characterization of the Site, a continuous organic layer and an irregular ground surface are noted in Zones 1, 2, 3, 5, and 6, which are considered to have a high capacity to store water. No direct observations could be made about Zones 4 and 7, as they are located on private lands, so they have been conservatively assumed to have a moderate capacity to store water.

It should be noted that if the surficial soils were as permeable as the sand and gravel aquifer beneath them, they would readily drain, resulting in rapid depletion of surface water, which is contrary to the hydraulic behavior observed at the Site. This observation supports the understanding of the wetland organic layer as generally acting to retain water and slow its infiltration.

Wetland Outflows

In general, wetland outflows include evapotranspiration, runoff, and infiltration. The proposed aggregate operations will not impact evapotranspiration or the runoff characteristics of wetlands (i.e., runoff is a driven by surface water conditions, so if the water conditions are similar, runoff from the wetland will be similar). A minor impact to groundwater outflows is possible in response to predicted groundwater drawdown in some areas, however this is not expected to be a significant impact for the following reasons:

- Low permeability organic layer. The organic layer accumulated in low areas of the Site is expected to have a low permeability and exhibit a slow rate of infiltration of water in the PSW (USEPA 2008).
- Water holding capacity. As identified in the Site Water Balance, the PSWs have a high-water holding capacity, which recognizes the porosity and capillary affinity of the materials.
- Perched conditions. When the groundwater levels drop below the organic layer, an unsaturated zone is expected to develop resulting in a reduction of the soil's hydraulic conductivity (Fetter 2001).
- Capillary barrier effect. A relatively coarse-grained sand and gravel underlies the organic layer in the PSW. This situation means that there is a greater capillary affinity of organic layer than that of the underlying soil, creating a barrier to flow under low groundwater conditions (Fetter 2001).

As minor changes are anticipated to outflows from the PSW, this supplement assessment of potential impacts is focused primarily on changes to water inputs during operations and post-rehabilitation as the drivers to changes in wetland hydrology.

Summary of Existing Conditions

Table 2 summarizes this discussion of the relative importance of water sources to the PSW zones and their water storage capacity. The importance of the water contribution to a feature or zone is considered on a scale from significant, moderate, to minor contribution and its capacity to effectively retain those water inputs to maintain hydric conditions.

Table 2: Qualitative Magnitude of Water Inputs and Storage in Existing Conditions by PSW Zone

PSW Zone	Direct Precipitation	Surface Water (e.g. stream bank overflow)	Runoff	Groundwater	Storage Capacity
1	Significant	Significant	Minor	Minor	High
2	Significant	None	Minor	Minor	High
3	Significant	None	Minor	Minor	High
3a (closed depression)	Significant	None	Moderate	Moderate	High
4	Significant	Minor	Minor	Minor	Moderate
5 (north of Road 2)	Significant	Significant	Moderate	Minor	High
5 (south of Road 2)	Significant	Significant	Minor	Moderate	High
6	Significant	Significant	Minor	Minor	High
7	Significant	Minor	Minor	Minor	Moderate

The observed existing conditions are qualitatively similar to literature examples of typical wetland hydrology water budgets, specifically that some wetland types are primarily sustained by precipitation and others by a combination of surface water and precipitation inputs, with runoff and groundwater discharge as more minor factors (USEPA 2008).

HYDROLOGY POTENTIAL FOR IMPACT ASSESSMENT

Operational Impacts on Wetland Hydrology

Potential operational impacts on the hydrology of the wetlands are conservatively evaluated by identifying the operational stage at which the greatest groundwater drawdown will occur in each zone. It should be noted that no impacts are anticipated to direct precipitation inputs, surface water contributions during hydrological events (such as the spring freshet), or to the ability of a PSW zone to retain water in its substrates during any operational period.

Hydrological potential for impacts are considered on a scale of decreasing severity from significant, moderate, minor, minimal, negligible, to none. Impacts during operational periods to each zone (Figure 2) are summarized below and in Table 3.

- Zone 1: This zone experiences no change to direct precipitation, surface water, or runoff inputs, but does lose some groundwater input during active aggregate extraction. Minimal potential for impact is anticipated during operations.
- Zone 2: This zone experiences no change to direct precipitation during operations. However, there is a reduction in runoff and groundwater discharge, which were minor contributors to the PSW in this zone. Minor potential for impact is anticipated during operations.

- Zone 3: This zone experiences no change to direct precipitation during active aggregate extraction. However, there is a reduction in runoff and groundwater discharge, which were minor contributors to the PSW in this zone. Minor potential for impact is anticipated during operations.
- Zone 3a: This zone experiences no change to direct precipitation during active aggregate extraction. During Year 2 of operations over 2 m of drawdown is predicted in a feature which may receive moderate groundwater inputs. The closed depression may receive less runoff from Zone 3, as a result of reduced runoff from lands adjoining Zone 3, and groundwater discharge to Zone 3. Zone 3a is considered to have moderate potential for impacts during operations, in particular during the early stages of below water table extraction.
- Zone 4: This zone is considerably downgradient of the Site with a negligible expected impact to any aspect of its hydrology.
- Zone 5 (north of Concession Road 2): This zone experiences no change to direct precipitation, surface water, or runoff inputs, but does lose some groundwater discharge during active aggregate extraction. Minimal potential for impact is anticipated during operations.
- Zone 5 (south of Concession Road 2): This zone experiences no change to direct precipitation or to surface water inputs to the zone, but there is some reduction in modelled groundwater discharge during extraction, in particular around Year 4. As direct precipitation and surface water from Tributary 3 are the significant sources of water to this zone and are unaffected by extraction, only minor potential for impact is anticipated during operations.
- Zone 6: This zone experiences no change to direct precipitation or to surface water inputs, but there is some reduction in groundwater discharge during active aggregate extraction, in particular during the early stages of operations. Similarly to Zone 5 south of the road, direct precipitation and surface water from Tributary 5 are the significant sources of water to this zone and are unaffected by extraction, therefore minimal potential for impact is anticipated during operations.
- Zone 7: This zone is considerably downgradient of the Site with a negligible expected impact to any aspect of its hydrology.

Table 3: Qualitative Magnitude of Water Inputs and Storage Changes under Operational Conditions by PSW Zone

Zone	Direct Precipitation	Surface Water (e.g. stream bank overflow)	Runoff	Groundwater	Storage Capacity	Potential for Hydrological Impact during Operations[1]
1	Significant	Significant	Minor	Minimal	High	Minimal
2	Significant	None	Minimal	None	High	Minor
3	Significant	None	Minimal	None	High	Minor
3a (closed depression)	Significant	None	Minimal	None	High	Moderate
4	Significant	Minor	Minor	Minor	Moderate	Negligible

Zone	Direct Precipitation	Surface Water (e.g. stream bank overflow)	Runoff	Groundwater	Storage Capacity	Potential for Hydrological Impact during Operations[1]
5 (north of Road 2)	Significant	Significant	Moderate	None	High	Minimal
5 (south of Road 2)	Significant	Significant	Minimal	None	High	Minor
6	Significant	Significant	Minor	Minimal	High	Minimal
7	Significant	Minor	Minor	Minor	Moderate	Negligible

Note: 1) Water input reductions during operations compared to baseline conditions are shaded in pink. 2) Impacts are considered on a scale of decreasing severity from significant, moderate, minor, minimal, negligible, to none.

Predicted Post-Rehabilitation Impacts on Wetland Hydrology

Potential impacts on wetland hydrology of the PSW areas under post-rehabilitation conditions are summarized below and in Table 4.

It should be noted that no impacts are anticipated to direct precipitation inputs, surface water contributions during hydrological events (such as the spring freshet), or to the ability of the PSW to retain water in their near surface substrates.

- Zone 1: This zone experiences no change to direct precipitation, surface water, or runoff inputs, but does lose some groundwater discharge as a result of water table flattening. Minimal potential for impact is anticipated.
- Zone 2: This zone experiences no change to direct precipitation. However, there is a reduction in runoff and groundwater discharge, which are minor contributors to the PSW in this zone under current conditions. Minor potential for impact is anticipated in post-rehabilitation conditions.
- Zone 3 and 3a: This zone experiences no change to direct precipitation and a slight increase in groundwater discharge in post-rehabilitated conditions. There is a reduction in runoff from the reduced catchment, which was a minor contributor to this zone. The increase in groundwater input is considered to offset the minor loss of runoff, and therefore negligible impacts is anticipated in post-rehabilitation conditions.
- Zone 4: This zone is considerably downgradient of the Site with no expected impact to any aspect of its hydrology.
- Zone 5 (north of Concession Road 2): This zone experiences no change to direct precipitation, surface water, or runoff inputs, but does lose some groundwater discharge in post-rehabilitated conditions. Because drawdown in this feature is minor (0.2 m) and the feature is overwhelmingly supported by its up-stream catchment, negligible impacts are anticipated.
- Zone 5 (south of Concession Road 2): This zone experiences no change to direct precipitation or to surface water inputs to the zone, however there is some reduction in modelled groundwater discharge in post-rehabilitation conditions. As direct precipitation and surface water from Tributary 3 are the significant sources of water to this zone and are unaffected by extraction, minor potential for impact is anticipated.

- Zone 6: This zone experiences no change to direct precipitation, to surface water inputs to the zone, runoff, and groundwater discharge increases slightly, so no impact is anticipated.
- Zone 7: This zone is considerably downgradient of the Site with no expected impact to any aspect of its hydrology.

Table 4: Qualitative Magnitude of Water Inputs and Storage Changes in Post-Rehabilitated Conditions by PSW Zone

PSW Zone	Direct Precipitation	Surface Water (e.g. stream bank overflow)	Runoff	Groundwater	Storage Capacity	Potential for Hydrological Impact during Post-Rehabilitated Conditions[1]
1	Significant	Significant	Minor	Minimal	High	Minimal
2	Significant	None	Minimal	Minimal	High	Minor
3	Significant	None	Minimal	Minor (slight increased)	High	Negligible
3a (closed depression)	Significant	None	Minor	Moderate (slight increase)	High	Negligible
4	Significant	Minor	Minor	Minor (slight increased)	Moderate	None
5 (north of Road 2)	Significant	Significant	Moderate	None	High	Negligible
5 (south of Road 2)	Significant	Significant	Minor	None	High	Minor
6	Significant	Significant	Minor	Minor (slight increased)	High	None
7	Significant	Minor	Minor	Minor (slight increased)	Moderate	None

Note: 1) Water input reductions during post-rehabilitation compared to baseline conditions are shaded in pink. 2) Water input increases during post-rehabilitation compared to baseline conditions are shaded in blue. 3) Impacts are considered on a scale of decreasing severity from significant, moderate, minor, minimal, negligible, to none.

Summary of Potential for Hydrological Impacts to Wetlands

This supplemental assessment qualitatively considered the relative importance of the water inputs and outputs and the effect of the organic layer in retaining water to the hydrology of the seven PSW zones identified at the Site in the Water Report.

- The PSW zones to the north of the Site are primarily supported by direct precipitation and surface water during high water level events (such as the spring freshet), and impacts to these zones are predicted to be minor (Zone 5) to minimal (Zones 1 and 6) during operation and post-rehabilitation.

- The PSW zones to the east, south, and west of the Site primarily rely on direct precipitation with little input from runoff or groundwater discharge. Consequently, potential impacts to these wetland zones were predicted to be minor (Zones 2 and 3) to negligible (Zones 4 and 7) during operations and post-rehabilitation.
- The exception is Zone 3a in the southern central portion of the Site, in which the hydrological conditions indicate a moderate potential for impact during the early years of operation, primarily due to a short-term reduction in groundwater inputs to that PSW sub-zone as a result of aggregate extraction, which can be mitigated by corrective actions, as discussed below.

Overall, the hydrological potential for impacts to the PSW zones surrounding the Site are predicted to be minor to negligible, with the exception of PSW Zone 3a, where hydrological changes suggest a moderate potential for impact.

WETLAND FUNCATION AND ASSESSMENT OF WETLAND IMPACTS

Threshold for Impacts on Wetlands

The Provincial Planning Statement (PPS) (Ontario 2024) recognizes the critical importance of wetlands on the landscape in southern Ontario, stating:

Development and site alteration shall not be permitted in:

- *Significant wetlands in Ecoregions 5E, 6E and 7E1; and significant coastal wetlands.*
- *Development and site alteration shall not be permitted on <u>adjacent lands</u> to the natural heritage features <u>unless the ecological function of the adjacent lands has been evaluated and it has been demonstrated that there will be no negative impacts</u> on the natural features or on their ecological functions.*

The PPS also provides definitions of key terms to clarify their meaning to assist in examining policy compliance:

Ecological function: means the natural processes, products or services that living and non-living environments provide or perform within or between species, ecosystems, and landscapes. These may include biological, physical and socio- economic interactions.

Negative impacts: means in regard to other natural heritage features and areas, degradation that threatens the health and integrity of the natural features or ecological functions for which an area is identified due to single, multiple or successive development or site alteration activities

Therefore, establishing that “no negative impact” has taken place to a wetland, can be accomplished by understanding hydrological conditions and the potential changes resulting from extraction to water regimes and assessing the magnitude of those changes relative to naturally occurring fluctuations, and how those variances may influence the data characterizing the wetland fauna and flora in a positive or negative manner.

Natural Variability

Wetlands are subject to annual variations, resulting from climate fluctuations in temperature, as well as seasonal weather changes in southern Ontario’s temperate climate zone. Seasonal variations are associated with temperature and precipitation. The influence of these two weather conditions affects water levels through precipitation, and evaporation during periods of higher temperatures (and consequently affects the plants and wildlife, such as amphibians, that are seasonally support by water conditions at or near surface), and they also affect plant growth and health, through evapotranspiration (which vary with temperature and type of vegetation). In addition, other factors such as beaver dams, major vegetation community shifts (e.g., die-off of canopy trees due to disease), and introduction of invasive species, can influence wetland hydrology and vegetation. Variability of these factors is naturally occurring in all wetland ecosystems and there are a range of conditions in which a wetland thrives and maintains its function in the environment, without remaining static through time. The hydrographs for SW5 and SW6 illustrate that natural variation over the three years of monitoring from 2022 to 2024. The groundwater in 2022 shows the typical drop of the groundwater under deciduous swamps in the summer and into early fall, in 2024 this drop is not seasonally observed to the same degree due to the wetter summer and early fall conditions; these annual fluctuations are normal and wetland flora and fauna generally acclimatize to this variability in southern Ontario.

Wetlands, as both natural heritage features and surface water features, are a vital component of the functional connections identified above, providing the interface between water and land.

Wetland Feature Impact Assessment

The natural environmental inputs or variables such as water inputs (groundwater, run off, surface water, precipitation), temperature ranges, evaporation and evapotranspiration, along with other factors, as noted above, that maintain the biological function of wetlands are known to be variable, resulting in a range of suitable conditions to maintain wetland function, without adverse impact. Further, as one form or function changes, other forms and functions may result (e.g., a new beaver dam can create a complete shift in the wetland vegetation community and water levels, resulting in a new form and set of functions). Changes in land use that may affect wetlands, both positive and negative, are assessed in consideration of the range of possible influences. Change in any individual variable may not necessarily affect a wetland in a positive or negative manner, but rather an understanding of the magnitude of the change and interaction of those individual changes collectively, is critical to understanding the effects of change on wetland features and their ecological function. As such, individual components of wetland hydrology change can be considered relative to their level or magnitude of change: negligible, minimal, minor, moderate, significant. Table 3 and Table 4 offer a qualitative assessment of the magnitude of water related changes and hydrological potential for impact to the ecological features under operational and post-rehabilitation conditions. The hydrological understanding of the level or magnitude of change is instrumental in assessing the potential for negative impacts on ecological function of the natural heritage feature as required by the PPS.

Where hydrological conditions identify potential for impact to the wetland, an ecological assessment is made of whether the change in hydrological conditions has led to an adverse change in the form and function of the wetland outside of the range of its natural variations.

The combined hydrological and ecological wetland monitoring plan outlined below, details the approach to the identification of potential impacts based on hydrological monitoring, and the ecological monitoring to identify if impacts are taking place, and corrective actions to mitigate any impact to the wetlands.

SUMMARY

In summary, the proposed pit is predicted to cause limited changes to the hydrology of the wetlands, which demonstrate considerable variability in existing conditions. Where these changes occur outside the range of naturally occurring conditions, they represent the potential for impacts (such as those predicted during operations in Zone 3a). Where hydrological conditions identify the potential changes, ecological data will provide the basis for an assessment of impacts to the system and determine if those changes are benign to the overall form and function or the wetland. Where ecological monitoring indicates an impact could be realized, the use of trigger conditions, and corrective actions will be utilized to protect the wetland from any adverse impact.

RECOMMENDATIONS

Hydrological and Ecological Wetland Monitoring Plan

Based on this supplemental assessment of wetland hydrology at the PSW zones of the Site, the following wetland monitoring is recommended for zones with moderate or minor predicted hydrological potential for impact.

- Monitoring of surface water and groundwater at wetland stations SW5 and SW6 shall continue as currently implemented by CBM.
- A new wetland station SW7 shall be established in 2025 in PSW Zone 3 and 3a, shown on Figure 11. The scope of monitoring shall be the same as that of SW5 and SW6 currently implemented by CBM.
- Hydrological information is collected to inform ecological interpretations. Therefore, in conjunction with the hydrological monitoring of zones with moderate or minor predicted impacts (Zones 2, 3, 3a, and 5), ecological monitoring is recommended at five locations, shown on Figure 11, to compliment surface water and groundwater monitoring. The complimentary monitoring is described in the Recommended Ecological Wetland Monitoring Methodology section below. Ecological monitoring shall begin one year prior to the start of aggregate extraction, and continue during the Operational Period, and end one year after the completion of Site Rehabilitation. During the one year of monitoring prior to the start of aggregate extraction, monitoring will be carried out biannually (early summer and early fall) to provide baseline data for comparison to enhanced monitoring in the event this is required (as discussed below).

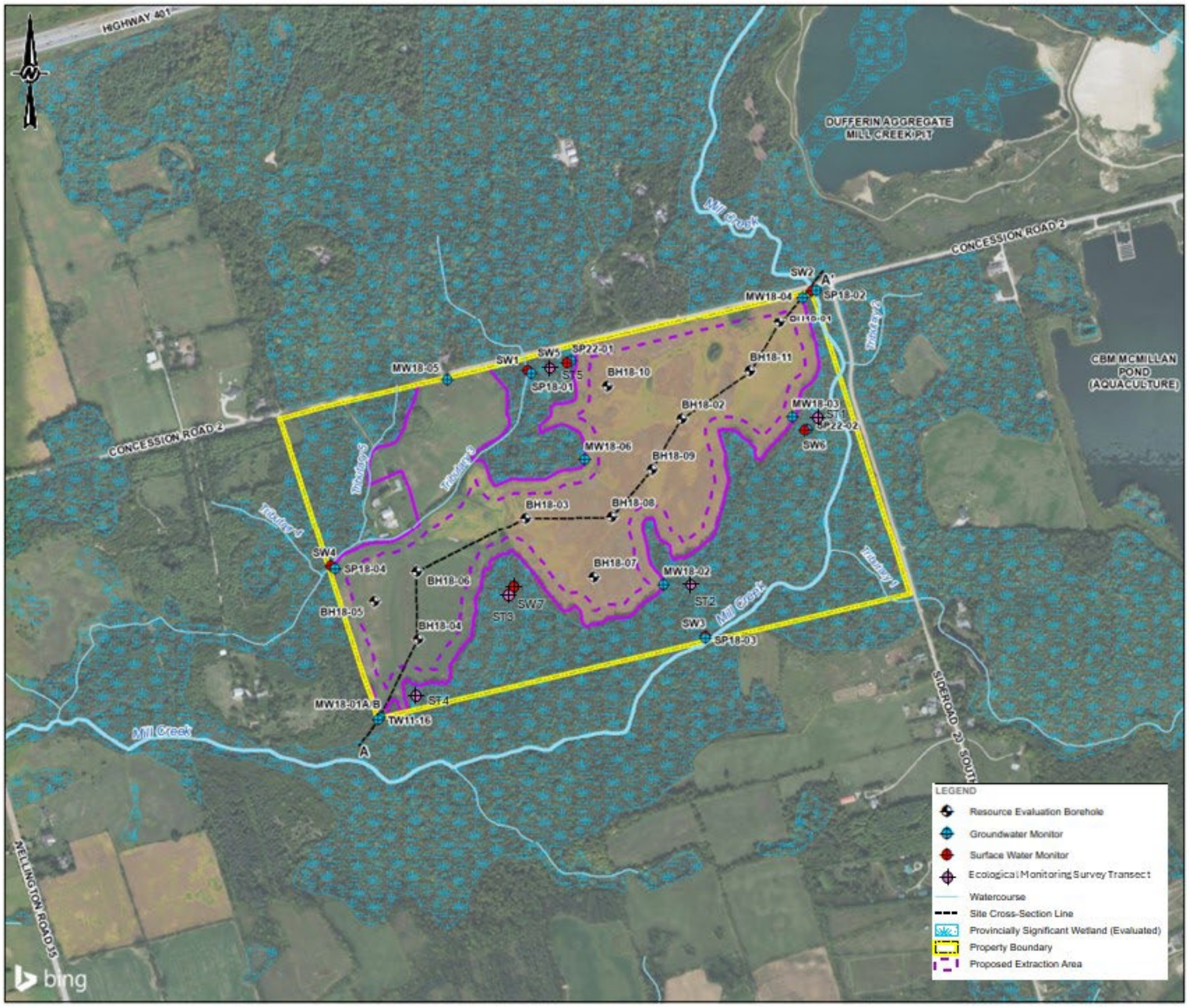

Figure 11: Recommended Monitoring Locations

Hydrological and Ecological Wetland Trigger Setting Approach and Corrective Actions

As described above, a combined hydrological and ecological approach shall be established to identify and mitigate potential impacts on the wetland. In principle, the preliminary triggers will verify that hydrological conditions remain within the historically observe range of natural variations, and if hydrological conditions indicate that there is potential for impact, ecological features shall be assessed with consideration of weather conditions.

1) Preliminary Trigger Level: Hydrological monitoring will provide information to establish the Preliminary Trigger Level. If hydrological conditions are observed to remain within their observed range, then no adverse affect is predicted. Preliminary triggers shall be selected for each season based on historic ranges of surface water and shallow groundwater levels in observed at the wetland hydrology monitoring stations (SW5, SW6, and SW7). If the condition of a preliminary trigger is met, there is potential for impact and the monitoring frequency at the affected surface water station shall be increased from quarterly to monthly and the

frequency of ecological monitoring at the associated survey transect shall be increased from annually to biannually (early summer and early fall).

2) Trigger Level: In the event that a preliminary trigger condition is met, the enhanced ecological monitoring frequency shall be used to support an assessment of whether or not impacts are taking place to the wetland’s form and function, for as long as the Preliminary Trigger Level conditions persist.

3) Ecological Relationship: Following ecological monitoring, an impact assessment considering hydrological and ecological monitoring information shall be undertaken to identify whether or not pit operations are contributing to an adverse impact on the wetland, or if other factors such as weather patterns or invasive species have affected the wetland, and reported following each ecological monitoring event to the regulating agency. In the event an impact resulting from operational activities is identified, situation specific corrective actions shall be discussed with the regulating agency and implemented by the licensee. Corrective actions to consider shall include reduced extraction rate, cessation of extraction, infiltrating water in setback areas to increase groundwater levels, and / or irrigation of impacted wetland features.

Recommended Ecological Monitoring Methodology

Based on the supplemental assessment of the hydrology of the wetland features minor to no impacts on the hydrology of the wetland are anticipated. To verify that the proposed extraction will have no adverse impact the form and function of wetlands, ecological wetland monitoring is proposed to compliment to hydrological monitoring. This monitoring involves the establishment of a combination of survey transects and associated fixed sample plots, as described below.

Survey Transects

One 100 m transects is to be established in each of the wetland zones where access is available as illustrated on Figure 11 that are representative wetland vegetation communities within the wetland complex on the subject property. Reflective T-bar are used to mark start and end points, and flagging tape used to demarcate the center line at 10 m intervals along the transect. All vascular plants within 1 m of the center line of the transect are identified along the length of the transect, and the abundance for each species estimated using definitions provided in the Glossary of the ELC manual (Lee et al. 1998):

- **Rare:** only one to a few individuals in the area of interest
- **Occasional:** scattered individuals throughout a community or represented by one or more large clumps of many individuals
- **Abundant**: Referring to a plant that is represented throughout the polygon or community by large numbers of individuals or clumps. Likely to be encountered anywhere in area of interest. Usually forming > 10% ground cover
- **Dominant**: a plant with the greatest cover or biomass within a plant community and by large numbers of individuals. Visually more abundant than other species in the same layer forming > 10% of the ground cover and >35% of the vegetation cover in any one layer.

In addition, the Floristic Quality Index (FQI) is to be calculated to provide a quantitative evaluation of botanical quality. The FQI is the product of Mean *Coefficient of Conservatism* (CC) and the square root of the area's plant richness (Swink and Wilhelm 1994).

Fixed Sample Plots

Fixed sample plots are also established at varying distances from the end of each transect plot. Each plot is to be 10 m x 10 m square with corners demarcated by metal rebar. Within each plot, all vascular plant species will be identified, and the percent cover of each species within each vegetation layer will be estimated visually. Photographs are taken at the center of each fixed sample plot to compare overall plot conditions from year to year.

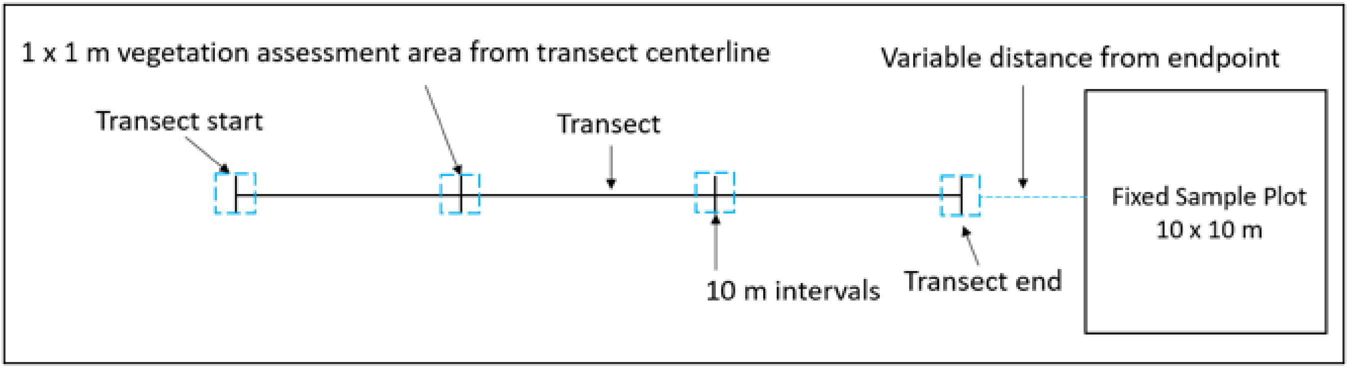

Figure 12: Schematic of Vegetation Monitoring Plot Layout

A weighted mean of *Coefficient of Conservatism* (CC) and *Coefficient of Wetness* (CW) is calculated for each vegetation layer based on species cover, and for the overall plot. The *Coefficient of Conservatism* and *Coefficient of Wetness* is based on information from the Floristic Quality Assessment System for Southern Ontario (Oldham et al. 1995). The *Coefficient of Conservatism* (CC) is a measure of habitat specificity / tolerance, and ranges in value from 0 (tolerant of a wide range of habitats) to 10 (very habitat specific) (See Table 1). The *Coefficient of Wetness* (CW) is an indicator of wetland or upland affinity, ranging in value from +5 (upland) to –5 (obligate wetland) (See Table 2). Mean CW and CC values are then calculated based on sampling data and will be compared over subsequent monitoring years. These data can provide indications of wetland condition changes in association with surface and groundwater levels, and climatic events. Total species richness and the weighted percentage of native species is also calculated for the overall plot. In addition to vascular plants, the percentage of standing water, organic detritus, and bare substrate are also estimated within each fixed sample plot. This information is used to compared over subsequent monitoring years.

Table 5. Coefficient of Conservatism (CC) Values Index

CC	RANK	DESCRIPTION
0 to 3	Tolerant	Found in a wide variety of plant communities, including disturbed sites.
4 to 6	Moderately Conservative	Typically associated with a specific plant community but tolerate moderate disturbance.

CC	RANK	DESCRIPTION
7 to 8	Conservative	Typically associated with a plant community in an advanced successional stage that has undergone minor disturbance.
9 to 10	Highly Conservative	Typically displaying a high degree of fidelity to a specific plant community or a narrow range of synecological parameters.

Adapted from Oldham et al. 1995.

Table 6. Coefficient of Wetness (CW) Values Index

CW	RANK	DESCRIPTION
- 5	OBL	**OBLIGATE WETLAND**: Occurs almost always in wetlands under natural conditions (99% probability)
- 4	FACW+	**FACULTATIVE WETLAND**: Usually occurs in wetlands, but occasionally found in non-wetlands (67-99%)
- 3	FACW	
- 2	FACW-	
- 1	FAC +	**FACULTATIVE:** Equally likely to occur in wetlands or non-wetlands (34-66%)
0	FAC	
1	FAC -	
2	FACU+	**FACULTATIVE UPLAND**: Occasionally occurs in wetlands, but usually occurs in non-wetlands (1-33%)
3	FACU	
4	FACU-	
5	UPL	**UPLAND**: Occurs almost never in wetlands under natural conditions (<1%)

Adapted from Oldham et al. 1995.

CLOSURE

We trust that this technical memorandum meets your current needs. If you have any questions or require clarification, please contact the undersigned at your earliest convenience.

WSP Canada Inc.

[redacted]

Paul Menkveld, M.Sc., P.Eng.
Hydrogeological Engineer

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George Schneider, M.Sc., P.Geo.
Senior Geoscientist
Signatory of hydrological interpretation

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Daniel Eusebi, B.E.S., R.P.P., M.C.I.P.
Senior Principal Ecologist

PGM/GWS/DE/rk

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ATTACHMENT 5

Hydrological and Ecological Monitoring Plan – Proposed Aberfoyle South Lake Pit

TECHNICAL MEMORANDUM

DATE October 21, 2025 **Project No.** CA-GLD-1791470A-VCNA

TO Andreanne Simard - Director of Lands, Resources and Environment
Stephen May - Lands Manager, Western Region
CBM Aggregates

CC George Schneider, Daniel Eusebi

FROM Paul Menkveld **EMAIL paul.menkveld@wsp.com**

HYDROLOGICAL AND ECOLOGICAL MONITORING PLAN – PROPOSED CBM ABERFOYLE SOUTH LAKE PIT

In December 2023, CBM Aggregates (CBM), a division of St. Marys Cement Inc. (Canada) submitted an *Aggregate Resources Act* application to licence the proposed Aberfoyle South Lake Pit, located at 6947 Concession Road 2, in the Township of Puslinch, County of Wellington, Ontario. WSP Canada Inc. (WSP) prepared a Level 1/2 Water Report (Water Report) and Natural Environment Report to support this application. Stakeholder comments have been received pertaining to various aspects of the application and reports.

The Water Report (WSP, 2023) presented site-specific groundwater and surface water monitoring recommendations to measure and evaluate the status on potential receptors associated with the development of the proposed pit, and to allow for comparison between the condition of the receptor measured during the monitoring program and those predicted as part of the impact assessment.

In response to stakeholder comments to the Water Report, WSP has prepared this Technical Memorandum which presents an enhanced site-specific monitoring plan, provides an approach to the establishment of trigger conditions (to be determined specifically based on all available baseline data prior to the Operational Phase), and identifies potential corrective actions. Monitoring locations are presented on Figure 1.

PROPOSED ENHANCED MONITORING PLAN

The Water Report recommends that a monitoring program be implemented to verify the pit's zone of influence on the surrounding Provincially Significant Wetlands (PSW), tributary features, and Mill Creek, as well as to monitor for potential interference with neighbouring private wells (WSP, 2023). The proposed enhanced monitoring program includes the following monitoring activities, which shall commence a minimum of one year prior to the start of extraction, continue through the Operational Period, and end one year after the completion of site Rehabilitation.

Groundwater Monitoring

- Monitoring shall include the current groundwater monitoring network, which consists of six overburden monitoring wells (MW18-01B to MW18-06), one previously existing bedrock well (TW11-16), and six standpipe piezometers (SP18-01 to SP18-04, SP22-01, and SP22-02) at the surface water stations.

Groundwater level monitoring shall consist of recording groundwater level and temperature data at 15-minute intervals using data loggers, along with quarterly logger downloads and manual water level measurements.

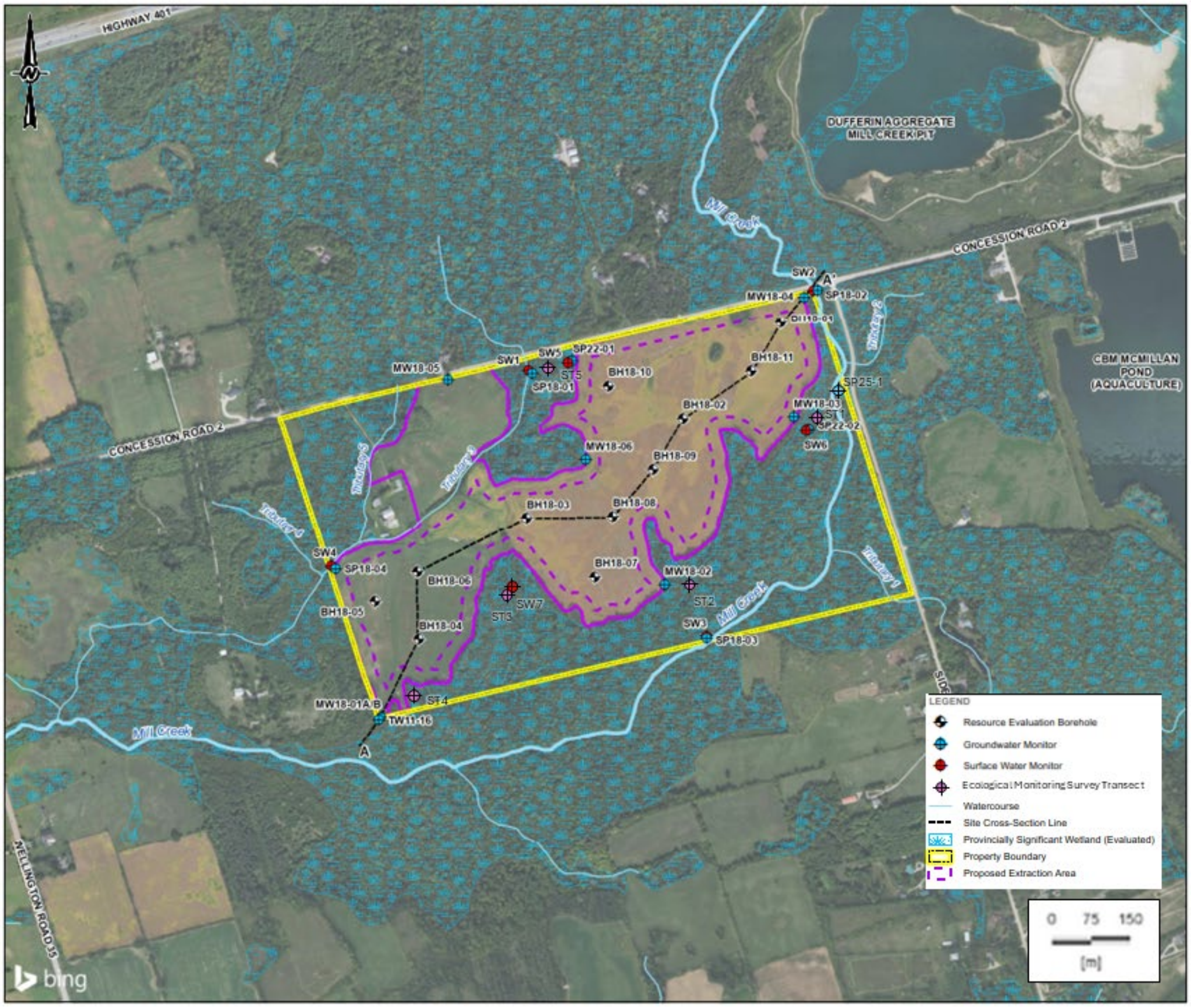

Figure 1: Monitoring Locations

- A new groundwater monitoring location shall be established to the east of Mill Creek, labeled SP25-1 on Figure 1, to observe groundwater conditions. Once installed, this location shall be included in the groundwater monitoring network described above.
- Groundwater quality monitoring is not proposed, as no water quality impacts are predicted.
- A Well Interference Complaint Response program shall be implemented to respond to any potential interference with other water users, as described in the Water Report (WSP, 2023).

Surface Water Monitoring

- Surface water conditions shall continue to be monitored at the existing surface water stations SW1 to SW4 located in the channels of Mill Creek and Tributary 3, as well as SW5 and SW6 located within the PSW.

Surface water monitoring shall include quarterly manual measurements of water level and flow, as well as continuous hourly monitoring of water levels and temperatures using dataloggers.

- Surface water quality monitoring is not proposed, as no water quality impacts are predicted.
- An additional monitoring station SW7 shall be installed to monitor hydrological conditions in the PSW in the southwestern portion of the Site, which includes wetlands similar to those observed at SW5 and SW6, and a low-lying area. SW7 shall include two standpipe piezometers (SW7A and SW7B), one placed at the northern margin of the low-lying feature (interpreted to be the upgradient side of the surface water feature), another placed in wetland south of the low-lying area, and a surface water monitoring point within the low-lying area. Surface water monitoring shall include quarterly manual measurements of water level, as well as continuous hourly monitoring of water levels and temperatures using dataloggers.

Ecological Monitoring

- To observe ecological conditions in the PSW, monitoring of the form and function of the wetland shall be carried out annually (in early summer) along five survey transects as depicted on Figure 1 and detailed below in Recommended Ecological Monitoring Method. Ecological monitoring shall begin one year prior to the start of aggregate extraction, and continue during the Operational Period, and end one year after the completion of site Rehabilitation. During the one year of monitoring prior to the start of aggregate extraction, monitoring will be carried out biannually (early summer and early fall) to provide baseline data for comparison to enhanced monitoring in the event this is required (as discussed below).
- In order to ensure effective monitoring of the Mill Creek fishery, existing baseline data and monitoring programs will be consolidated prior to the commencement of extraction activities. Any identified gaps will be addressed to establish a comprehensive and robust baseline that serves as an essential reference point for evaluating the fishery during its operational phases. Ongoing monitoring will subsequently be conducted in response to hydrological conditions that may suggest potential ecological impacts.
- To effectively monitor the Mill Creek fishery, baseline monitoring shall be conducted prior to the start of extraction, with a particular focus on key ecological indicators such as Brown Trout spawning activity. This monitoring will serve as a critical reference point for evaluating the fishery during operational phases and will be presented to GRCA to ensure alignment with their current monitoring activities. Subsequent monitoring of the Mill Creek fishery will be conducted in response to hydrological conditions that indicate a potential ecological impact.

Monitoring of Setback Naturalization

The following monitoring of the naturalization of the setbacks along the alignment of tile drain is recommended:

- Monitor the site for signs of rill and other erosion until the area has stabilized and vegetation within the buffer has become established and self-sustaining;
- Monitor wetland edge for signs of erosion and sedimentation. Correct any potential issue and restabilize and plant areas; and
- Monitor the newly planting buffers for invasive species and if needed initiate an invasive species control program.

Data Review and Reporting

- Results of the monitoring program shall be reviewed by the licensee quarterly and reported to the Ministry of Natural Resources (MNR) annually as part of the licence requirements. Trends during Operations and Post-Rehabilitation shall be compared to Pre-Operational conditions. If the results of the monitoring program indicate the potential for adverse impacts to groundwater users (private wells), surface water features (Mill Creek and its tributaries) or to wetlands, then appropriate enhanced monitoring, and corrective actions shall be implemented, as described below.

RECOMMENDED ECOLOGICAL MONITORING METHOD

The proposed ecological monitoring involves the establishment of a combination of survey transects and associated fixed sample plots, as described below.

Survey Transects

One 100 m transect shall be established in each of the wetland zones, as illustrated on Figure 1, that are representative of the wetland vegetation communities within the wetland complex on the subject property. Reflective T-bar shall be used to mark start and end points, and flagging tape used to demarcate the center line at 10 m intervals along the transect. Vascular plants within 1 m of the center line of the transect shall be identified along the length of the transect, and the abundance for each species estimated using definitions provided in the Glossary of the ELC manual (Lee *et al.* 1998):

- **Rare:** Only one to a few individuals in the area of interest.
- **Occasional:** Scattered individuals throughout a community or represented by one or more large clumps of many individuals.
- **Abundant**: Referring to a plant that is represented throughout the polygon or community by large numbers of individuals or clumps. Likely to be encountered anywhere in area of interest. Usually forming > 10% ground cover.
- **Dominant**: A plant with the greatest cover or biomass within a plant community and by large numbers of individuals. Visually more abundant than other species in the same layer forming > 10% of the ground cover and >35% of the vegetation cover in any one layer.

In addition, the Floristic Quality Index (FQI) shall be calculated to provide a quantitative evaluation of botanical quality. The FQI is the product of Mean *Coefficient of Conservatism* (CC) and the square root of the area's plant richness (Swink and Wilhelm 1994).

Fixed Sample Plots

Fixed sample plots shall also be established at varying distances from the end of each transect plot. Each plot shall be 10 m x 10 m in size with corners demarcated by metal rebar, as illustrated on Figure 2. Within each plot, vascular plant species shall be identified, and the percent cover of each species within each vegetation layer shall be estimated visually. Photographs shall be taken at the center of each fixed sample plot and compared to overall plot conditions from year to year.

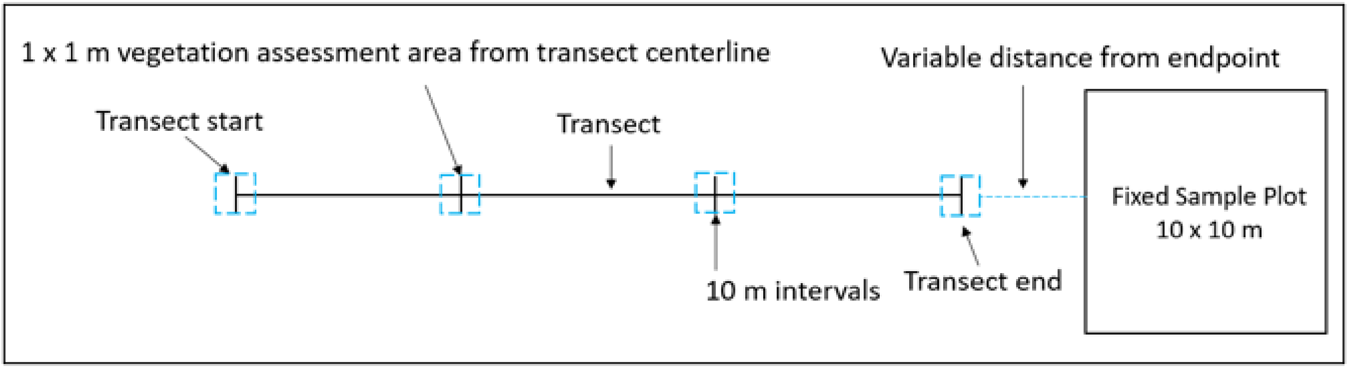

Figure 2: Schematic of Vegetation Monitoring Plot Layout

A weighted mean of *Coefficient of Conservatism* (CC) and *Coefficient of Wetness* (CW) shall be calculated for each vegetation layer based on species cover, and for the overall plot. The *Coefficient of Conservatism* and *Coefficient of Wetness* is based on information from the Floristic Quality Assessment System for Southern Ontario (Oldham et al. 1995). The *Coefficient of Conservatism* (CC) is a measure of habitat specificity / tolerance, and ranges in value from 0 (tolerant of a wide range of habitats) to 10 (very habitat specific) (see Table 1). The *Coefficient of Wetness* (CW) is an indicator of wetland or upland affinity, ranging in value from +5 (upland) to –5 (obligate wetland) (see Table 2).

Mean CW and CC values shall then be calculated based on sampling data and compared to subsequent monitoring years. These data provide indications of wetland condition changes in association with surface and groundwater levels, and climatic events. Total species richness and the weighted percentage of native species shall also be calculated for the overall plot. In addition to vascular plants, the percentage of standing water, organic detritus, and bare substrate shall also be estimated within each fixed sample plot. This information shall be used to compare to subsequent monitoring years.

Table 1. Coefficient of Conservatism (CC) Values Index

CC	RANK	DESCRIPTION
0 to 3	Tolerant	Found in a wide variety of plant communities, including disturbed sites.
4 to 6	Moderately Conservative	Typically associated with a specific plant community but tolerate moderate disturbance.
7 to 8	Conservative	Typically associated with a plant community in an advanced successional stage that has undergone minor disturbance.
9 to 10	Highly Conservative	Typically displaying a high degree of fidelity to a specific plant community or a narrow range of synecological parameters.

Adapted from Oldham *et al.* 1995.

Table 2. Coefficient of Wetness (CW) Values Index

CW	RANK	DESCRIPTION
- 5	OBL	**OBLIGATE WETLAND**: Occurs almost always in wetlands under natural conditions (99% probability)
- 4	FACW+	**FACULTATIVE WETLAND**: Usually occurs in wetlands, but occasionally found in non-wetlands (67-99%)
- 3	FACW	
- 2	FACW-	
- 1	FAC +	**FACULTATIVE:** Equally likely to occur in wetlands or non-wetlands (34-66%)
0	FAC	
1	FAC -	
2	FACU+	**FACULTATIVE UPLAND**: Occasionally occurs in wetlands, but usually occurs in non-wetlands (1-33%)
3	FACU	
4	FACU-	
5	UPL	**UPLAND**: Occurs almost never in wetlands under natural conditions (<1%)

Adapted from Oldham et al. 1995.

TRIGGER LEVELS AND CORRECTIVE ACTIONS

This section establishes an approach to the selection of triggers and identifies potential corrective actions. Specific trigger levels shall be established in consultation with the MNR and the Grand River Conservation Authority (GRCA) prior to the commencement of aggregate extraction using available information to establish baseline conditions.

Tiered triggers for each impact receptor shall be designed to identify conditions which precede an impact, enhance monitoring, and identify the potential for impact and engage mitigation measures, described as follows.

1) Preliminary Trigger Level: The levels established to identify conditions that precede those in which there is potential for impacts and proactively enhance monitoring to identify trigger levels and take corrective actions in a timely fashion.

2) Trigger Level: The levels at which a potential impact may occur to an impact receptor. In response to the identification of a trigger level, an impact assessment shall be performed with all relevant data and distributed to the regulating agency, and, if operation of the pit is identified as a contributing factor, corrective actions shall be taken to mitigate potential impacts.

Details of the approach to setting Preliminary Trigger Levels and Trigger Levels for each potential impact receptor are described as follows.

Mill Creek Fishery

The monitoring strategy for the Mill Creek Fishery and Tributary 3 will use hydrological triggers to identify conditions that fall outside the range of natural variation, along with thermal thresholds to identify potential impacts on the fishery. In the event, that a thermal change is observed (outside of the range of natural variations) enhanced monitoring, an impact assessment, notification of the regulating agency, and, if necessary, corrective actions will be taken.

1) Preliminary Trigger: The preliminary trigger condition will be considered to have been met if the daily average surface water temperature exceeds the range of naturally occurring conditions, or the impact threshold for the species (8.9 °C in October and November). In the event the trigger condition is met, monitoring will be enhanced (from quarterly to monthly) to support the evaluation of the Trigger Level.

2) Trigger Level: The trigger condition will be based on thermal stresses associated with Brown Trout, and will be considered to have been met if observed surface water temperatures exceed 23.5 °C at any time and 8.9 °C in October and November. In the event the trigger condition is met, the trigger level will be evaluated against observed natural variations as well as upstream data points to assess if extraction is a contributing factor in the changes observed, or if another cause is identified, such as beaver activity or weather patterns.

   The exceedance and associated findings shall be reported to the regulatory agency and if an impact of extraction is identified, corrective actions will be proposed. Corrective actions considered could include reduced extraction rates to allow groundwater levels to recover, temporary cessation of extraction, or providing a direct input of water from the pit pond to support river during such periods.

Provincially Significant Wetlands

A combined hydrological and ecological approach shall be established to identify and mitigate potential impacts on the wetland. In principle, the preliminary triggers will verify that hydrological conditions remain within the historically observe range of natural variations, and if hydrological conditions indicate that there is potential for impact, ecological features shall be assessed with consideration of weather conditions.

1) Preliminary Trigger Level: Hydrological monitoring will provide information to establish the Preliminary Trigger Level. If hydrological conditions are observed to remain within their observed range, then no adverse effect is predicted. Preliminary triggers shall be selected for each season based on historic ranges of surface water and shallow groundwater levels in observed at the wetland hydrology monitoring stations (SW5, SW6, and SW7). If the condition of a preliminary trigger is met, there is potential for impact and the monitoring frequency at the affected surface water station shall be increased from quarterly to monthly and the frequency of ecological monitoring at the associated survey transect shall be increased from annually to biannually (early summer and early fall).

2) Trigger Level: The hydrological information collected serves to support ecological interpretations of an impact on the wetlands. In the event that a preliminary trigger condition is met, the enhanced ecological monitoring frequency shall be used to support an assessment of whether or not impacts are taking place to the wetland's form and function, for as long as hydrological trigger conditions exist.

3) Ecological Relationship: Following ecological monitoring, an impact assessment considering hydrological and ecological monitoring information shall be undertaken to identify whether or not pit operations are contributing to an adverse impact on the wetland, or if other factors such as weather patterns or invasive species have affected the wetland, and reported following each ecological monitoring event to the regulating agency. In the event an impact resulting from operational activities is identified, situation specific corrective actions shall be discussed with the regulating agency and implemented by the licensee. Corrective actions to

consider shall include reduced extraction rate, cessation of extraction, infiltrating water in setback areas to increase groundwater levels, and / or irrigation of impacted wetland features.

Groundwater Levels to the East of Mill Creek

Trigger levels for groundwater to the east of Mill Creek shall be established to maintain the system within the range of natural variability.

1) Preliminary Trigger: Preliminary trigger conditions shall be established based on monitoring of the natural variability in groundwater conditions to the east of Mill Creek, as observed at SP25-1. If water levels fall within a specified margin of the historically observed naturally occurring minimum water level, the preliminary trigger condition shall be considered to have been met, and monitoring frequency shall be increased from quarterly to monthly, until the trigger condition is no longer met.

2) Trigger Level: In the event that groundwater levels are below the historically observed minimum groundwater elevation, an interpretation of available data shall be used to assess if operational activities are contributing to the observed groundwater level changes, or if another cause, such land use changes or weather patterns are the most likely explanation. This impact assessment shall be reported to the regulating agency with recommendations of corrective actions, if required. Corrective actions considered shall include reduced extraction rate, ceasing extraction, infiltrating water in setback areas to increase groundwater levels, and placement of a silt curtain to reduce groundwater inflows from the east.

Baseflow in Tributary 3

Tributary 3 is intermittent and subject to a range of seasonal baseflow conditions, with the upper reaches providing poor fish habitat. Notwithstanding, trigger levels in Tributary 3 shall be established to maintain the system within the range of natural variability.

1) Preliminary Trigger: Preliminary trigger conditions shall be established based on monitoring of the natural variability Tributary 3 to establish seasonal minimum surface water levels. Some seasonal levels will be 0 m of water, when Tributary 3 has been observed to be “dry” (water level observed to be near zero). When water levels fall within a specified margin of the lowest level observed in a season, levels will be considered to have met the preliminary trigger condition. In response to the preliminary trigger conditions, monitoring frequency shall be enhanced from quarterly to monthly until the trigger condition is no longer met. Daily average levels are recommended for the evaluation of this trigger to reduce the influence of “noise” in surface water level observations.

2) Trigger Levels: In conditions when Tributary 3 is “dry” (water level observed to be near zero), the number of days with a within the same season shall be considered to be the trigger condition for baseflow in Tributary 3. In the event the “dry” period exceeds that observed in the range observed within the natural variations, the trigger condition shall be considered to have been met. In conditions in which water levels are greater than zero but below their seasonal naturally occurring range, the trigger condition shall be considered to have been met. If the trigger condition is met, an interpretation of available data shall be used to assess if extraction is a contributing factor in the changes to observed to Tributary 3’s conditions, or if another cause, such as beaver activity or weather patterns, are the most likely explanation for the observed changes. This impact assessment shall be reported to the regulatory agency and if an impact of extraction is identified, corrective actions will be proposed. Corrective actions considered shall include reduced extraction rates to

allow groundwater levels to recover, temporary cessation of extraction, or providing a direct input of water from the pit pond to support the tributary during such periods.

CLOSURE

We trust that this enhanced site-specific monitoring plan for the proposed Aberfoyle South Pit meets your current needs. Should you have any questions or require clarification, please contact the undersigned at your earliest convenience.

WSP Canada Inc.

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Paul Menkveld, M.Sc., P.Eng.
Hydrogeological Engineer

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George Schneider, M.Sc., P.Geo.
Senior Geoscientist
Signatory to hydrological monitoring and triggers

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Warren Aken, M.Sc.
Principal Aquatic Ecologist
Signatory to fishery monitoring and triggers

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Daniel Eusebi, B.E.S. R.P.P., M.C.I.P.
Senior Principal Ecologist
Signatory to natural environment monitoring and triggers

PGM/GWS/DE/rk

REFERENCES

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Oldham, M. J., Bakowsky, W., Sutherland, D. A. 1995. Floristic Quality Assessment System for Southern Ontario. Natural Heritage Information Centre, Ontario Ministry of Natural Resources. DOI:10.13140/RG.2.2.35685.91360

Swink, F. and G. Wilhelm. 1994. Plants of the Chicago Region, 4th Edition.

ATTACHMENT 6

Flood Mapping – Proposed Aberfoyle South Lake Pit

TECHNICAL MEMORANDUM

DATE August 12, 2025 **Project No.** 1791470A

TO David Hanratty
CBM Aggregates, a division of St. Mary's Cement Inc. (Canada)

CC George Schneider

FROM Mohsin Siddique; Craig DeVito **EMAIL craig.devito@wsp.com**

FLOOD MAPPING – PROPOSED ABERFOYLE SOUTH LAKE PIT

1.0 INTRODUCTION

In November 2023, CBM Aggregates (CBM), a division of St. Marys Cement Inc. (Canada), submitted a Class A Pit Below Water licence application under the *Aggregate Resources Act (ARA)* at the proposed Aberfoyle South Lake Pit located at 6947 Concession Road 2, in the Township of Puslinch, County of Wellington, Ontario (referred herein as Property). WSP Canada Inc. (WSP), has been retained by CBM to complete an assessment of various return period event flood elevations from Mill Creek on the Property, as requested from the Grand River Conservation Authority (GRCA) during their review of the Terms of Reference for the ARA licence application.

The Property is approximately 85 hectares (ha) in size and is located at 6947 Concession Road 2, in the Township of Puslinch, County of Wellington, Ontario. Of this Property, approximately 44 ha are proposed for licensing under ARA (referred herein as Site) and the extraction area within the Site is approximately 27 ha in size (Figure 1.1). The Property is comprised of approximately 50% agricultural fields which are flanked by three wooded areas in the northwest, north-central and southeast portions of the Property and an unoccupied residence in the western portion of the Property (Figure 1.1).

The predominant surface water features in the vicinity of the Site include Mill Creek and its tributaries. Mill Creek flows from north to south along the eastern and southeastern portion of the property (Figure 1.1), exits the Property along the southern boundary, and then flows westward approximately 150 m to the south of the Property boundary. There are five small tributaries to Mill Creek proximal to the Property (Figure 1.1), referred to as Tributary 1, 2, 3, 4 and 5. Tributaries 1, 3 and 5 originate off-Property but then flow onto the Property and join Mill Creek, while Tributaries 2 and 4 are located entirely off-Property.

2.0 OBJECTIVE

The primary objective of this technical memorandum is to assess floodplains of Mill Creek and Tributary 3 and provide the results in terms of storm flood elevations and floodplain maps for 5-year, 10-year, 25-year, 50-year and 100-year storm floods, noting that considering the layout of Site and extraction area, and the overall drainage pattern, floodplains of Tributaries 1, and 5 were not assessed. Flood elevation data was not provided for a 2-year storm flood, however typically a 2-year flood will be contained within the creek channel and will not overtop the top of channel and therefore not enter the site.

3.0 METHODOLOGY

To assess the floodplain of the study area, hydraulic modeling was conducted using HEC-RAS software (version 6.3.1). Two (2) one-dimensional steady flow HEC-RAS models: (1) Mill Creek and (2) Tributary 3, were used. The models of Mill Creek and Tributary 3 are based on GRCA's HEC-RAS models for the regional flood (provided by GRCA) and uses Canadian Geodetic Vertical Datum of 1928 (CGVD28) / North American Datum (NAD) of 1983 of the Canadian Spatial Reference System (NAD83(CSRS)). Note that for floodplain mapping, flood elevations were converted to CGVD2013 / NAD1983 using GPS.H tool (Government of Canada, 2024).

The calibration parameters and associated values in both models were assumed unchanged from their respective regional flood models. Upstream and downstream boundary conditions in the models included storm inflows (for 100-year, 50-year, 25-year, 10-year and 5-year storm floods), extracted from GRCA's respective HEC-2 models, along the reaches and downstream channel bed slopes. Note that the 2-year storm flow data were not provided by GRCA and hence these were not included in the assessment. Tables 1 and 2 provide input boundary conditions (storm inflows for 5-year to 100-year storm floods) for HEC-RAS models along the reaches of Mill Creek and Tributary 3, respectively.

4.0 RESULTS

The results of the HEC-RAS modeling based on CGVD2013 / NAD1983 are presented as storm flood elevations (Tables 3 and 4) and the floodplain maps (Figures 1.2 through 1.6) along the reaches of Mill Creek and Tributary 3. The summary of results is as follows:

- **Mill Creek:**
  - Floodplain boundaries of 100-year and 50-year storm floods, were found to overlap the Site boundary at the northeastern corner of the Property, however, floods were not found to extend beyond the extraction area limit. No flooding was observed in the other parts of the Site due to Mill Creek. Flood due to 2-year storm (being relatively lower than 5-year storm) is expected to be contained within the creek channel and not enter the Site boundary.
  - Storm flood elevations at the northeast corner of the Property, where the Mill Creek flood water is found to enter the Property (Section 14551), ranged from 303.61 metres above sea level (masl) for 100-year storm flood to 303.17 masl for 5-year storm flood.
- **Tributary 3:**
  - Floodplain boundaries of all storm floods were found to overlap the Site boundary, however, only the 100-year and 50-year storm floods were found to extended beyond the extraction area limit. Note that the extraction area is located on the southern side of the Tributary 3. Flood levels due to 2-year storm (being relatively lower than 5-year storm) is expected to be contained within the tributary channel and not extend beyond the banks.

- Storm flood elevations at the northern corner of the Property, where the Tributary 3 flood water is found to enter the Property (Section 1600.1), ranged from 302.8 masl for 100-year storm flood to 302.61 masl for 5-year storm flood.

5.0 POTENTIAL IMPACTS TO SURFACE WATER

- Due to the overlapping of floodplain and the extraction area, flood water is expected to enter the Site and extraction area, however, in general, the flooding due to 2-year storm event is expected to be contained within the creek channel. It is expected that the pits in the extraction area would act as storage area and provide additional temporary storage capacity for the flood water in comparison to the current conditions, which would help reduce the effects of flooding downstream from the Site. By extension, the retention of runoff and reduction to peak flows would lead to the potential for lower rates of sediment erosion / transport.
- It is expected that the large flood events would result in a temporary stoppage in operations, depending on the elevation of the flood waters. If pit access or the safe operation of equipment is at risk, operations will be stopped. This stoppage is expected to be short-lived, as flood waters are expected to recede in a matter of days and the potential for significant damage to the site infrastructure would be minimal.
- Pit operations will be planned to limit the risks of flood water being conveyed through the pit pond(s) and short circuiting of the creek channel. This will be achieved through perimeter grading up to an elevation of 304.6m to control flood water bypassing the channel and extraction planning. Figure 1.7 shows the location of proposed perimeter grading. Note that even with the additions of perimeter grading that increases ground elevations in some areas, the pit extraction will still have an overall benefit to flood volumes in the area as the pit would provide additional storage for water if the flood reached the extraction limit at the northeast corner of the property. The site plans have been updated to address flood risk potential and the comments received so the pit pond can provide flood storage without short circuiting. Updated site plans are provided in the attachments.

6.0 CLOSURE

We trust that this technical memorandum meets your current needs. If you have any questions or require clarification, please contact the undersigned at your earliest convenience.

WSP Canada Inc.

[redacted] [redacted]

Mohsin Siddique, PhD, PEng
Water Resources Engineer

Craig DeVito, PEng
Water Resources Engineer

MS/CDV/ld

Attachments: **Tables:**

Table 1: Storm Inflows along Mill Creek
Table 2: Storm Inflows along Tributary 3
Table 3: Water Surface Elevations of Storm Floods along Mill Creek
Table 4: Water Surface Elevations of Storm Floods along Tributary 3

Figures:

Figure 1.1: Site Location and Cross Sections
Figure 1.2: Storm Flood Elevation Map for 100-year Storm Flood
Figure 1.3: Storm Flood Elevation Map for 50-year Storm Flood
Figure 1.4: Storm Flood Elevation Map for 25-year Storm Flood
Figure 1.5: Storm Flood Elevation Map for 10-year Storm Flood
Figure 1.6: Storm Flood Elevation Map for 5-year Storm Flood
Figure 1.7: Perimeter Grading Location Map

https://wsponline.sharepoint.com/sites/gld-21291g/deliverables/4000 5000 hydrogeology level 1 and 2/10 floodplain assessment/1791470a-tm-revx-cbm lake flood assessment-23june2025.docx

REFERENCES

Government of Canada (2024). GPS.H tool. Available at: https://webapp.csrs-scrs.nrcan-rncan.gc.ca/geod/tools-outils/gpsh.php

TABLES

Table 1: Storm Inflows along Mill Creek

Cross-section ID	Storm Inflow (m^3/s)					
	Regional Flood (1982)	100-year	50-year	25-year	10-year	5-year
19380	127	15	12.5	9.8	6.2	4.1
16101	165	18.4	16	13.3	9.2	6.2
12200	165	16	14.2	12.5	9.2	6.4
8901.4	165	14.6	13.3	11.5	8.5	6
8886.3	153	n/a	n/a	n/a	n/a	n/a
4560	141	13.2	12	10.5	7.8	5.6

n/a: not applicable

Table 2: Storm Inflows along Tributary 3

Cross-section ID	Storm Inflow (m^3/s)					
	Regional Flood (1982)	100-year	50-year	25-year	10-year	5-year
1600.4	15.3	2.4	1.9	1.4	0.8	0.5

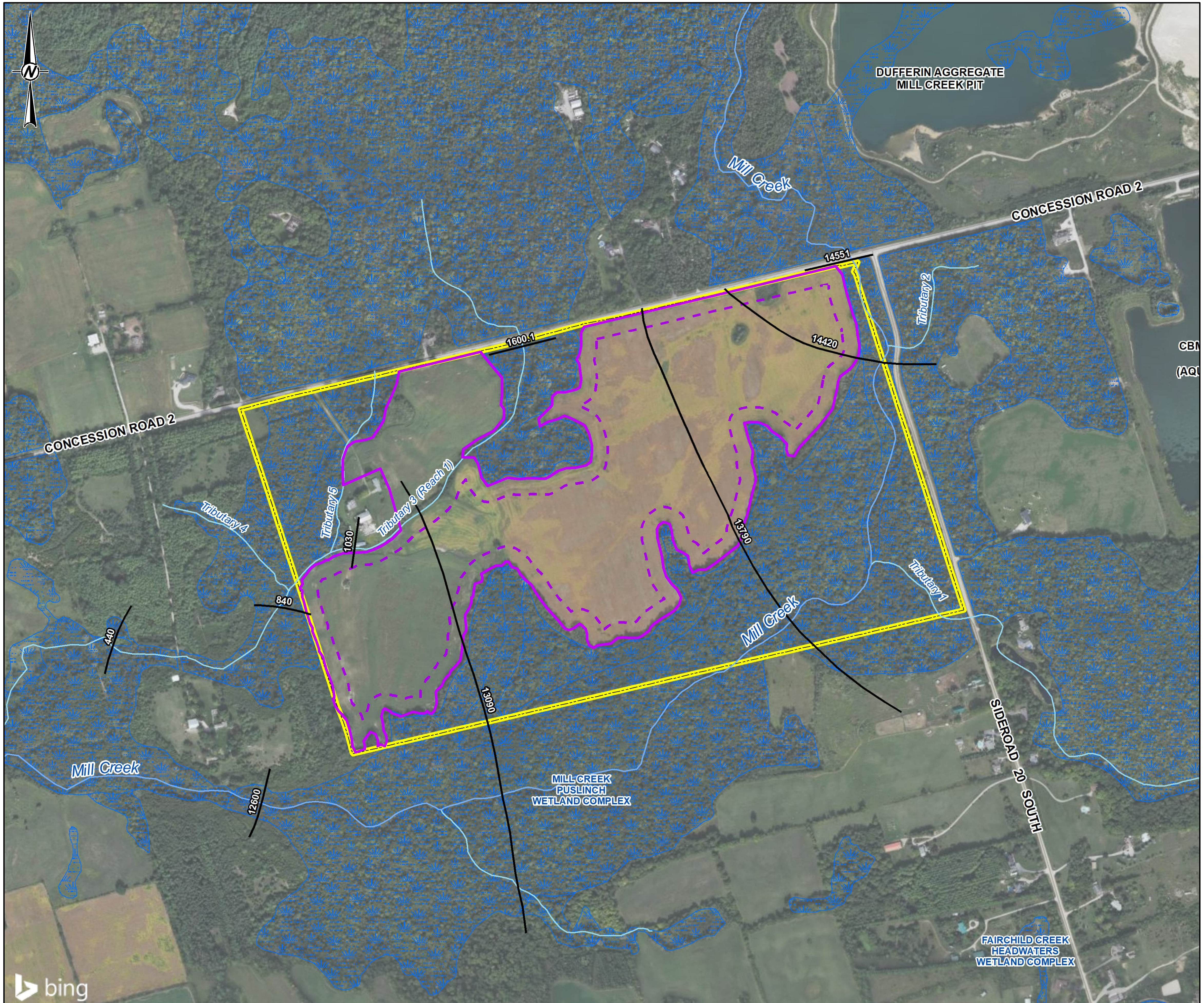
Table 3: Water Surface Elevations of Storm Floods along Mill Creek

Cross Section ID	Storm Flood Elevations (masl)					
	Regional Flood (1982)	100-year	50-year	25-year	10-year	5-year
14551	304.55	303.61	303.55	303.48	303.33	303.17
14420	304.48	303.51	303.45	303.37	303.19	303.01
13790	303.75	302.50	302.43	302.34	302.18	302.03
13090	303.27	301.24	301.17	301.08	300.91	300.76
12600	302.80	300.94	300.86	300.77	300.59	300.41

Table 4: Water Surface Elevations of Storm Floods along Tributary 3

Cross Section ID	Storm Flood Elevations (masl)					
	Regional Flood (1982)	100-year	50-year	25-year	10-year	5-year
1600.1	303.19	302.80	302.78	302.74	302.65	302.61
1030	302.55	301.96	301.90	301.84	301.86	301.79
840	302.03	301.59	301.55	301.50	301.21	301.14
440	301.66	300.78	300.74	300.71	300.65	300.61

FIGURES



LEGEND

- CROSS-SECTION
- WATERCOURSE
- ROAD
- PROVINCIALLY SIGNIFICANT WETLAND (EVALUATED)
- PROPERTY BOUNDARY
- LICENCE BOUNDARY / SITE BOUNDARY
- PROPOSED EXTRACTION AREA

0 100 200 300 400

1:7,500 METRES

REFERENCE(S)

1. BASEDATA: MNRF LIO, OBTAINED 2019
2. IMAGERY SOURCE: SOURCES: ESRI, HERE, GARMIN, INTERMAP, INCREMENT P CORP., GEBCO, USGS, FAO, NPS, NRCAN, GEOBASE, IGN, KADASTER NL, ORDNANCE SURVEY, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), (C) OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY
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3. PROJECTION: TRANSVERSE MERCATOR DATUM: NAD 83 COORDINATE SYSTEM: UTM ZONE 17N

CLIENT
CBM AGGREGATES, A DIVISION OF ST. MARYS CEMENT INC. (CANADA)

PROJECT
ABERFOYLE SOUTH LAKE PIT

TITLE
SITE LOCATION AND CROSS-SECTIONS

CONSULTANT

YYYY-MM-DD	2025-01-23
DESIGNED	ST
PREPARED	CGE/SO
REVIEWED	AS
APPROVED	HM

PROJECT NO.	CONTROL	REV.	FIGURE
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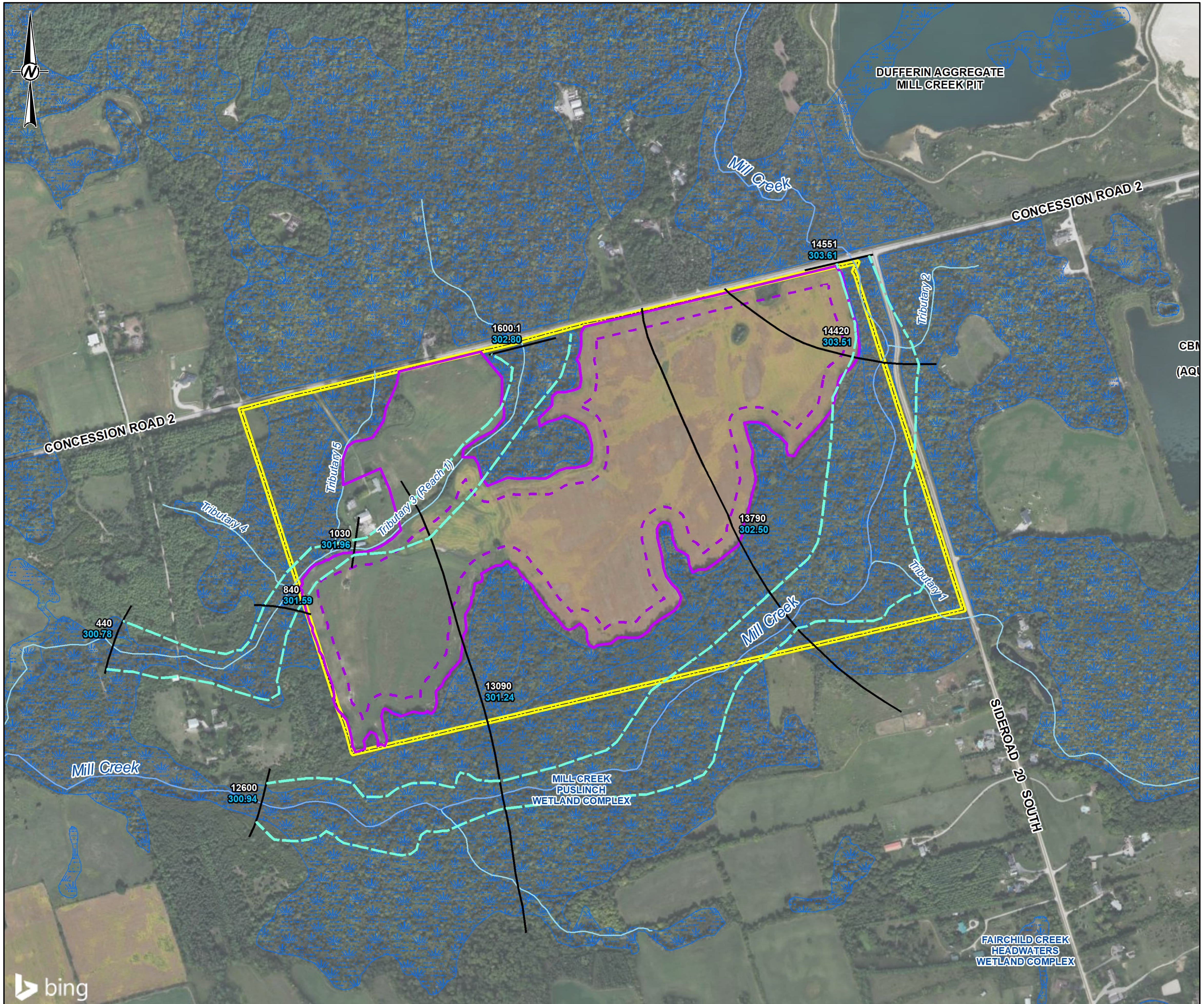

LEGEND

- CROSS-SECTION
- FLOODPLAIN EXTENT
- WATERCOURSE
- ROAD
- PROVINCIALLY SIGNIFICANT WETLAND (EVALUATED)
- PROPERTY BOUNDARY
- LICENCE BOUNDARY / SITE BOUNDARY
- PROPOSED EXTRACTION AREA

0 100 200 300 400
1:7,500 METRES

REFERENCE(S)

1. BASEDATA: MNRF LIO, OBTAINED 2024
2. IMAGERY SOURCE: SOURCES: ESRI, HERE, GARMIN, INTERMAP, INCREMENT P CORP., GEBCO, USGS, FAO, NPS, NRCAN, GEOBASE, IGN, KADASTER NL, ORDNANCE SURVEY, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), (C) OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY
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3. PROJECTION: TRANSVERSE MERCATOR DATUM: NAD 83 COORDINATE SYSTEM: UTM ZONE 17N

CLIENT
CBM AGGREGATES, A DIVISION OF ST. MARYS CEMENT INC. (CANADA)

PROJECT
ABERFOYLE SOUTH LAKE PIT

TITLE
STORM FLOOD ELEVATION MAP - 100 - YEARS FLOOD LEVELS (CGVD2013)

CONSULTANT

YYYY-MM-DD	2025-01-23
DESIGNED	ST
PREPARED	KP
REVIEWED	AS
APPROVED	HM

PROJECT NO.	CONTROL	REV.	FIGURE
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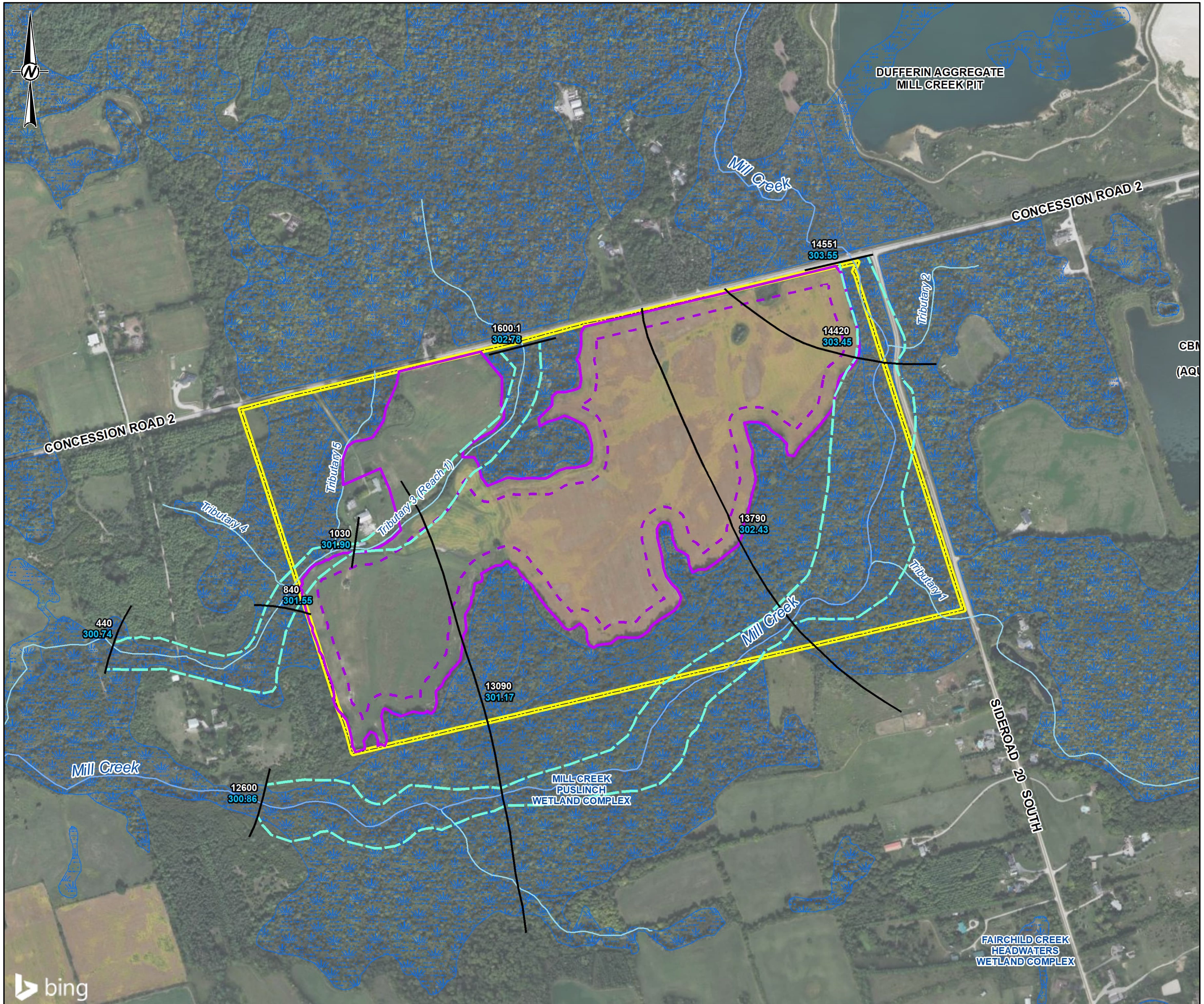

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- CROSS-SECTION
- FLOODPLAIN EXTENT
- WATERCOURSE
- ROAD
- PROVINCIALLY SIGNIFICANT WETLAND (EVALUATED)
- PROPERTY BOUNDARY
- LICENCE BOUNDARY / SITE BOUNDARY
- PROPOSED EXTRACTION AREA

0 100 200 300 400

1:7,500 METRES

REFERENCE(S)

1. BASEDATA: MNRF LIO, OBTAINED 2024
2. IMAGERY SOURCE: SOURCES: ESRI, HERE, GARMIN, INTERMAP, INCREMENT P CORP., GEBCO, USGS, FAO, NPS, NRCAN, GEOBASE, IGN, KADASTER NL, ORDNANCE SURVEY, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), (C) OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY

IMAGE SEPTEMBER 2016

3. PROJECTION: TRANSVERSE MERCATOR DATUM: NAD 83 COORDINATE SYSTEM: UTM ZONE 17N

CLIENT
CBM AGGREGATES, A DIVISION OF ST. MARYS CEMENT INC. (CANADA)

PROJECT
ABERFOYLE SOUTH LAKE PIT

TITLE
STORM FLOOD ELEVATION MAP - 50 - YEARS FLOOD LEVELS (CGVD2013)

CONSULTANT

YYYY-MM-DD	2025-01-23
DESIGNED	ST
PREPARED	KP
REVIEWED	AS
APPROVED	HM

PROJECT NO.	CONTROL	REV.	FIGURE
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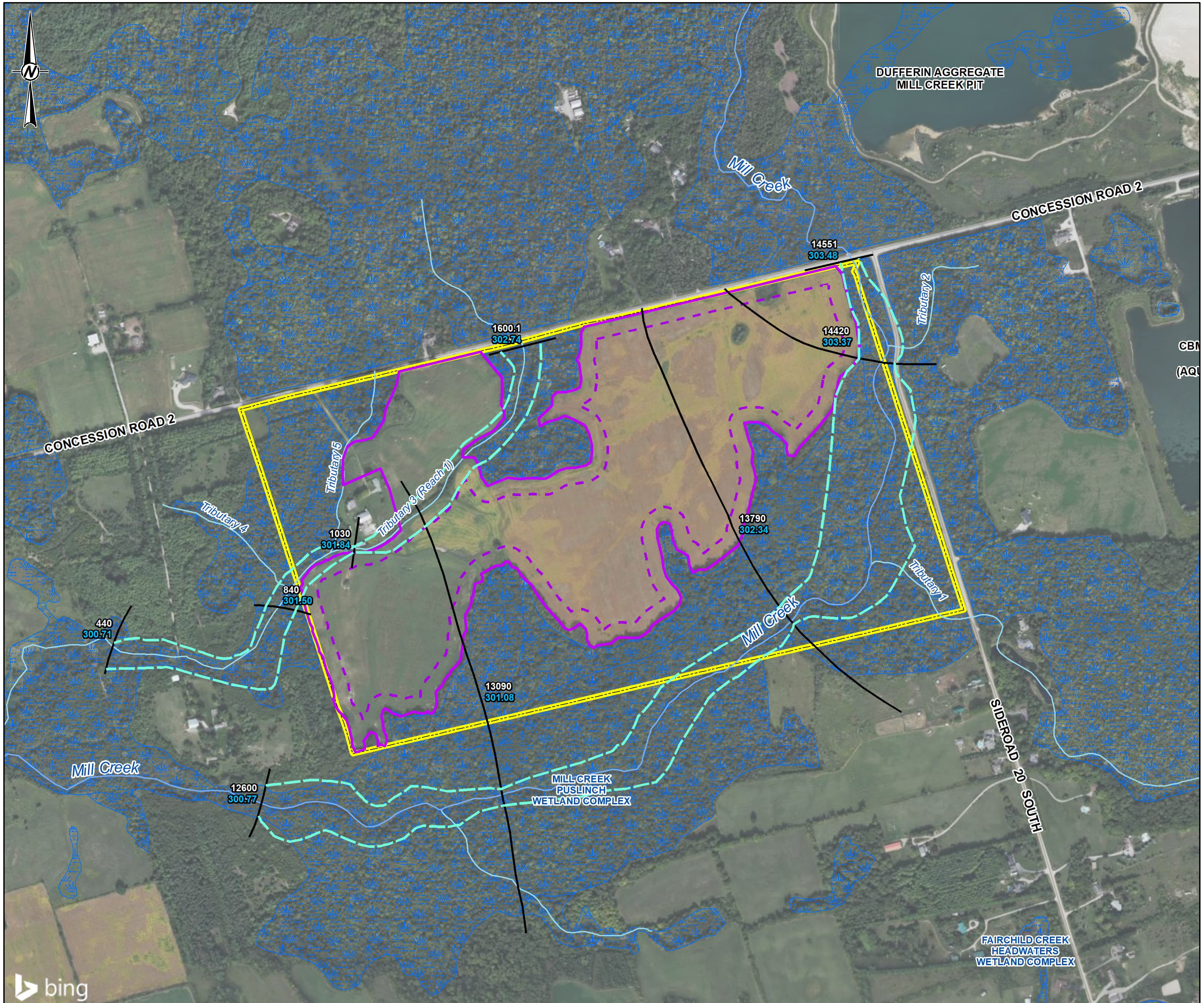

LEGEND

- CROSS-SECTION
- FLOODPLAIN EXTENT
- WATERCOURSE
- ROAD
- PROVINCIALLY SIGNIFICANT WETLAND (EVALUATED)
- PROPERTY BOUNDARY
- LICENCE BOUNDARY / SITE BOUNDARY
- PROPOSED EXTRACTION AREA

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REFERENCE(S)

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2. IMAGERY SOURCE: SOURCES: ESRI, HERE, GARMIN, INTERMAP, INCREMENT P CORP., GEBCO, USGS, FAO, NPS, NRCAN, GEOBASE, IGN, KADASTER NL, ORDNANCE SURVEY, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), (C) OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY
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3. PROJECTION: TRANSVERSE MERCATOR DATUM: NAD 83 COORDINATE SYSTEM: UTM ZONE 17N

CLIENT
CBM AGGREGATES, A DIVISION OF ST. MARYS CEMENT INC. (CANADA)

PROJECT
ABERFOYLE SOUTH LAKE PIT

TITLE
STORM FLOOD ELEVATION MAP - 25 -YEARS FLOOD LEVELS (CGVD2013)

CONSULTANT

wsp

YYYY-MM-DD	2025-01-23
DESIGNED	ST
PREPARED	KP
REVIEWED	AS
APPROVED	HM

PROJECT NO.	CONTROL	REV.	FIGURE
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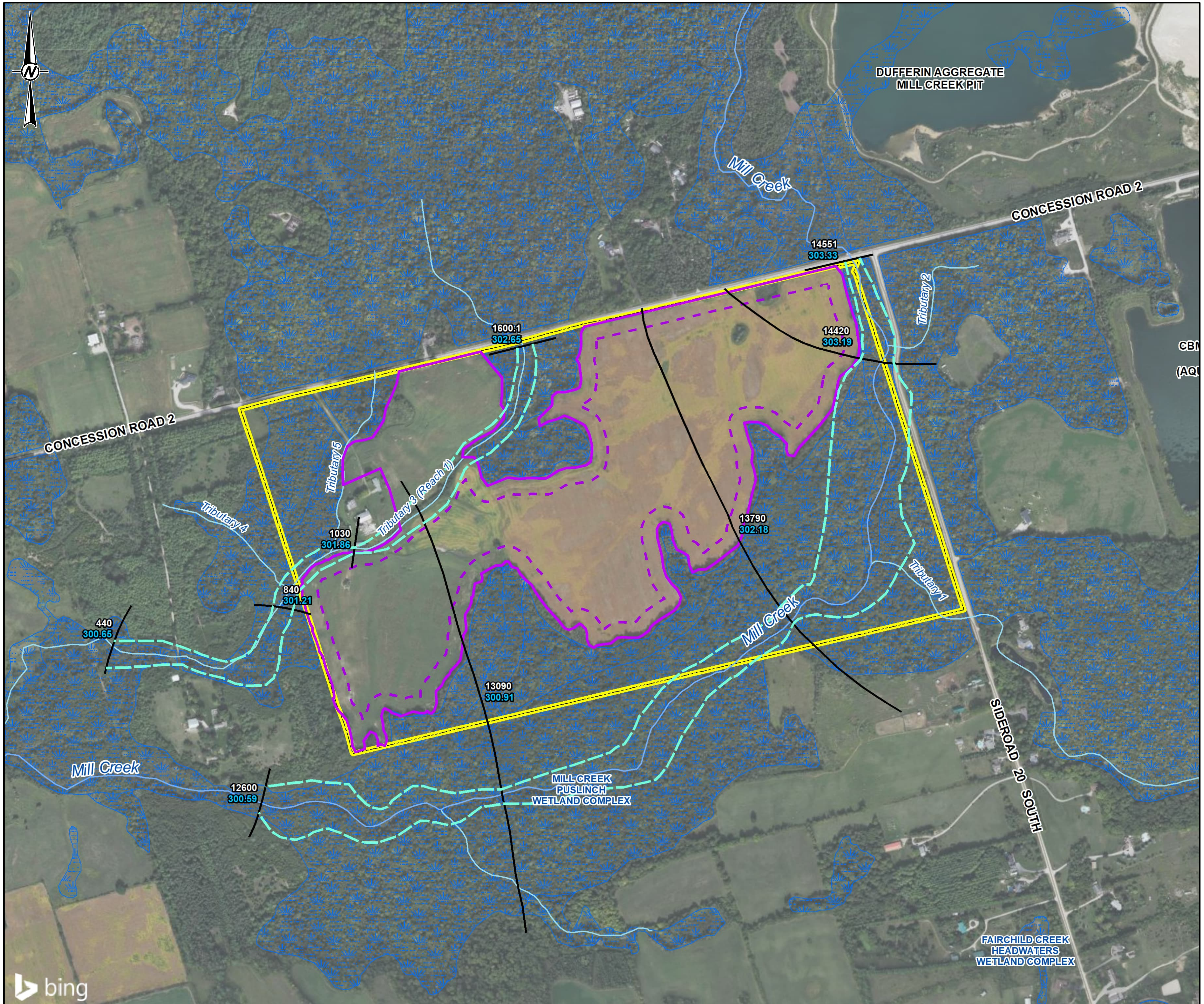

LEGEND

- CROSS-SECTION
- FLOODPLAIN EXTENT
- WATERCOURSE
- ROAD
- PROVINCIALLY SIGNIFICANT WETLAND (EVALUATED)
- PROPERTY BOUNDARY
- LICENCE BOUNDARY / SITE BOUNDARY
- PROPOSED EXTRACTION AREA

0 100 200 300 400

1:7,500 METRES

REFERENCE(S)
1. BASEDATA: MNRF LIO, OBTAINED 2024
2. IMAGERY SOURCE: SOURCES: ESRI, HERE, GARMIN, INTERMAP, INCREMENT P CORP., GEBCO, USGS, FAO, NPS, NRCAN, GEOBASE, IGN, KADASTER NL, ORDNANCE SURVEY, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), (C) OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY
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3. PROJECTION: TRANSVERSE MERCATOR DATUM: NAD 83 COORDINATE SYSTEM: UTM ZONE 17N

CLIENT
CBM AGGREGATES, A DIVISION OF ST. MARYS CEMENT INC. (CANADA)

PROJECT
ABERFOYLE SOUTH LAKE PIT

TITLE
STORM FLOOD ELEVATION MAP - 10 - YEARS FLOOD LEVELS (CGVD2013)

CONSULTANT

wsp

YYYY-MM-DD	2025-01-23
DESIGNED	ST
PREPARED	KP
REVIEWED	AS
APPROVED	HM

PROJECT NO.	CONTROL	REV.	FIGURE
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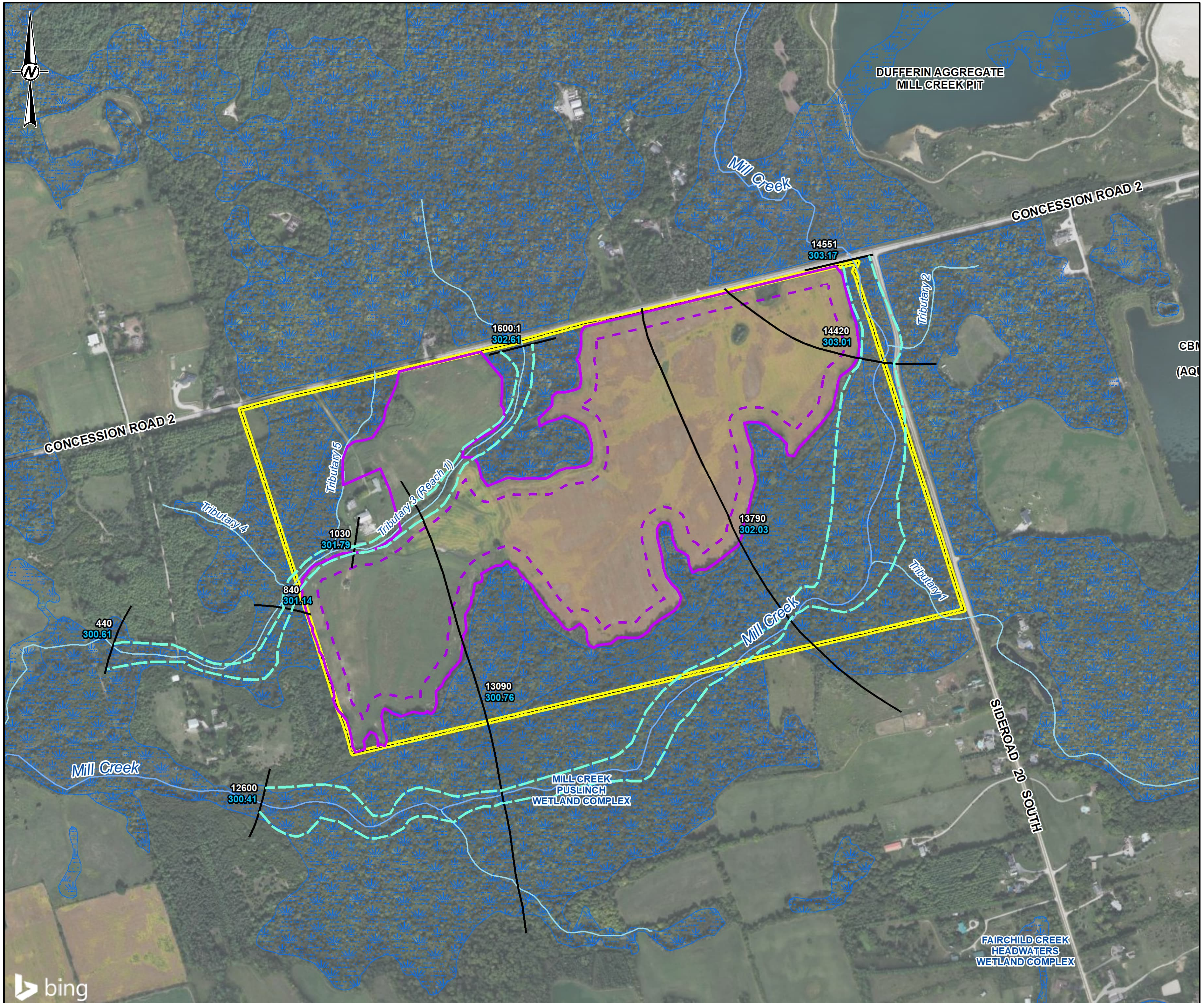

LEGEND

- CROSS-SECTION
- FLOODPLAIN EXTENT
- WATERCOURSE
- ROAD
- PROVINCIALLY SIGNIFICANT WETLAND (EVALUATED)
- PROPERTY BOUNDARY
- LICENCE BOUNDARY / SITE BOUNDARY
- PROPOSED EXTRACTION AREA

0 100 200 300 400

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1. BASEDATA: MNRF LIO, OBTAINED 2024
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3. PROJECTION: TRANSVERSE MERCATOR DATUM: NAD 83 COORDINATE SYSTEM: UTM ZONE 17N

CLIENT
CBM AGGREGATES, A DIVISION OF ST. MARYS CEMENT INC. (CANADA)

PROJECT
ABERFOYLE SOUTH LAKE PIT

TITLE
STORM FLOOD ELEVATION MAP - 5 - YEARS FLOOD LEVELS (CGVD2013)

CONSULTANT

wsp

YYYY-MM-DD	2025-01-23
DESIGNED	ST
PREPARED	KP
REVIEWED	AS
APPROVED	HM

PROJECT NO.	CONTROL	REV.	FIGURE
1791470	0017	0	1.6

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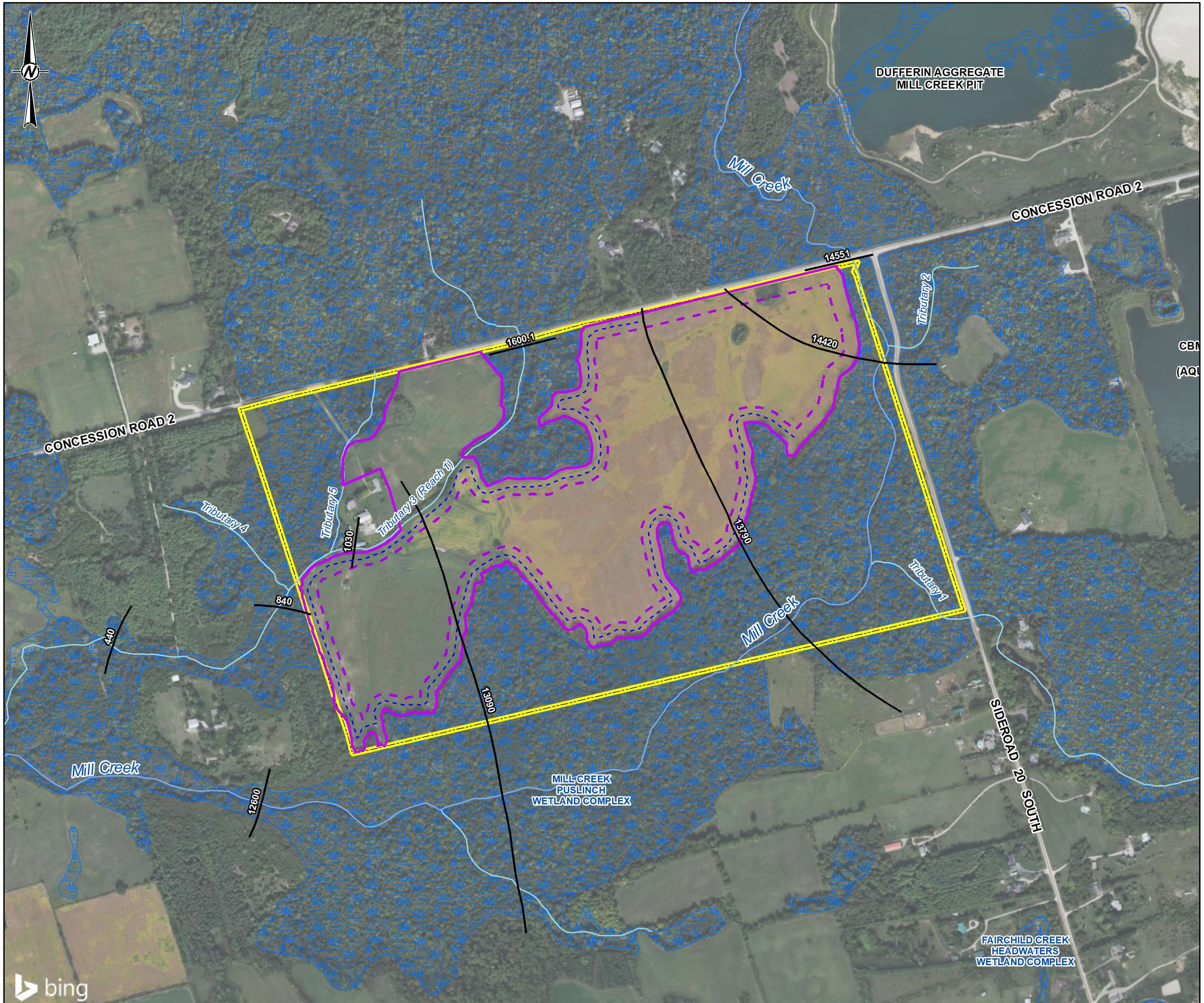

LEGEND

- CROSS-SECTION
- WATERCOURSE
- ROAD
- PROVINCIALLY SIGNIFICANT WETLAND (EVALUATED)
- PROPERTY BOUNDARY
- LICENCE BOUNDARY / SITE BOUNDARY
- PROPOSED EXTRACTION AREA
- PERIMETER GRADING LOCATION

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REFERENCE(S)

1. BASEDATA: MNRF LIO, OBTAINED 2019
2. IMAGERY SOURCE: SOURCES: ESRI, HERE, GARMIN, INTERMAP, INCREMENT P CORP., GEBCO, USGS, FAO, NPS, NRCAN, GEOBASE, IGN, KADASTER NL, ORDNANCE SURVEY, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), (C) OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY
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3. PROJECTION: TRANSVERSE MERCATOR DATUM: NAD 83 COORDINATE SYSTEM: UTM ZONE 17N

CLIENT
CBM AGGREGATES, A DIVISION OF ST. MARYS CEMENT INC. (CANADA)

PROJECT
ABERFOYLE SOUTH LAKE PIT

TITLE
Perimeter Grading Location

CONSULTANT

YYYY-MM-DD	2025-07-02
DESIGNED	
PREPARED	MS
REVIEWED	CDV
APPROVED	

PROJECT NO.	CONTROL	REV.	FIGURE
1791470	0017	0	1.7

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: 25mm

ATTACHMENT 7

Fish Community Survey

TECHNICAL MEMORANDUM

DATE November 1, 2024 **Project No.** CA-GLD-1791470A

TO David Hanratty
Votorantim Cimentos

CC Heather Melcher, Neal DeRuyter, Stephen May

FROM Warren Aken **EMAIL warren.aken@wsp.com**

CBM ABERFOYLE SOUTH PIT EXPANSION – FISH COMMUNITY ASSESSMENT

WSP Canada Inc. (WSP) has been retained by CBM Aggregates (CBM), a division of St. Marys Cement Inc. (Canada), to provide consulting services for the proposed CBM Aberfoyle South Pit Expansion (the Project).

In order to fully address stakeholder comments and ensure CBM has the required information available to respond, WSP has undertaken a fish community survey associated with watercourses on the Aberfoyle South Pit Expansion Site.

For the purpose of this memorandum, the following definitions are used (APPENDIX A):

- **Site** - the total land area within the property owned by CBM that is proposed for licensing under the ARA. The site is approximately 44 ha.
- **Extraction Limit** – The total area within the site in which aggregate is proposed for extraction. The total area of the Extraction Limit is approximately 27 ha.
- **Study Area** - The Study Area for the fish community survey encompasses the Mill Creek and associated unnamed tributaries.

FISH COMMUNITY SURVEY

There are five unnamed tributaries to Mill Creek associated with the Site. The following four unnamed tributaries (excluding Tributary #3) lie outside of the licence boundary, as seen on the figure attached (APPENDIX A).

- **Tributary #1** originates in the Mill Creek-Puslinch PSW approximately 780 m southeast of the property and flows through the southeast corner of the property and into Mill Creek;
- **Tributary #2** originates in the Mill Creek-Puslinch PSW approximately 130 m east of the property and flows into Mill Creek;
- **Tributary #4** originates in the Mill Creek-Puslinch PSW approximately 180 m west of the property and flows into Tributary #3 just west of the property; and

- **Tributary #5** originates in the Mill Creek-Puslinch PSW just northwest property and flows southwest into Tributary #3.

Tributary #3 originates in the Mill Creek-Puslinch PSW approximately 330 m north of the property, flowing first through the Mill Creek-Puslinch PSW and then through the northwest portion of the Site before re-entering the Mill Creek-Puslinch PSW and joining Mill Creek approximately 530 m west of the property (APPENDIX A).

With extensive fisheries information available for the Mill Creek (i.e., from MNR), the focus of the fish community survey was on Tributary #3, and its associated branch (Tributary #5). Tributary #1 and #2 were also assessed along Sideroad 20 South prior to entering the Site. Tributary #4 was not assessed during the 2024 survey as it is located off-Site and is likely to have similar fish habitat characteristics and fish assemblage as Tributary #5.

Fish sampling was undertaken on September 9 and 10, 2024 by means of a portable battery driven electrofishing device (Smith-Root LR24). Electrofishing is the use of electricity to catch fish and is regarded as the most effective single method for sampling fish communities in streams (Plafkin *et al*, 1989[1]).

Results

Mill Creek has a coldwater thermal regime and is known to support several fish species, including blacknose dace (*Rhinichthys atratulus*), bluntnose minnow (*Pimephales notatus*), brook stickleback (*Culaea inconstans*), central mudminnow (*Umbra limi*), common shiner (*Luxilus cornutus*), creek chub (*Semotilus atromaculatus*), fathead minnow (*Pimephales promelas*), rainbow darter (*Etheostoma caeruleum*), rock bass (*Ambloplites rupestris*), and white sucker (*Catostomus commersonii*) (MNRF 2023a). It also supports sensitive coldwater species such as brown trout (*Salmo trutta*) and brook trout (*Salvelinus fontinalis fontinalis*) (MNRF 2023a and b).

MNR data indicate that Tributaries #1, #2, #3, and #4 have a coldwater thermal regime and are likely to support a similar fish community as recorded in the main branch of Mill Creek (MNRF 2023a). The fish community survey completed by WSP found 12 fish species within Tributaries #1, #2, #3, and #5 (Table 1). Brown trout were only caught in Tributary #1. The fish community survey also confirmed that although a range of small-bodied fish were caught within Tributary #3, several shallow muddy sections limit the movement of larger fish such as trout upstream. Within Tributary #3, upstream of Tributary #5, there is limited spawning and rearing habitat for coldwater species such as brown trout. Within the upper reaches of Tributary #3, brook stickleback and central mudminnow dominated the fish assemblage.

[1] Barbour, M.T., J. Gerritsen, B.D. Snyder, and J.B. Stribling. 1999. Rapid Bioassessment Protocols for Use in Streams and Wadeable Rivers: Periphyton, Benthic Macroinvertebrates and Fish, Second Edition. EPA 841-B-99-002. U.S. Environmental Protection Agency; Office of Water; Washington, D.C.

Table 1: Fish Community Survey Results, September 2024

Species	Trib#1	Trib#2	Trib#3	Trib#5
Pumpkinseed (*Lepomis gibbosus*)	20		3	
Northern Redbelly Dace (*Chrosomus eos*)	33	1	72	
Western Blacknose Dace (*Rhinichthys obtusus*)	105		48	
Brook Stickleback (*Culaea inconstans*)	15	11	210	46
Fathead Minnow (*Pimephales promelas*)	3		6	
Central Mudminnow (*Umbra limi*)	20	4	72	3
Creek Chub (*Semotilus atromaculatu*)	5	1	155	
Golden Shiner (*Notemigonus crysoleucas*)	1		1	
White Sucker (*Catostomus commersonii*)		1	47	
Northern Pearl Dace (*Margariscus nachtriebi*)			4	
Blacknose Shiner (*Notropis heterolepis*)			1	
Brown Trout (*Salmo trutta*)	9			

All the fish species recorded in Mill Creek and the associated tributaries within the study area are considered secure and common in Ontario and globally (S5; G5). No aquatic SAR were assessed to have ranges that overlap the Study Area, and no critical aquatic SAR habitat was determined to be present within the Study Area (DFO 2024).

On-Site hydraulic and geomorphic investigations for Tributary #3 concluded that the tributary is an intermittent water feature that is characterized by a narrow channel and high riparian cover. It should be noted that Tributary #3 has been referred to as both intermittent and perennial within the different existing conditions reports. The reference to the seasonality of the stream has been based off the fact that the installed loggers have measured zero flow on at least four occasions, while during these periods, pooled water was still present. Further to this, the water depth during these low flow periods is likely limiting to fish as during summer, there is insufficient baseflow to consistently sustain water in Tributary #3. Therefore, referring to the Tributary #3 as intermittent is appropriate when considering fish habitat.

During the September 2024 survey, it was noted that the average wetted depth was less than 0.3 m with deep organic muck sections present through the middle reach of Tributary #3 (APPENDIX B). The presence of watercress indicates that the tributary is likely groundwater-fed (O’Neil and Hildebrand 1986 and WSP 2024). No specialized habitats (e.g., spawning) were identified in Tributary #3.

Closure

This information has been incorporated into the DFO Request for Review. We trust this memorandum meets your current needs. If you have any further questions regarding this memorandum, please contact the undersigned.

WSP Canada Inc.

[redacted]

[redacted]

Warren Aken
Senior Aquatic Ecologist

Amber Sabourin
Lead Ecologist

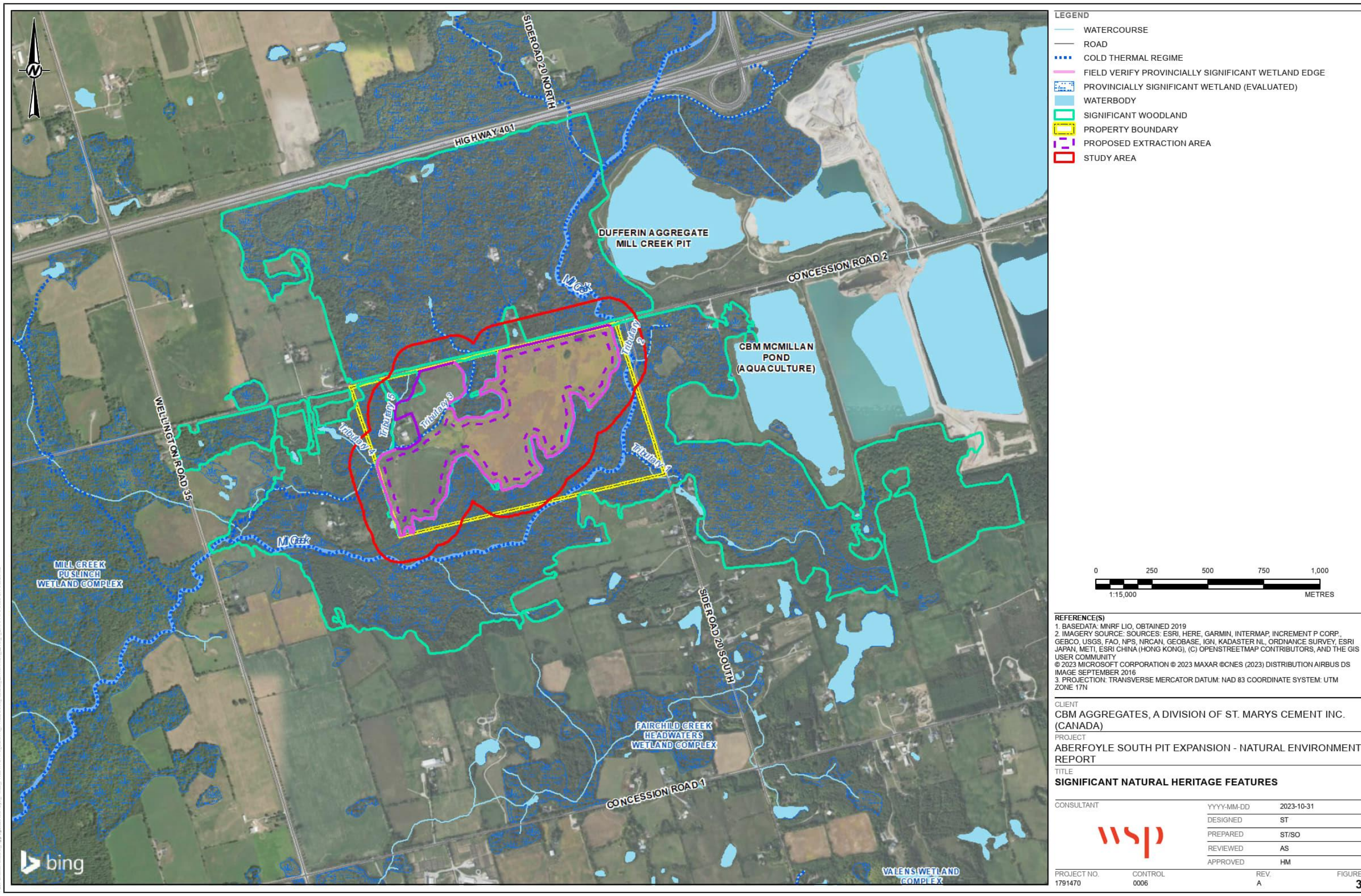
WA/AS/mp

Attachments: Appendix A: Study Area - Associated Watercourses
Appendix B: Photos

https://wsponline.sharepoint.com/sites/gld-21291g/deliverables/natural environment report/fish community assessment/ca-gld-1791470a-l-rev0-cbm_aberfoyle_fish_community-01nov2024.docx

APPENDIX A

Study Area - Associated Watercourses


HIGHWAY 401
SIDEROAD 20 NORTH
DUFFERIN AGGREGATE
MILL CREEK PIT
CONCESSION ROAD 2
CBM MCMILLAN
POND
(AQUACULTURE)
WELLINGTON ROAD 35
MILL CREEK
PUSLINCH
WETLAND COMPLEX
SIDEROAD 20 SOUTH
FAIRCHILD CREEK
HEADWATERS
WETLAND COMPLEX
CONCESSION ROAD 1
VALENS WETLAND
COMPLEX
bing
LEGEND
WATERCOURSE
ROAD
COLD THERMAL REGIME
FIELD VERIFY PROVINCIALLY SIGNIFICANT WETLAND EDGE
PROVINCIALLY SIGNIFICANT WETLAND (EVALUATED)
WATERBODY
SIGNIFICANT WOODLAND
PROPERTY BOUNDARY
PROPOSED EXTRACTION AREA
STUDY AREA
0
250
500
750
1,000
1:15,000
METRES
REFERENCE(S)
1. BASEDATA: MNRF LIO, OBTAINED 2019
2. IMAGERY SOURCE: SOURCES: ESRI, HERE, GARMIN, INTERMAP, INCREMENT P CORP., GEBCO, USGS, FAO, NPS, NRCAN, GEOBASE, IGN, KADASTER NL, ORDNANCE SURVEY, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), (C) OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY
© 2023 MICROSOFT CORPORATION © 2023 MAXAR ©CNES (2023) DISTRIBUTION AIRBUS DS IMAGE SEPTEMBER 2016
3. PROJECTION: TRANSVERSE MERCATOR DATUM: NAD 83 COORDINATE SYSTEM: UTM ZONE 17N
CLIENT
CBM AGGREGATES, A DIVISION OF ST. MARYS CEMENT INC. (CANADA)
PROJECT
ABERFOYLE SOUTH PIT EXPANSION - NATURAL ENVIRONMENT REPORT
TITLE
SIGNIFICANT NATURAL HERITAGE FEATURES
CONSULTANT
YYYY-MM-DD 2023-10-31
DESIGNED ST
PREPARED ST/SO
REVIEWED AS
APPROVED HM
PROJECT NO. 1791470
CONTROL 0006
REV. A
FIGURE 3
IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM:
25mm

APPENDIX B

Photos

Insert file pathway here

Photo 1. Mill Creek at SW2 (March 2024)

Photo 2. Mill Creek at SW2 (March 2024)

Photo 3. Mill Creek at SW2 (October 2019)

Photo 4. Mill Creek at SW3 (October 2019)

Photo 5. Mill Creek at SW3 (March 2024)

Photo 6. Mill Creek at SW3 (July 2018)

Proposed Aberfoyle South Pit Expansion

Date: September 2024

Project No: CA-GLD-1791470A

Attachment 2: Photo Plate

Photo 7. Tributary #3 at SW1 (March 2024)

Photo 8. Tributary #3 at SW1 (March 2024)

Photo 9. Tributary #3 at SW1 (October 2019)

Photo 10. Tributary #3 at SW4 (March 2024)

Photo 11. Tributary #3 at SW4 (March 2024)

Photo 12. Tributary #3 at SW4 (October 2019)

Insert file pathway here

Photo 7. Tributary #3 (September 2024)

Photo 8. Tributary #3 (September 2024)

Photo 9. Tributary #3 (September 2024)

Photo 10. Tributary #1 (September 2024)

Photo 11. Tributary #2 (September 2024)

Photo 12. Tributary #5 (September 2024)

Proposed Aberfoyle South Pit Expansion

Date: September 2024

Project No: CA-GLD-1791470A

Attachment 2: Photo Plate

wsp.com