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January 11, 2013

Via: Email

Mrs. Janice Sheppard, AMCT
CAO
Township of Guelph/Eramosa
P.O. Box 700
Guelph ON N1G 5B4

Dear Janice:

Re: ZBA Hidden Quarry – Township of Guelph/Eramosa
James Dick Construction
File No.: 300032475.0000

We have reviewed the above noted ZBA along with the following documentation:

- Site Plan Drawings, prepared by Stovel and Associates, plotted September 21, 2012:
  - Page 1 of 5, Existing Features
  - Page 2 of 5, Operations Plan
  - Page 3 of 5, Quarry Phasing
  - Page 4 of 5, Cross Sections
  - Page 5 of 5, Cross Sections
- Planning Report, prepared by Stovel and Associates Inc., dated September 2012;
- Stage I – II Archaeological Assessment, prepared by York North Archaeological Services Inc., dated August 31, 2012;
- Air Quality Assessment, prepared by RWDI, dated September 6, 2012;
- Traffic Impact Study, prepared by Cole Engineering, dated April 2012;
- Level II Natural Environment Technical Report, prepared by GWS Ecological & Forestry Services Inc., dated August 2012; and,
- Level I and II Hydrogeological Investigation, prepared by Harden Environmental Services Ltd., dated September 2012.

We offer the following comments.

Background
The subject site (Part of Lot 6, Concession 1 in the Township of Guelph/Eramosa) is currently zoned Agricultural and Hazard. The applicant is proposing to amend the existing Agricultural and Hazard zoning to Extractive Industrial with a special provision to provide relief from required surface water excavation setbacks. Since 1999, the Official

Plan has identified this area as an Aggregate Resource area; only a portion of the property will be used for extraction purposes. Extraction is being proposed both above (80%) and below (20%) the water table. The site will be accessed off of 6th Line. The proposed annual tonnage limit for the site is 700,000 tonnes.

General

- Details of private water and wastewater services required to service the scale house or Shop/Office/Lab building should be provide on the drawing showing location and size/footprint. CBO to confirm adequacy of services.
- A residential unit exists within the proposed site. Details regarding the intended use or removal of this residence and the associated services and entrance should be provided.
- Details should be provided for the driveway apron and should adhere to Township Design Standards within the ROW.
- A high point at the property limit of the right of way should be provided in the New Entrance/Exit to the site to ensure additional surface runoff is not being directed towards 6th Line.
- The proposed entrance to be paved from the scale house to the public road.
- Will the existing service entrance shown on the Operations Plan remain or be removed?
- Fence/Gate geometry to be such that one full truck length can be off the travelled portion of the public road with the gate closed.
- Note 5 on the Operations Plan indicates that the existing property limits are fences although also indicates that fencing and repairs will be undertaken once extraction is initiated. An inspection of the existing fence condition is recommended to confirm the condition of existing fence and to establish the municipality's requirements in this regard.
- Top of rock elevation should be added to the Operations Plan.
- The Township's By-law Enforcement Officer should confirm the activities noted below conform to the Township's Noise Control by-law:
  - extraction operations may occur between the hours of 7 a.m. and 7 p.m., Monday to Friday and 7 a.m. until 1 p.m. on Saturday;
  - hauling operations may occur between 6 a.m. and 6 p.m. Monday to Friday and 6 a,m, to 1 p.m. on Saturday; and,
  - drilling and blasting will occur between 8 a.m. and 5 p.m. Monday to Friday.
- It is understood that a small pond will be constructed for wash water. Additional details should be provided on washing operations.
- Additional details should be provided outlining how the stripped overburden will be dealt with.

Archaeological Assessment

- It is noted that a significant cultural heritage feature has been identified in the northwest portion of the site. The technical recommendations of the archaeologist (York North Archaeological Services) have been included on the site operation plan.
- It is understood that a Stage III assessment will be undertaken prior to any works being completed on site. This assessment should be completed to the satisfaction of the Ministry of Tourism, Culture and Sport.

Air Quality

- The Emissions Summary and Dispersion Modelling (ESDM) as prepared by RWDI was reviewed. Although the documentation took some time to interpret, there was nothing in the ESDM to indicate that the site could not request and receive an Environmental Compliance Approval ("ECA").

Traffic Impact Study

The Traffic Impact Study (TIS) for the proposed quarry was prepared by Cole Engineering Limited (2012) and generally considers traffic operations at the access onto the 6th Line as well as the intersection of Highway 7/6th Line and Highway 7/5th Line. Our comments in this regard are as follows:

- The TIS notes that 5th Line is under the jurisdiction of the Township of Guelph/Eramosa, however it is actually under the jurisdiction of the Town of Milton.
- Comments should be obtained from the Ministry of Transportation (MTO), for operations affecting Highway 7, and from the Town of Milton, for operations affecting 5th Line.
- No information is provided on the anticipated lifespan of the quarry, which would provide context into the potential for longer term impacts.
- The forecast of background traffic is based on traffic counts taken in February 2012. The MTO classifies Highway 7 as a commuter road, which is also confirmed by the strong directional distribution of traffic on a daily basis (i.e., high eastbound traffic in a.m. peak period and high westbound traffic in p.m. peak period). On a seasonal basis, MTO's commuter roads typically have 20 to 25% higher traffic volumes in the summer months, when compared to winter traffic (i.e., February counts). Traffic volumes should be increased to account for these seasonal variations.
- The forecast of trip generation from the proposed quarry is based on data from a proxy site (i.e., Erin Pit). On a weekly basis, the calculation assumes consistent traffic over a Monday to Saturday period, inclusive. Information should be provided to confirm this assumption. The number of working days assumed for the critical month (i.e., August) also does not appear to take into account holiday period, or any reduced operations due to weather, over the monthly period. Also the trip generation is based on average loads which are typical of tractor trailers, whereas actual trip volumes may be higher if the fleet is comprised of higher numbers of tandem or triaxle trucks. Based on the above factors, the estimates for peak period traffic may be low.
- No analysis was provided on the requirements for turning lanes at the intersection of Highway 7/6th Line and at the intersection of Highway 7/5th Line. It is recommended that turning lane warrants and requirements be reviewed for these intersections.
- The TIS does not provide any review of the need to upgrade 6th Line to accommodate the increased truck traffic. It is recommended that a geotechnical study be provided to confirm the road base and road surface requirements. Road widths should also be reviewed, to confirm sufficiency to allow two lanes.
- Analysis of stopping sight distances have been provided for the proposed access onto 6th Line, based on an assumed 50 km/h operating speed. However, since speeds are not posted, the legal speeds on this rural road should be assumed to be 80 km/h, in accordance with the Highway Traffic Act. The required stopping sight distance should be revised accordingly.

- The TIS does not analyze the available sight distances at the intersection of Highway 7/6th Line. It should be confirmed that sufficient stopping sight distances and turning sight distances are available to accommodate the significant increase in truck turning movements at this location.
- The visibility triangles (daylighting) are limited at the intersection of Highway 7/6th Line, by encroachment of existing trees. Considering the down gradient on the 6th Line approach and the type of traffic (i.e., large trucks), visibility triangles should be provided for the approaches, in accordance with the requirements of the Geometric Design Manual for Ontario Highways.
- The design and placement of truck entrance warning signs should meet the requirements of the Ontario Traffic Manual, based on a design speed of 100 km/h on Highway 7 and 80 km/h on 6th Line.

Natural Environmental Technical Report
Burnside has reviewed the report titled "Proposed Hidden Quarry Level II Natural Environment Technical Report" as prepared by GWS Ecological &Forestry Services Inc. Our comments are as follows:

- Development and site alteration are not permitted within a Provincially Significant Wetland ("PSW"). The boundary of the Eramosa River-Blue Springs Creek PSW should be staked in the field with the Ministry of Natural Resources ("MNR") or the Grand River Conservation Authority ("GRCA") with MNR's approval. The report notes that the boundary will be staked at a later date but we strongly suggest that this exercise should occur prior to acceptance of the Level II report as it could have significant implications on the limit of extraction.
- Development and site alteration are not permitted adjacent to a PSW unless it can be demonstrated that no negative effects will result. As such, additional information is required to confirm that the proposed quarry will not affect the hydrology of the wetland. Specifically, the Level II report notes that a hydraulic barrier will be required to prevent the loss of water from the wetland into the quarry bottom. However, there is no discussion of potential effects based on changes to the amount of water entering the wetland. Will the drainage area to the wetland be reduced as a result of the quarry?
- Development and site alteration are also not permitted within or adjacent to Significant Wildlife Habitat unless it can be demonstrated that no negative effects will result. It is not clear that all Significant Wildlife Habitats have been identified and, as such, it is not clear that adequate protection will be provided. We specifically note that the following types of habitats have not been discussed or addressed:
  - According to Section 4.5.5 of the report, Little Brown Bat was recorded on the property. This species is listed as Endangered federally but not provincially. As a result, its habitat would qualify as a type of Habitat for Species of Conservation Concern, in accordance with the Under the Natural Heritage Reference Manual (MNR, 2005) and the Significant Wildlife Habitat Technical Guide (MNR, 2000). The latest guidance for the MNR is that habitat may exist in naturally occurring forest stands (FOD communities) but not in plantations (CUP). It is suggested that the MNR be contacted for further guidance on identifying the significant habitat of this species and the type of protection required.

Hydrogeological Investigation
Burnside has reviewed the report prepared by Harden Environmental Services Ltd entitled "Level 1 and 11 Hydrogeological Investigation Hidden Quarry, Rockwood, Ontario as dated September 2012 and have the following comments:

- We raise some caution with respect to the water level information provided from standpipes installed in open pit excavations.
- TP9 has no description of the dolostone rock. Since the basal till layer has been removed, it is possible that the rock could be acting as an underdrain. Many intervals in the test pit logs do not include descriptions of soil colour and, as a result, it is not clear whether there was any evidence of colour changes associated with saturated conditions.
- Borehole logs for M5 to M10 were missing from the report.
- It is noted that wells M1D to M4 do not include a surface seal and, as a result, the water levels reported may not be accurate.
- Multi-level wells are located only on the west side of the site. The overburden geology changes from primarily sand at M3 to primarily silty sand till at M11. An understanding of the change in geology and variations in water levels between M3/M9 and M11 is needed so that the impacts of extraction on Tributary B can be fully understood.
- Table C1 provides flow data. It is not clear from the table whether data with no values are due to no measurement being taken or whether flows were below the sensitivity of the flow meter. The data should be compared with precipitation data. This should be clarified. Continuous flow measurements would provide an additional level of understanding since spit flows are highly variable.
- An in-situ hydraulic assessment was completed using falling head testing and using a pump to remove water at constant rate (M2, M4). Table D1 indicates that a falling head test was completed at M2 and a short term pumping test was completed in both M2 and M4. A comparison of hydraulic conductivity values obtained with the two methods at M2 should be provided.
- Both MW1D, M2 and M4 have a silica sand pack above the lower bentonite seal whereas the other two bedrock wells (M13-D, M14-D) have a bentonite seal above the sand pack to surface. Wells M1D and M13D have lower hydraulic conductivity values. Is it possible that the minimal annular seal and substantial sand pack in M2 and M4 is impacting the results of hydraulic conductivity testing?
- A good job was done in documenting wells near the site. The two nearby overburden wells are either no longer used (No. 6) or are used occasionally for cleaning purposes (No. 2). Well No. 2 is shallow (3.97 mbtoc) and should be monitored.
- Viewlog™ and Modflow™ were used to create a model of groundwater potentials for the bedrock aquifer.
  - The model uses three layers to represent the bedrock aquifer. How does the model consider the overburden at the site?
  - Hydraulic conductivity values of 5.8 $v10^{-7}$ m/sec (M1D) and 4.0 x 10^{-7} m/sec (M13D). How were these lower k values utilized in the model?
  - Appendix D does not contain any hydraulic conductivity data for M3 and the highest k value is 2.0 x 10^{-4} m/sec at MpN-1. What is the rationale for assigning a value of 1.8 x 10^{-4} m/sec to the bedrock and what is the thickness of this layer?

  - Is the recharge value of 150 mm realistic given the hummocky nature of the site, the relatively coarse deposits that overlie the bedrock in some areas and the closed drainage areas (D5, D6 and D7)?
  - How does the recharge used in the model created for the site compare to values used in the Source Water Protection work completed for the area by Golder and Aqua Resource?
  - Figure H10 provides the predicted groundwater flow in the bedrock. How does this compare to the current flow direction (there is no north arrow on the map)?
  - The model is used to predict changes in bedrock water levels as a result of extraction in two areas of the site (east pond and west pond). What will the impacts be in the overburden?
  - Many of the figures (H4, H5, H6 and H7) do not have legends and, as a result, the significance of the colours used is not always apparent.
  - Tributary B is an ephemeral stream which was assigned a recharge value of 0.154 m/day. How was this value calculated? How was limited flow data for SW5/SW7 considered in the calculation?
  - Burnside recommends that a thorough review of the model be completed by a groundwater modeller with experience in fractured rock geology.
- The infiltration rates used in the groundwater model are less than the rates in the Gartner Lee model (2004) which seems reasonable given the till layer overlying the bedrock. However, it is not clear if higher recharge rates in micro drainage area D7 would affect the interpretation of future impacts. Based on the 1 m contours in Figure 3.4 it is also not clear why D5 and D6 are not considered as one micro-drainage area.
- The bedrock surface is shown in Figure 3.5. The proposed extraction area should be added to this map. It appears that there are few (if any) bedrock monitoring wells within the two extraction areas. Given the heterogeneity of the bedrock, it is recommended that monitoring wells be installed within the extraction areas.
- The report indicates that in general the basal silt till is thin or absent above the bedrock near Tributary B. It is our opinion that there is insufficient information to conclude that the basal till is thin or absent near Tributary B. TP3, TP5 and TP11 did not encounter bedrock but did have finer grained materials. There is no discussion about the difference in effective "k" values between the till and the finer grained materials. This suggests that the water "lost" by Tributary B is may be remaining in the overburden and may not reach the bedrock.
- It is noted in the report that the Brydon Spring likely represents discharge directly from the bedrock and can be considered to be the re-emergence of Tributaries B and C. There are limited bedrock wells on the proposed quarry site and there is no data that confirms that the tributary loses water to the bedrock. Tracer testing should be considered to confirm this statement.
- It is indicated that some monitors have up to 17 years of records and provides groundwater potentials for overburden and bedrock in Figures 3.16 and 3.17. Although there are numerous monitors on site, few (if any) are actually within the extraction area. Only one bedrock well (M2) extends to the bottom of the proposed extraction depth. This well is screened near the top of the bedrock and, as a result, only provide information for a small portion of the bedrock. Water level data from TP8 and TP9 is from a different date than the remainder of the data that was used to prepare Figure 3.16. There also appears to be limited data to support the contours between MW1 and M7. Similarly, there does not appear to be sufficient data

presented in the report to support the assertion that "groundwater occurring within the overburden does so above the silt till as a silt layer generally in the northern portion of the site and percolates into the bedrock within the southern portion of the site. An isopach map of silt thickness would assist in demonstrating the limit of the till unit.

- An estimate of hydraulic conductivity and transmissivity based on data collected during short term pumping tests and falling head tests is provided. Based on the mapping provided, it appears that none of the bedrock wells tested are within the two proposed extraction areas. Onsite in-situ testing was completed in wells with limited screened intervals. The lack of data within the extraction areas results in several concerns:
  - Given the heterogeneity of the bedrock, is there the potential for zones of higher or lower hydraulic conductivity to be present. There are significant variations in flow (400 L/min at mushroom farm vs. 82 L/m in TW2).
  - The excavation will behave as a large diameter well open through the bedrock sequence. The onsite wells are screened over discrete intervals and hydraulic testing will not be representative of the entire bedrock sequence.
  - The Guelph/Eramosa Study used significantly higher hydraulic conductivity values. Since the bedrock is heterogeneous significant variations in hydraulic conductivity can be expected. Additional data from within the extraction areas is needed to confirm on-site conditions.
- Figure 3.18 shows the relationship between water levels in the tributary and MP2, M9 and MP1. The water levels in the tributary are consistently higher than levels in the monitors, however, this may simply demonstrate a lack of connection between the base of the tributary and the fine grained till. Adding stratigraphy to Figure 3.18 would assist in the interpretation of water levels.
- It is agreed that there does not appear to be any groundwater contribution to the Northwest wetland from the bedrock. The water level data in Figure 3.19 and information in cross section B-B' suggests that upward gradients in the overburden west of the wetland may provide discharge to the wetland in the spring when water levels are highest. Please comment.
- It is indicated that Allen wetland is supported by direct precipitation runoff and interflow from the north. Streamflow enters the wetland from the De Grandis Pond. There does not appear to be any relationship between water levels in the Allen wetland and the bedrock wells on the Hidden Quarry Site with diffuse groundwater seepage into the pond interpreted as interflow along the contact between the relatively permeable surficial till found on the De Grandis property and there silt till identified beneath the wetland. The water level in bedrock well 6707545 on cross section A to A' are is the overburden. This well appears to be unconfined. There do not appear to be any bedrock wells in the vicinity of the De Grandis Property. If similar conditions exist on the De Grandis property, is there the potential that the maximum predicted drawdown of 0.6 m shown in Figure 4.3 could impact the Pond?
- Elevated nitrate concentrations (>5 mg/L) were present in samples from bedrock wells M2 and M3. Both M2 and M3 are bedrock wells located at the north end of the Hidden Quarry site. The top of screen at M3 is near the bedrock/till contact and the top of screen at M2 is about 7 m below the bedrock/till contact. Neither well has a surface seal. As a result, it is not certain if there was a conduit created through the till when the wells were constructed. The current level of information does not allow the following concerns to be addressed:

  - What is the source of the nitrate?
  - If the elevated nitrate is currently present in only the shallow bedrock, excavation of the bedrock will create a vertical connection between the shallow and deep fracture systems. What will be the impact to nearby domestic well quality?
  - The final depth of extraction is not indicated. What are the impacts of mixing water from the underlying shale with the water from the dolostone?
- The bedrock below the water table will be blasted and the broken rock will be removed with excavators or draglines stationed above the water table without dewatering (Note: should dewatering be required additional review of the detailed operations will be required). The proposed mining area is shown in Figure 4.1. The proposed depth of extraction should be shown on all the cross sections with an additional cross section created to show the extraction area east of Tributary 5.
- The construction of a hydraulic barrier along the downgradient side of the onsite wetland is proposed. The proposed barrier is to be 2.5 m wide and keyed into the silt/silt till layer.
  - It is not clear from Figure 4.2 how the location of the proposed barrier corresponds to the limits of micro drainage areas on Figure 3.4. The scale of the contours on Figure 3.4 suggests that D5 and D6 are connected. The addition of the limits of extraction and the location of the proposed barrier to this Figure would assist in confirming that runoff to the wetland will not change.
  - The addition of wells and water level data to Figure 5.1 along with observed lithology is needed to ensure that the barrier is placed at the optional location.
  - Additional detail on how the width of the barrier was calculated should be provided.
- There does not appear to be any wells which are located in the two extraction areas that penetrate the entire bedrock sequence. As a result, the bulk hydraulic conductivity and the depths of fracture are not reliably known. The extraction of the bedrock may result in the connection of horizontal fractures that are currently separated by zones of relatively impermeable bedrock. This could result in the alteration of current groundwater flow in the bedrock. The statement that the creation of a waterbody will result in increased storage and will benefit downstream wells, springs, ponds or streams during drier conditions suggests that there is a connection between the bedrock beneath the site and downstream resources. As a result, any decrease in available water onsite or changes in water quality will potentially impact downgradient features.
- There is not sufficient information on the bedrock in the extraction areas to allow for a reliable prediction of drawdown to be made. The vertical spacing and contribution of the water bearing fractures is not known and as a result, inflow into the pit may result in temporary dewatering of shallow fractures. The length of time for water levels to stabilize is not estimated. There is also a potential that bedrock water quality will be affected if cascading occurs within the extraction area.
- The report indicates that there is downgradient of the Northwest Wetland (southeast of M1), groundwater flow in the silty sand layer and sand and gravel layer ceases and there is only groundwater found in the bedrock. There are no overburden monitoring wells downgradient of M1S/D and as a result, there is no evidence to confirm that there is no water in the overburden.
- Northwest Wetland water balance should address the following:
  - There is a difference between the flux of groundwater upgradient and downgradient of the wetland. Is the increase unsaturated thickness due to

variations in the elevations of the top of the till or is it a result of contribution by the wetland?
  - The design hydraulic conductivity of the barrier 1 x 10^{-7} m/s in Section 5.1.1.2 which is different than the value of 5 x 10^{-8} m/s in Section 4.2.1.
- The predicted water level change in the aquifer for the nearest well will be 1.6 m. However, there are no wells within the proposed extraction areas that penetrate to the proposed depth of the quarry. As a result, the potential for a connection with nearby domestic wells is not known.
- The extraction of the bedrock has the potential to connect shallow fractures with deeper fractures and as a result, there is the potential to cause changes in water quality in nearby domestic wells. Please comment.
- There are no wells that provide an indication of water levels in the bedrock within the extraction areas. Wells in test pits are not considered to provide reliable water levels. The monitoring network needs to be modified to provide additional information on water levels in the overburden south of the wetland and to provide a better understanding of where the significant water bearing fractures occur in the bedrock. We concur with the need to compete a well survey. Contingency measures should be tied into trigger levels for both water levels and water quality.

Summary
It is recommended that the above noted technical issues be addressed prior to approving the zone change application.

Please feel free to contact me or Don McNalty if you have any questions regarding the above noted comments. This review has been carried out by staff with specific areas of expertise. Consequently questions or comments may be passed on to the appropriate individuals who have carried out the initial reviews

Yours truly,

R.J. Burnside & Associates Limited

Jackie Kay

Jackie Kay, P.Eng. MBA
JK/jw

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