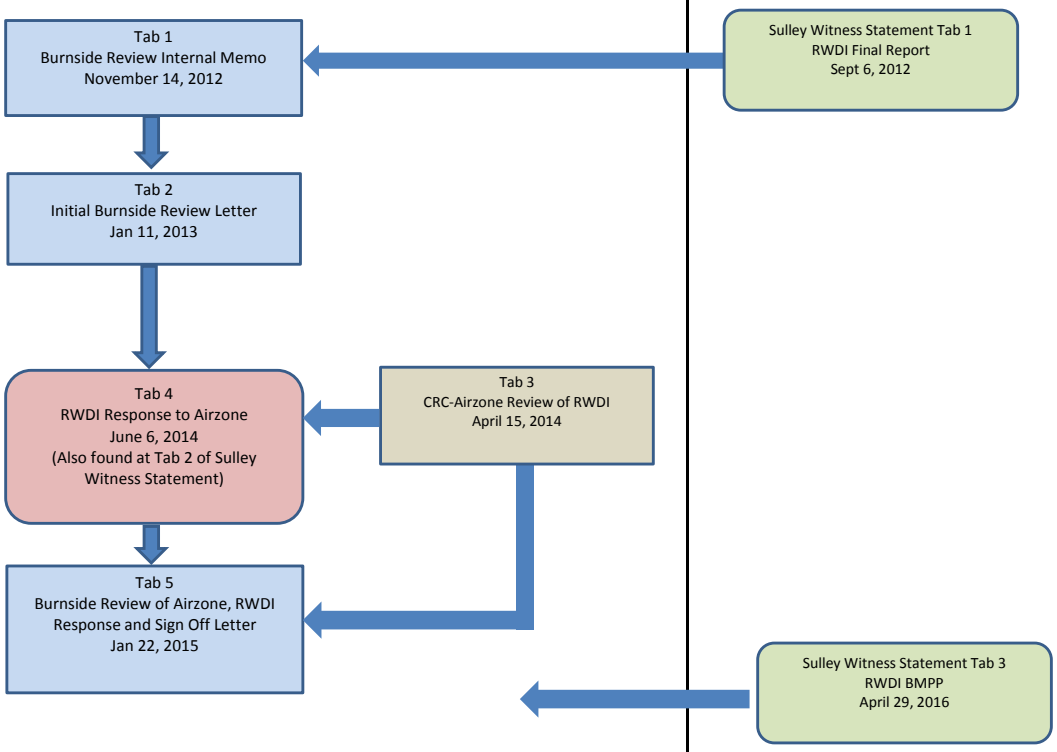
Evidence Book 10

2-May-16

Township of Guelph/Eramosa

Air Quality Review Document Book



Legend

Items located in other Document books as Specified

Burnside Comments

RWDI Responses

CRC

Contents of this Volume

Township of Guelph/Eramosa
Air Quality Review Document Book Index

TAB	DOCUMENT
1	Burnside Review Internal Memo - November 14, 2012
2	Initial Burnside Review Letter - January 11, 2013
3	CRC - Airzone Review of RWDI - April 15, 2014
4	RWDI Response to Airzone - June 6, 2014
5	Burnside Review of Airzone, RWDI Response and Sign Off Letter - January 22, 2015

R.J. Burnside & Associates Limited 6990 Creditview Road, Unit 2 Mississauga ON L5N 8R9 Canada
telephone (905) 821-1800 **fax** (905) 821-1809 **web** www.rjburnside.com

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Memo

Date:	November 14, 2012	**File No.:**	300032475
Project:	Review of Hidden Quarry		
Prepared By:	Harvey Watson		
Distribution:	Dave Hopkins		

Comments

Dave,

In general, RWDI prepared an Emission Summary and Dispersion Modelling ("ESDM") report that was well written and followed the Ontario Ministry of the Environment ("MOE") guidance "A-10 – Procedure for Preparing an ESDM Report". The air dispersion model used (AERMOD) is an acceptable air dispersion model and produces results that are acceptable to the MOE for the foreseeable future. The older model (346) would not have been a good choice. The format of the application document titled "Proposed Hidden Quarry, Township of Guelph-Eramosa, Wellington County, Final Report, Air Quality Assessment, September 6, 2012" (the "Application") followed the recommended format as provided in the "Acme" examples which provides examples of how the MOE would like to see application documents prepared. The basic concept of the "Procedure for Preparing an ESDM Report" guidance is that the proponent must write an ESDM that describes the "worst case reasonable" operations at the location. Having done that and showing compliance, it is then reasonable to expect that the proponent will always be in compliance.

The air dispersion methodology used followed the methodology outlined in the MOE's Guideline "A-11 Air Dispersion Modelling Guideline for Ontario (ADMGO)".

The first simplifying assumption of the Application is that the only contaminant of concern at the location is particulate matter. While the dolostone collected has a large number of constituents, the majority of them have no specific criteria and the ones that do have individual criteria are found in concentrations much less than the concentration that would cause them to exceed their criterion before the particulate matter criterion is exceeded. Therefore, this simplifying assumption is reasonable.

The Application indicates that the emissions for dry extraction will exceed the emissions for underwater extraction which is also a reasonable assumption because the aggregate that is removed during the underwater extraction will be wet and not emit as much dust.

There was nothing in this ESDM to indicate that the site could not request and receive an Environmental Compliance Approval ("ECA"). The modelling appears to have taken into account all the appropriate scenarios and situations. However, the ESDM document did not always make it easy to find the information or confirm that what was done did meet the criteria.

The recommended improvements in documentation are listed below.

1) Section 4.1.1 Paragraph 2 (page 13 of .pdf) says "The option exists to use conveyors to move material from working face to the processing plant." However, the information in Table 2.1 and Table 5.1 do not provide sufficient information to determine whether the "Compliance" simulation used conveyors as sources of emissions to demonstrate compliance. Would it be possible to add this information to Table 5.1 to show which scenario used which sources?

2) Section 4.2.4 Paragraph 2 (page 15 of .pdf). The author may wish to state in the document that "intensive flushing / sweeping programs" will be employed at the Site and so the lower silt loading used is reasonable rather than just indicating that such a program would have the stated effect.

3) The ESDM write up in Section 4.3 does not indicate to which of the 13 tables in Appendix B each calculation relates. Would it be possible for the author to indicate specifically which table and row is the subject of each calculation described in Section 4.3? This additional information would make finding and verifying the calculations much easier.

   For instance, section 4.3.1.2 shows an emission rate of 0.13 g_{SPM}/s. That value was the first emission rate calculated but that value appeared as "1.3 E-01" in the 11th column of 15 columns in the second table in Appendix B.

4) Section 4.3.3.1 shows the "Material Handling Emission Factor" as $3.2*10^{-3}$ $kg_{TSP}/Mg_{aggreagate}$. The corresponding emission factor in Appendix B1, "Bulk Material Handling / Transfer Emissions" on the 4th row from the bottom (LOADOUT1) shows "$3.2*10^{-4}$". If the table shows the emission factor "(with controls if applicable)", why would the calculation in section 4.3 not show the same value?

5) Section 4.4 (page 20 of .pdf) paragraph 1 says "The assessment of data quality for each emission rate is provided on Table 5.1, and is generally based on the AP-42 data quality ratings. In general, the emission data quality ratings for the processing sources are equivalent to a "Marginal" rating as per Section 8.3 of MOE Guideline A10. The emission factors used, and the data quality rating assigned to those factors do reflect the best available data for these types of sources, and are accepted by the MOE for air quality assessments of this nature."

   While the above is all accurate, Guideline A-10 in Section 8.3.4 says "In many cases, the use of emission rate estimating methodologies that are classified as Marginal or Uncertain Data Quality may be the only available method. Where the maximum POI concentration is not approaching the MOE POI Limit (i.e., the POI concentration is less than 10% of the respective limit), emission rate estimates of Marginal or Uncertain Data Quality, would be adequate. In most cases, where POI

concentrations are more significant, emission rate estimates that are based on Marginal or Uncertain Data Quality may also be considered acceptable provided these emission rate estimates have been altered to be sufficiently conservative."

As a result, the author may wish to provide the justification recommended by Guideline A-10 since the POI concentrations exceed 10 % of the criterion for TSP at the property line in the compliance scenario.

6) Section 7.2.1 (page 27 of .pdf) indicates that "the facility is in compliance with the relevant criteria at the property line and at all receptor locations, with the exception of PM_{10} along the property line." Table 7.1A (page 38 of .pdf) shows a maximum value of 48 % of criterion for PM_{10} at the property line under the heading "P3". Does the text refer to Table 7.1A?

7) Table 2.1 Sources and Contaminant Identification Table (page 31 of .pdf) indicates that "C01 – Conveyer Transfer" is discussed in Section 3.2.2.3. The text on page 11 of the .pdf goes from Section 3.2.1.5 to 3.3 without any 3.2.2 in the middle.

8) Appendix B1 Crushed Stone Processing (page 61 of .pdf). The AP-42 factor for the primary crusher is 6.0E-04. That factor is the factor from AP 42 for a tertiary crusher. The author may wish to explain why the factor for a tertiary crusher can be used in this instance.

9) Appendix B1 Crushed Stone Processing (page 61 of .pdf). The AP-42 factor for the primary crusher is 6.0E-04. If the maximum processing rate is 500 tonnes/hour (Mg/h), then how was the emission rate of 0.075 g/s calculated? 500 Mg/h * 0.0006 kg/Mg * 1000 g/kg / 3600 s/h = 0.08333 g/s.

10) Appendix B1 Crushed Stone Processing (page 61 of .pdf). There are multiple columns which have a column title of "1", "3", "5", etc. The table would be more easily understood if there was an indication that these values correspond to the wind speed used to generate the emission rate in that column.

11) Tables 7.1A through 7.1C may be more clear if the title "P1" through "P3" had been labelled "Phase 1" through "Phase 3".

R.J. Burnside & Associates Limited 292 Speedvale Avenue West Unit 20 Guelph ON N1H 1C4 Canada
telephone (519) 823-4995 **fax** (519) 836-5477 **web** www.rjburnside.com

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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

Cc: Gae Kruse, Township of Guelph/Eramosa (Email)
Mike Davies, Cuesta Planning Consultants (Email)
Heather Ireland, GRCA (Email)

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AirZOne
Comprehensive Air Quality Services

To: Stephanie De Grandis, *Concerned Residents Coalition* **15 April 2014**

From: Franco DiGiovanni, *Senior Air Quality Modeller* **Pages: 25**

Screening-level review of James Dick Construction Ltd. air quality assessment re: Proposed Hidden Quarry

1. Background

James Dick Construction Limited (JDCL) has proposed to locate a quarry, the proposed Hidden Quarry, in the Township of Guelph-Eramosa, Wellington County. JDCL retained RWDI AIR Inc. (RWDI) to conduct an air quality study to assess the potential air quality impacts from the quarry. RWDI issued a "Final Report" (dated September 6, 2012) describing their assessment.

A copy of the report was obtained by the Concerned Residents Coalition (CRC). I was requested, by CRC, to provide a screening-level review of the RWDI report (provided in section 5 of this report) and to address the Terms of Reference and answer questions provided by CRC (listed and addressed in section 7 of this report).

In addition, in this report, I provide my qualifications as an air quality expert in section 2, section 3 indicates the scope of this review, section 4 provides an overview of the requirements of an air impact assessment, section 6 assesses a previous review of the RWDI report, section 8 provides conclusions and section 9 provides recommendations for further work required before the air quality assessment can be considered complete.

2. Qualifications of Franco DiGiovanni, PhD

I am a Senior Air Quality Modeller for Airzone One Limited (Airzone), an air quality consulting company located in Mississauga, Ontario. My position entails conducting air quality assessments using dispersion modelling for permitting purposes and also for general air assessments. I have been in this position since 1999 and during my time I have worked on a wide range of air regulatory approvals in Ontario and a number of air assessments using dispersion modelling. As part of my experience, I have been involved in reviewing and providing commentary on the Provincial regulatory air permitting system in Ontario.

I have a BSc(HONS) in Geology from Imperial College (London) and a PhD in Physical Geography from the University of Hull (UK) where my thesis was on modelling airborne particle dispersion. I spent four years conducting postdoctoral research at the University of Guelph, and subsequently, as an NSERC Visiting Fellow with Environment Canada. During that time I continued to focus my research on modelling particle dispersion in air. I have published 12 peer-reviewed scientific articles; all have dealt with airborne particles and five specifically dealt with modelling the dispersion of airborne particles. I have taught Air Quality courses at Conestoga and Sheridan Colleges.

I have been retained as an air pollution dispersion modelling expert in more than half-a-dozen litigation (mainly land re-zoning) disputes, which have involved peer-reviews. I have been qualified to give opinion evidence before the Ontario Municipal Board ("OMB") on matters of air quality.

I have assisted the Town of Oakville in developing their Health Protection and Air Quality (HPAQ) Bylaw, specifically aimed at assessing stationary facility emissions of fine particulate matter ("PM2.5"). This involved the setting of air quality threshold standards for Oakville. As part of that work I have also written dispersion modelling and air impact assessment guidance to support their regulatory system.

With regards to aggregate pit operations, I have carried out an air assessment on behalf of a proponent in Ontario. I have also supervised an assessment of dust emissions from a limestone quarrying operation in the

Caribbean as part of an environmental assessment for a waste dump expansion. More recently I have directed the air emission assessment of multiple limestone quarries in the Caribbean in relation to an Environmental Impact Assessment for a garbage incinerator.

I have previously reviewed air assessments for three other aggregate operations in Ontario. I have reviewed two proposed aggregate operations brought before the Ontario Municipal Board (OMB) and one brought before a Joint Review Tribunal (JRT). Both proponents heard before the OMB retained RWDI as their air quality consultant,

I have carried out an assessment for Environmental Compliance Approval ("ECA") purposes for a brick manufacturing facility that has ancillary aggregate-like operations. Additionally, I have managed noise impact assessments for asphalt plants, which also have ancillary aggregate-like operations. Furthermore, I have also conducted dust assessments, or supervised the assessment, for a number of industrial operations that have aggregate-like operation activities on-site. A copy of my Curriculum Vitae is attached.

3. Scope of Work

I will conduct a preliminary, and brief, screening-level review of the RWDI report. The purpose would be to identify major deficiencies (if any) in the air assessment conducted by RWDI.

Specifically I will (1) review the text in the main body of the report and only relevant materials in the appendices (maps, etc.), and, (2) provide a summary report on my findings.

I will not provide a detailed review of supporting materials in the appendices, including detailed calculation tables, dispersion models, scientific papers or materials referred to within the body of the report, or any secondary references cited in the primary references provided. I believe that, eventually, these should be reviewed but are not at this stage.

I provide my findings and report below (section 5).

I have also been provided Terms of Reference by CRC, including questions they have raised. These are addressed in section 7.

4. Requirements of an Air Quality Assessment

4.1 Introduction

One way to determine airborne pollutant levels resulting from emissions from an aggregate facility would be to measure the levels of all substances emitted into the surrounding community. However, actual measurements will not be available for a proposed aggregate project; instead, we have to rely on predicted changes in air quality (using air quality computer models) to assess estimated changes in local air pollution levels.

As the site does not yet exist much of the input data required to conduct the assessment does not yet exist. In those cases estimates for those data must be made on a conservative basis. For example, the level of dustiness of the unpaved roads in the proposed aggregate pit is not yet known and yet is a key input into assessing dust emissions and impacts on the surrounding neighbourhood.

However, there is information available from other existing or past aggregate operations. If those other operations are representative of the proposed site, then data from those other sites may be used as an estimator of (for example) road dustiness for the proposed aggregate pit. The key issue in assessing those data is dealing with the range of data values from those other sites. Unless one has good reason to argue against it, it is prudent to choose the upper limit of the range, the value that will result in the highest emissions or impacts. For example, the United States Environmental Protection Agency (US EPA) has published information on road dustiness levels in aggregate and quarrying operations. Unless one can argue otherwise it is prudent, and necessary, to choose the upper limit. It is the proponent's responsibility to explain why upper limit values are not possible for the proposed site.

Moreover, under certain circumstances, an aggregate pit may be proposed under different conditions not well represented in existing datasets. Under such circumstances the upper limit of available data may not even be

representative of the maximum dustiness in the proposed aggregate pit roads. Different decisions must be made in those cases.

The adoption of the above approach will help ensure that the actual impacts will not be underestimated; this is the essence of the conservative approach in aggregate air quality assessments.

Married to the conservative approach, the assessment must also be carried out on a worst-case basis. Maximum emissions and worst-case dispersion conditions must be considered under maximal production levels so that maximal impacts can be considered and assessed. For example, crushing machinery in the pit intended to be used to process extracted aggregate will emit dust. The more aggregate processed in a day, the greater the dust emissions from that machinery. It is important that the maximum emissions rates that could happen, or will be allowed to happen, are assessed; these limits could be set by pit management (with appropriate over-sight) or may be limited by the machine itself (mechanical specifications). Equally, other factors may cause neighbourhood impacts to reach a maximum; the location of machinery, as close as permissible to property boundaries, must be assessed if it is allowed within the Site Plans. In general, the operational scenario assessed should be that which causes the highest off-site impacts; it is the responsibility of the proponent to test all likely scenarios and find the one(s) that cause the highest off-site impacts. It is also the responsibility of the proponent to demonstrate to the public that it has tested all scenarios and found the worst-case one, which must then be used in the air assessment.

4.2 Sources of Emissions

There are numerous sources of contaminant emissions at an aggregate operation. They include dust sources such as vehicle loading and unloading with extracted material, road dust from on-site traffic, rock crushing and screening operations, wind erosion of stockpiles and also gaseous emissions from on-site combustion equipment (diesel generators, vehicles, gas-fired heaters, etc.).

In regards to the dust emissions, dust particles vary in size and composition. The total amount of dust in the air is known as Total Suspended Particulate ("TSP"). The size fractions of dust particles can vary from very fine particles, less than 2.5 micrometres (µm) in aerodynamic diameter, through to particles greater than 44 µm in diameter. Dust particles smaller than 10 µm in aerodynamic diameter are known as "PM10." The finer dusts (especially those smaller than 2.5 µm in aerodynamic diameter, termed "PM2.5") are known to cause health effects.

In Ontario, TSP is regulated by the Ministry of the Environment ("MOE") as part of Ontario Regulation 419 ("O.Reg.419/05"), which sets out a point-of-impingement ("POI") standard of 120 $\mu g/m^3$ averaged over a 24 hour period. The PM10 and PM2.5 size fractions do not have POI standards under O.Reg.419/05. PM10 has a suggested interim Ambient Air Quality Criterion ("interim AAQC")and PM2.5 has a "Canada Ambient Air Quality Standard" ("CAAQS"). The CAAQS is not protective of human health but rather is merely intended as an airshed management tool.

Dust from aggregate operations also varies by composition. For example, pit road dust may contain the same minerals contained in the overburden soil or the aggregate deposit itself, or both. If the road surface material contains quartz (a common mineral in rocks and soils; a form of crystalline silica), the dust raised may be an inhalation hazard since crystalline silica has known health effects if inhaled.

Once all contaminants that can be emitted have been identified, these become the "contaminants of concern" (CoCs) for an air quality assessment focused on the impacts of a "subject" facility.

In any air assessment, one must consider the locations of sources of emissions at the facility (e.g., rock crushers within an aggregate pit producing dust) and how individual dust source emissions vary over time. As mentioned, it is necessary to consider the maximal emissions that could happen but also the coincidence of dust sources (e.g., all dust sources that may emit at the same time). For example, if material handling, causing dust emissions, may occur at the same time as vehicle movement on roads, also causing dust emissions, then this combined scenario should be assessed. A proponent is always free to show that the coincidence of certain emissions is not possible or not permitted at their facility.

4.3 Modelling Air Concentrations

To assess the levels of a contaminant surrounding a facility, due to emissions from that facility, Ontario (and most other jurisdictions) requires the use of quantitative computer models that predict the dispersion of contaminants from a discharge point to a receptor in the surrounding community ("dispersion models").

In its simplest form, a dispersion model requires input on (1) the sources of pollution, including the emission rate, and, (2) meteorological data such as wind speed and turbulence. The model then simulates, mathematically, the pollutant's transport and diffusion through the air. The model output is an air pollutant concentration level for a particular time period at one or more specific receptor locations in the surrounding community.

Dispersion modelling represents a simplification of actual events. For a particular location and time period, dispersion modelling is not as accurate as specific measurement of airborne contaminants. The most common air dispersion models used for regulatory compliance in North America are generally accurate within a factor of 2 when compared to actual measurements (as ranked comparisons), but may be even more inaccurate when model results are compared to measurements at specific locations and times (paired comparisons). However, modelling does allow a prediction of changes in air pollution levels when an aggregate facility is modified, and does allow estimates to be made at many locations ("receptors") and for long periods of time (e.g., years). It is also the only way to estimate air quality levels from a proposed facility.

Overall, the practice associated with taking a conservative approach, when conducting a modelled air impact assessment, means that an assessment must combine worst-case emissions with worst-case meteorology to ensure that worst-case air quality levels are estimated at all locations in question. This focus on worst-case impacts (rather than average impacts) is the general practice when conducting an air quality impact assessment.

4.4 Estimated Air Quality Levels in the Surrounding Community

As pollutants from the proposed facility ("subject" source) disperse through the air, they will add to pre-existing levels of those same pollutants (so-called "background levels") emitted from other sources. For example, PM2.5 will be emitted by many of the surrounding "non-subject" facilities, e.g., from public roads, agricultural operations as well as from other industrial facilities, etc., in the area.

However, background levels of air pollutants are not the same at all locations. For example, closer to a non-subject source, background levels will be higher as they will be affected by emissions of CoCs from that non-subject source. A specific example would be consideration of major roadways in the area. These roadways will emit PM2.5 (for example) due to automobile exhaust and road dust. Major roadways will also be emission sources of oxides of nitrogen ("NOx"). Therefore, locations closer to major roadways will experience higher background levels of PM2.5 and NOx, for example.

In theory all sources, no matter how far away, will contribute to air quality levels at locations in the Township of Guelph-Eramosa; in practice, however, it is found that only sources within a relatively short distance will cause significant variations in background levels. Beyond that short distance, emissions from all non-subject sources will "merge" together.

This concept of dividing background air levels into "regional" and "local" components is well established and is formalized in various regulatory modelling guides and regulations around the world. For example, the Province of Alberta Air Quality Model Guideline describes methods of dividing the background into these two components, where section 3.9 ("Cumulative Effects Assessment of Nearby Emission Sources") describes inclusion of local non-subject sources and section 4.2 ("Baseline Concentrations") describes the addition of regional background. In addition, the United States regulatory air quality dispersion modelling is guided by the "Guideline on Air Quality Models" and is incorporated by reference in the American regulations for the Prevention of Significant Deterioration of Air Quality, Title 40, Code of Federal Regulations (CFR) sections

51.166 and 52.21 in June 1978 [Federal Register, 43 (118), 26 382-26 388]. Part 51 paragraph 8.2.3 describes division of background into local and distant sources.

Emissions from local, anthropogenic ("man-made"), non-subject sources can be divided into mobile (on-public-roads vehicle emissions) and stationary sources. Mobile sources (e.g., on-road vehicles) emit CoCs via tail-pipe emissions and via re-suspension of road dust (causing, for example, emissions of PM2.5).

In assessing background concentrations, biogenic ("natural") emissions should also be considered.

The Province of British Columbia "Guidelines for Air Quality Dispersion Modelling in British Columbia" section 10.1 ("Model Output – the Need to Add Background") provides advice on an order of preference among different techniques to estimate background concentrations of CoCs. The BC modelling guide (page 82) indicates the order of preference as, sequentially:

Top preferred - "a network of long-term ambient monitoring stations near the source under study"

Second most preferred – "long-term ambient monitoring at a different location that is adequately representative"

Third most preferred – "modelled background"

4.5 Use of Air Quality Assessment Modelling Results

In my experience conducting reviews of air quality reports, a health impact expert frequently provides their opinion in the form of a human health risk assessment based upon the community-level exposure to CoCs estimated by the modelling.

I am not a health impact expert. However, below are a few references indicating the dangers of very fine dust emissions from aggregate operations (aka "PM2.5"):

World Health Organization (WHO) Europe. (2004). Health Aspects of Air Pollution (2004). Results from the WHO project 'Systematic Review of Health Aspects of Air Pollution in Europe':

"Many studies have found that fine particles (usually measured as PM2.5) have serious effects on health, such as increases in mortality rates and in emergency hospital admissions for cardiovascular and respiratory reasons. Thus there is good reason to reduce exposure to such particles."

Toronto Public Health (TPH). (2004). Agenda for Action on Air and Health. Prepared by Kim Perrotta, Monica Campbell, Angela Li-Muller, Ronald MacFarlane, Sarah Gingrich. Toronto, Ontario: July 2004, referring to PM2.5 as one of the five air pollutants:

"The premature deaths and hospital admissions estimated for the five air pollutants in the Toronto Air Pollution Burden of Illness study are associated with air levels that are well below both, Ontario's existing ambient air quality criteria (AAQC) and the new Canada-wide Standards (CWS) developed by the Canadian Council of Ministers of the Environment (CCME)."

Filling the Gaps in the Regulation of Fine Particulate Matter, Office of the Environmental Commissioner of Ontario. Serving the Public; Annual Report, 2012-2013 (Section 5.8):

"Particles less than 10 micrometres (µm) in diameter can be inhaled, and particulate matter smaller than 2.5 µm (PM2.5) is able to penetrate deep into the lungs where there is a diminished capacity to remove contaminants. Anthropogenic emissions of PM2.5 are produced primarily by fuel combustion (e.g., gasoline and diesel engines, wood burning, etc.), industrial activities, and disturbance of open sources, such as dust, during construction, resource extraction, etc. Secondary PM2.5 is produced through reactions between gaseous substances known as precursor emissions. Transboundary emissions from the United States are also a significant source of PM2.5 in Ontario. Evidence shows that exposure to particulate matter is a cause of a number of serious and fatal health effects, including chronic bronchitis and asthma, reduced lung function, and

increases in hospitalization and mortality due to cardiorespiratory diseases. Health risk increases with exposure to PM2.5, and there is no known threshold below which adverse health effects are not anticipated."

A Canadian document about PM2.5 standards: "Canada-wide Standards for Particulate Matter and Ozone: Five Year Report: 2000-2005" (CCME November 2006):

"The long-term air quality management goal for PM and ozone is to minimize the risks of these pollutants to human health and the environment. There is clear evidence of the harmful effects of these pollutants throughout the range of concentrations to which Canadians are exposed. This means that any reduction in the ambient levels of these pollutants provides a reduction in population health risk. The CWSs for PM and Ozone were endorsed by CCME in June 2000. They represent a balance between the desire to achieve the best health and environmental protection possible in the relative near-term and the feasibility and costs of reducing the pollutant emissions that contribute to elevated levels of PM and ozone in ambient air."

According to the above references, it seems prudent to pass any resulting conclusions of PM2.5 concentrations on to a health impacts expert, as was my experience in the Nelson Aggregated Case (Re Nelson Aggregates Co. Case No.: 20-030).

In my experience of air quality reports, in addition, an ecological expert could also provide their opinion in the form of an ec ological risk assessment for the environmental-level exposures of CoCs estimated by the modelling.

5. Deficiencies with the RWDI Air Quality Assessment

I have reviewed the Air Quality Assessment (AQA) and numerous and serious deficiencies were found. I will describe those deficiencies in the order that they were presented in the RWDI report.

This review is a screening-level review. A more in-depth review may reveal additional problems not mentioned in this report.

AQA Report s.1.4 PROCESS FLOW DIAGRAM

"The typical process flow diagram for the processing plant is shown on Figure 1.4. It should be noted that at any time, the precise flow of material may change between different pieces of processing equipment, but the overall maximum processing rate remains constant."

Different pieces of aggregate processing equipment may emit differing amounts of dust even for the same overall material throughput rate. Thus it should be noted that greater use of different pieces of equipment (as suggested by RWDI) may lead to greater emissions than estimated by RWDI regardless of the overall amount of material processed per day staying constant. Further clarification is required here as the emissions scenario used in their assessment may not be reflective of the maximum emissions in reality.

Furthermore, the number of pieces of processing equipment used affects dust emissions (regardless of the overall amount of material processed per day staying constant), and so the number of pieces of equipment (and type) needs to be fixed, or, a worst-case scenario needs to be presented if there are variations possible. In addition, the worst-case scenario should be justified by comparison against the other possible scenarios.

Conclusion – This statement would seem to provide a caveat to their assessment; this may mean that their assessment may not be reflective of the actual worst-case emissions whereas it should be reflective of the worst case emissions.

AQA Report s.1.5 OPERATING SCHEDULE

"_ Site preparation and rehabilitation activities occur from 7:00 am to 7:00 pm.

_ Drilling, blasting, excavation and processing operations occur from 7:00 am to 7:00 pm; and,

_ Shipping operations will occur from 6:00 am to 6:00 pm."

It should be ensured that the modelling accounted for site processing during 7 am – 7 pm whereas shipping activities were off-set to the period 6 am – 6 pm. This requires further review of the modelling.

"_ The site will operate generally from April 1 to December 24."

If the modelling assessment excluded the period between December 25 and April 1, then this exclusion needs to be explicitly cited on the site operational plans. Further explanation and review is required.

This is because modelling estimations excluding that calendar period may exclude meteorology specific to that period; meteorology specific to that (Winter) period may cause poorer air dispersion and thus higher impacts compared to the period actually used. This requires further review of the modelling.

Conclusions - further review on the operating schedule is required to verify RWDI's claims.

AQA Report s.3.1.1.1 Crystalline Silica

"The quarry will process dolostone. Dolotsone dust consists of a mixture of calcium and magnesium carbonates, which do not have any specification limitations under the O. Reg. 419/05."

Calcium carbonate has an air quality limit (Jurisdictional Screening Level (JSL) 24 hour value of 24 µg/m^3), which should be assessed by RWDI; they did not assess for calcium carbonate against this limit.

Even under guidance supporting O.Reg. 419/05, all contaminants must be assessed even if there is no standard or guideline listed as they may nonetheless cause an adverse effect. Under such circumstances, a health/ecological assessment is required to assess the effects of the maximal off-site exposure levels from such substances.

"Dolostone dust may include small amounts of other non-metallic materials introduced from other aggregates contained as anomalies in the rock."

RWDI should explain these non-metallic materials that are "*introduced*" from other aggregates. What is the geological process by which this occurs? Why are these considered "*anomalies*"? – it is normal to have a mixture of minerals in rocks – again explanations are required. Until suitable explanations are provided this analysis remains lacking and uncertain.

Of further note, it is also irrelevant if the amounts are "*small*"; even small amounts must be accounted for as part of the assessment to ascertain their impact. RWDI did not account for these other "*non-metallic materials*" but should have. Thus the overall assessment is missing this component.

"Of these materials, crystalline silica is of most interest with respect to air quality."

It is impossible to decide which material is of most interest until we have information on all other constituents. The full analysis is required but has not been provided. Until it is provided the analysis remains incomplete and uncertain.

"Based upon the chemical analysis of the quarry, the average concentration of crystalline silica is well below the 10% threshold."

This "*chemical analysis*" should be provided (which it was not) so that its credibility can be reviewed. Without being provided the claim by RWDI remains uncertain and unverifiable.

"To ensure this aspect of air quality standard is met, the silica content will be monitored as part of the normal chemical analysis of particulate matter at the site."

The complete protocol for this analysis is required; without that, this analysis is uncertain and unverifiable.

Will the aggregate be analysed before extraction to ensure work is stopped before the community is exposed to unacceptable levels in a proactive fashion? Or, will air monitoring samples be analysed retroactively, potentially discovering unacceptable exposures after the community has already been exposed?

AQA Report s.3.1.1.2 Trace Metals

"With regard to trace metals and other possible contaminants contained within dust generated at a dolostone quarry operation, the MOE's guidance in its "Procedure for Preparing an Emission Summary and Dispersion Modelling Report, Version 3" was followed. Table 7-3 of the procedure document identifies non-metallic mineral mining and quarrying operations as sectors where metals in the fugitive particulate matter are generally not anticipated. Based on this guidance, trace metals were not assessed explicitly."

However, this does not obviate proponents from assessing for other substances within the aggregate (and thus dust generated). RWDI have not assessed for all other components within the aggregate.

Conclusion on aggregate composition – valid and complete site-specific data is required in order to predict the composition of the dust that will be generate from the pit; this has not been provided. This renders RWDI's assessment uncertain and thus unreliable.

AQA Report s.3.1.1.3 Combustion By-Products

"With respect to emissions of combustion by-products from on-site mobile equipment and the drag-line, the principal contaminants of interest are typically nitrogen oxides (NOx), $PM_{2.5}$, PM_{10}, and TSP and these are used as surrogates for all products of combustion."

In RWDI's assessment for another aggregate pit, the Henning Pit in North Dumfries (air quality assessment report submitted November 2013), they also analysed for benzo-a-pyrene (BaP) emissions from diesel combustion sources. To quote from RWDI's report on Henning Pit:

"The MTO's Guide identifies the following as the contaminants of greatest relevance to transportation air quality:

- *Carbon monoxide (CO)*
- *Nitrogen dioxide (NO_2)*
- *Particulate matter (airborne particles) smaller than 10 microns (PM_{10})*
- *Particulate matter smaller than 2.5 microns ($PM_{2.5}$)*
- *Key hydrocarbons compounds (benzene, 1,3-butadiene, formaldehyde, acetaldehyde, and acrolein)*

In addition to these, the so-called polycyclic aromatic hydrocarbons (PAH) were also considered, of which the key representative is benzo(a)pyrene (BaP)."

It is more reasonable to have followed the general procedure that RWDI did in their Henning Pit analysis (although some of the details of their procedure were questionable). Thus, BaP should have been included in their analysis for the present JDCL assessment. In their Henning Pit assessment, RWDI demonstrated that BaP has the highest potential to exceed the air quality standard; thus it would potentially be the contaminant of greatest concern.

Conclusion – missing combustion by-products assessments.

AQA Report s.3.2.1.1 Emissions from Overburden Stripping & Rehabilitation

"Removal and hauling of overburden is expected to occur only at times when extraction, production and shipping of aggregate are relatively low. The total on-site level of activity is expected to be lower than that during peak extraction, production and shipping. As such, peak extraction, production and shipping, with no coincident overburden removal represents the worst-case operating scenario to be assessed as required under Section 10 of O. Reg. 419/05. Removal of overburden does not represent the worst-case operating scenario and therefore was not assessed."

RWDI claims that overburden stripping and rehabilitation only occurs when aggregate processing amounts are at less than maximal activity levels and thus does not require assessment; if so, this should be reflected in the site plans. However, there is no discussion of whether overburden processing occurs in the same locations as processing for aggregate material, nor if it has the same composition. These two aspects can profoundly affect dust dispersion and community-level exposures. Therefore, overall, a separate assessment is required unless adequate explanation is provided. Until proper explanation is provided, this analysis remains uncertain and unverifiable.

Conclusion – assessment on stripping and rehabilitation missing.

"In addition, stripping of overburden normally involves material that has inherently high moisture content. A review of literature on continuous soil measurements, included in Appendix C, indicates that the 95th percentile low soil moisture level was 20% by volume (approximately 13% by mass). These values are from a study done in Illinois; however RWDI believes that the measurements provide a suitable surrogate for soils in south-western Ontario. Given the moist, organic, loam nature of the material, a review of the emission factors provided in U.S. EPA AP-42 Chapter 13.2.4: Aggregate Handling and Storage Piles for these activities suggest that with elevated moisture content (in this case greater than 13%), the potential emissions of particulate matter are insignificant compared to site-wide emissions during peak extraction, production and shipping."

RWDI claims (from the above quote "*RWDI believes that the measurements provide a suitable surrogate for soils in south-western Ontario"*) that soil moisture data from Illinois is representative of conditions in southern Ontario – this claim requires verification and, until verified, remains uncertain.

Conclusion – RWDI's claim on soil moisture levels is not sufficiently supported.

AQA Report s.3.2.1.4 Aggregate Storage Piles

"Wind erosion from exposed pit faces and stockpile areas is relatively infrequent, occurring only when the wind is high and conditions are dry. Wind erosion begins to occur when the wind gusts exceed 15 to 20 km/h and becomes significant when the gusts exceed about 30 km/h. As discussed in Section 6.1.1, winds above 30 km/h occur less than 2% of the time during the summer. If surfaces are wet due to rainfall or other precipitation, then wind erosion will not occur. Overall, wind erosion is expected to occur less than 2% of time."

The claims of insignificance by RWDI need to be numerically verified. RWDI must provide specific numeric calculations to support their claim. Until this is done, their claim remains uncertain and unverifiable.

Conclusion – RWDI's claim on wind erosion frequency is not sufficiently supported.

AQA Report s.3.3.2.1 Fugitive Dust Emissions from Paved and Unpaved Internal Haul Roads

"JDCL will develop a Best Management Practice Plan, which will serve as a guideline for dust management practices at the facility. With the implementation of this plan, the facility is exempt from assessing particulate emissions from paved roadways, unpaved roadways, and aggregate storage piles located on-site, as per guidance in Section 7.4.1 of MOE Guideline A10."

RWDI claims that it does not need to assess particulate emissions from roads, despite the fact that roads tend to be one of the major sources of dust emissions at an aggr egate extraction operation. They claim that assessment is not required as part of their so-called "compliance assessment." However, it would seem that RWDI misunderstand that section of the MOE guideline s.7.4.1, which only refers to no requirement to assess metals in dust; other components still need to be assessed.

Conclusion – road particulate assessments missing from compliance assessment.

Other sources not directly assessed, not mentioned by RWDI and other issues

Clarification is required on whether there will be any blasting of aggregate for above-water-table operations.

Conclusion – clarification required on above-water-table blasting.

Referring to Figure 5.2B – mapping of source locations: it should be noted that any deviations from the source locations shown in this map will results in different modelling results and therefore different values for community-level exposures. Therefore, these locations (equipment, roads, etc.) must be fixed for the duration of the pit activity; the exact locations must be fixed by a land survey based upon the UTM geographical coordinates specified in the model runs. Assurance that this will be done may be achieved, for example, by specification of source locations on the Site Plans, with UTM coordinates specified.

Conclusion – clarification in the Site Plans required on source locations.

AQA Report s.4.1.2 SCENARIO 2 – CUMULATIVE EFFECTS MODELLING – CONVEYORS FROM FACE

"This scenario included fugitive dust and tail pipe emissions from mobile equipment at the site, and considers the use of conveyors for transporting raw material from the working face to the primary crusher.

As a conservative simplification, emissions from the transfer of the material onto the conveyor were represented by the same haul truck loading emission estimate of the third scenario, while emissions from the conveyor drop into the primary crusher are represented by the emission estimate from the third scenario for trucks dumping into the grizzly feeder at the primary crusher."

The US EPA provides specific emission factors for the conveyor drop operations that RWDI estimated here; however RWDI did not use these more specific methods but rather substituted equations meant for truck loading.

RWDI claims that these are "*conservative*" but provides no evidence to verify this claim. RWDI are required to provide this evidence to back-up their claim. Without such evidence, their claim remains uncertain and unverified.

Conclusion – RWDI's claim that truck loading estimates are applicable to conveyor transfers is not sufficiently supported.

AQA Report s.4.2.1 HAUL TRUCK LOADING AND DUMPING OPERATIONS

"PM emissions from loading of haul trucks and dumping at the grizzly were estimated using emission factors from the U.S. EPA Compilation of Air Pollutant Emission Factors (AP-42) Chapter 13.2.4: Aggregate Handling and Storage Piles. A moisture value of 5% was used to reflect the high moisture content of material taken directly from the working face. This is consistent with RWDI's experience at sand and gravel operations in Southern Ontario."

RWDI needs to explicitly prove that 5% is a reasonably conservative value to use. In this case, a conservative value would be the lowest moisture value (driest) that it could reasonably be. In this we cannot depend on "*RWDI's experience at sand and gravel operations in Southern Ontario*" so we cannot verify if those other

"*experience*"(s) are representative of the situation at the proposed Hidden Quarry. Rather than assume "trust" in RWDI's "*experience*," RWDI must, instead, provide explicit evidence of their claims. Without such explicit evidence, these claims remain uncertain and unverifiable.

Conclusion – RWDI's claim that moisture values used are minimal is not sufficiently supported.

AQA Report s.4.2.3 SHIPPING OPERATIONS

"PM emissions from loading of shipping trucks were estimated using emission factors from AP-42 Chapter 13.2.4: Aggregate Handling and Storage Piles. The moisture values for the material handled were based on the mean values provided in Chapter 13.2.4 for limestone products."

Why were mean values used when conservative (upper) limits are normally required? Such an assumption could lead to underestimates of community-level impacts as lower limit (worst-case) moisture values should be used unless RWDI can provide contrary evidence. RWDI must explain this non-conservative assumption.

Conclusion – RWDI's use of a non-conservative moisture value is not sufficiently supported.

"The amount of aggregate material handled at each location was assumed to be equivalent to the production rate of the material stockpiled at that location. A supplemental control efficiency of 90% was applied to reflect the washed nature of the aggregate."

We require quantitative evidence of RWDI's "*supplemental control efficiency of 90%*" claim – until provided this assumption remains uncertain and unverified.

Conclusion – RWDI's claim of a supplemental control efficiency is not sufficiently supported.

AQA Report s.4.2.4 FUGITIVE DUST EMISSIONS FROM PAVED INTERNAL HAUL ROADS

"The paved section was estimated to have average silt loading of 1.2 g/m², which is lower than the mean value for quarry sites provided on Table 13.2.1-3 of AP-42. Past experience indicates that this is achievable on industrial paved roads using intensive flushing / sweeping programs."

The silt loading represents the level of dustiness on the roads. This value assumed by RWDI of 1.2 g/m^2 represents very low levels of road dustiness compared to the range of values represented in the stated table (range 2.4 – 14 g/m^2) and is therefore not conservative. RWDI claims that this low dustiness level may be achievable based on "*past experience*;" however, the requirement is to provide quantitative evidence that "*past experience*" applies here; RWDI must provide calculations that prove that these levels of road dustiness can be achieved, with certainty, at the proposed Hidden Quarry. Without such evidence, their claim remains uncertain and unverifiable.

Conclusion – RWDI's claim that the paved road silt loading level used is appropriately conservative is not sufficiently supported.

AQA Report s.4.2.5 FUGITIVE DUST EMISSIONS FROM UNPAVED INTERNAL HAUL ROADS

"The silt loading values were based on values provided in AP-42, and is supported by studies done by RWDI at various sites across Ontario. The unpaved haul routes were estimated to have an average silt loading of approximately 8.3%."

Again, RWDI uses an average value rather than a conservative, worst-case value without providing justification. The AP-42 values quoted range from 2.4 – 16%. RWDI cites "*supported by studies done by RWDI at various sites*" but does not provide that evidence nor explains, on a quantitative basis, why those would apply to the proposed Hidden Quarry site. Without such evidence, their claim remains uncertain and unverifiable.

Conclusion – RWDI's claim that the unpaved road silt level is appropriate is not sufficiently supported.

"In addition, watering of the unpaved haul routes, combined with a posted and monitored speed limit of 25 km/h, was estimated to provide 95% control of emissions compared to a dry haul route with no speed limit, based on information provided in AP-42 and in literature supporting AP-42. These values reflect the implementation of the Best Management Practices Plan."

RWDI claim a very high control efficiency of 95%. This claim requires very detailed justification and verification as dust emissions from unpaved roads tend to be the major sources of dust at aggregate extraction operations. Without this detailed and explicit quantification, RWDI's claim remains quite uncertain and unverifiable.

Conclusion – RWDI's claim on watering road dust efficiency is not sufficiently supported.

AQA Report s.4.2.6 – 4.2.8

not reviewed.

AQA Report s.4.3.1 – 4.3.5

Not fully reviewed. Typographical error found in an equation (in s. 4.3.5.1), which may lead to confusion. Details of inputs should be reviewed at some point in the future.

AQA Report s. 4.3.6-4.3.8

not reviewed.

AQA Report s.4.4 ASSESSMENT OF DATA QUALITY FOR EACH EMISSION RATE

not reviewed.

AQA Report s. 6 Dispersion Modelling

"Sources were modelled as a series of volume sources with parameters based on information obtained from the Site Plan and typical dimensions of processing equipment and vehicles used at other facilities of this nature. The modelled source parameters are consistent with guidance from the NSSGA2. Internal haul roads were modelled as adjacent volume sources, also in accordance with guidance from the National Sand Stone and Gravel Association and the U.S. EPA."

The volume source specifications used by RWDI require a third-party check. This should be completed as part of a more detailed review.

Conclusion – further review is required to verify RWDI's claims on the characterisation of source parameters.

AQA Report s.6.1.1 METEOROLOGICAL CONDITIONS

"Under O. Reg. 419/05 the MOE provides a series of pre-processed meteorological data sets for use in dispersion modelling assessments in Ontario. These data sets use surface observations and upper air data from airports that represent major geographical areas of Ontario. While these data sets are the MOE's preferred option for conducting dispersion modelling assessments, they do not necessarily reflect localized conditions, and therefore a discussion of the dispersion modelling data sets and a discussion of more localized meteorological conditions is provided here. For this assessment, the meteorological data from London shows good agreement with the local data, as discussed below."

To use alternative data to MOE's preferred dataset, one must submit a special application and explanation to the MOE to argue why the alternative data is equal to or better than the MOE's preferred dataset. Because this assessment is to be reviewed by open public discourse, RWDI must make full and complete arguments to the public.

In this case, RWDI seem to be arguing that the datasets are in agreement. However, given that the London dataset is preferred by the MOE it is therefore not logical that RWDI would bother to deviate from the preferred London dataset – a full and complete explanation is required.

Conclusion – RWDI's claim that these alternative meteorological datasets are more appropriate is not sufficiently supported.

"Data from the Guelph Turfgrass Institute is not complete for the period of record, so data from the Region of Waterloo International Airport were used to determine the potential for wind erosion, and to characterize the wind climate for the area. Data from the Guelph Turfgrass Institute is useful however, in that it shows a general tendency towards lower average wind speeds than observed at the Region of Waterloo International Airport, which in turn shows lower average wind speeds than observed at the London International Airport. This suggests that using the Region of Waterloo International Airport data to discuss the potential for wind erosion is conservative, and that using the data from London International Airport for the modelling assessment is also appropriate."

RWDI would seem to suggest that using data with lower wind speeds provides conservatively high estimates of potential wind erosion. A full and quantitative explanation is required of this assumption. For example, for material handling (drop) operations, the equation used by RWDI indicates (Appendix B5 of their report) that the lower the wind speed, the lower the emissions; this is contrary to RWDI's assumption above. Until this is fully explained by RWDI, this assumption remains uncertain and unverifiable.

Conclusion – RWDI's claim that using datasets with lower wind speeds provides conservative ("high-end") estimates of wind erosion is not sufficiently supported.

AQA Report s. 6.1.2 AREA OF MODELLING COVERAGE

"In addition, 18 discrete receptor locations were included in the assessment. These receptors represent residences near the quarry."

As part of a more detailed review, there should be a third-party check that all appropriate human receptors have been included in the assessment, including future potential, as-of-right, land uses.

Conclusion – further review is required to verify RWDI's claims that they included all appropriate receptors.

AQA Report s. 6.1.4 TERRAIN DATA

"Base elevations for sources are based on information contained on the Site Plan and are assumed to be at the elevation of the first lift."

Cross reference to the Site Plan is required to verify the credibility of this assumption; further explanation may be required.

Conclusion – further review is required to verify RWDI's claims on terrain data used.

AQA Report s. 6.1.5 AVERAGING PERIODS USED

"PM10 and PM2.5 do not currently have standards in O. Reg. 419/05, but they do have air quality criteria that, like TSP, are based on an averaging time of 24 hours."

Annual averaging is required for certain contaminants and requires their specific calculation using the AERMOD model. For example, PM2.5 has an annual standard listed by the Canadian Council for Ministers of Environment. The MOE in Ontario lists an annual standard for benzene, one of the emissions from diesel exhaust. It is not clear that annual averaging will not be relevant at this aggregate pit.

Conclusion – annualized assessments for certain contaminants are missing.

AQA Report s. 6.4 AMBIENT CONCENTRATIONS

"The compliance assessment predicted the impact of the quarry emission sources at and beyond the property boundary of the facility. The comprehensive cumulative effects assessment went a step further and considered how predicted impacts from the quarry sources would combine with ambient air pollutant levels to produce an overall impact at sensitive off-site receptors."

In order to allow an assessment of ecological impacts RWDI should assess cumulative air concentration levels at all locations at and beyond the property boundary of the facility not just at so-called "sensitive" receptors. RWDI would seem to have only chosen nearby residences but have ignored other areas where ecological effects may occur. They have not provided cumulative air results in these other areas and so ecological impact experts will not have appropriate information available to them to make an ecological impacts assessment.

Conclusion – assessments missing of ecological exposures to air quality contaminants.

"Pollutant concentrations in ambient air can be attributed to two distinct elements:

1. Non-Background (locally significant emissions sources): Emissions from large industrial sources, mobile sources, and other miscellaneous sources that result in acute spatial variation of in-air pollutant concentrations on a local scale (e.g., large combustion sources, industrial process emissions, major highways).

2. Miscellaneous other sources, including smaller industries; agricultural activities, residential and commercial sources; traffic on the local road network; rail traffic; and long-range transport of pollutants from other regions. These sources can be approximated by spatially uniform in-air pollutant concentrations on a local scale.

With respect to non-background sources, there are no such sources within 5 kilometres of the quarry."

However RWDI do not define, on a quantitative basis, what they mean by "*non-background*" sources. They indicate that there are no such sources that cause "*acute*" spatial variations in background concentrations in the vicinity. For example, they would seem not to consider highway traffic emissions from Highway 7 as causing "*acute spatial variation*" and yet do not present evidence on this. This lack of quantitative specification causes their classification to be vague, and therefore uncertain and unverifiable.

Conclusion – RWDI's claim that there are no "non-background" sources within 5 km is not sufficiently supported.

"Therefore, estimating the overall impact at sensitive off-site receptors required an estimate of background pollutant levels, which was based on historical monitoring data from a representative monitoring site. Although the monitoring site in Guelph is located in a more urbanized environment, with some non-background sources located within several kilometers of the monitor, this provides a more conservative estimate of ambient air pollutant levels. Given the proximity of the station to the quarry, and the conservativeness of the data, it is a suitable site for this assessment."

RWDI assumes that airborne concentration data from an urban area provides higher air quality levels than in the Rockwood setting (and it is thus conservative). However, local (Rockwood) sources close to particular receptors may be subject to elevated levels at those locations. Given that JDCL have planned/contemplated this pit for almost 30 years, it would have been advisable that local monitoring had been initiated to provide site-specific data on local, existing air quality.

Conclusion – RWDI's claim that the Guelph data is conservative compared to all areas in Rockwood is not sufficiently supported.

"Background $PM_{2.5}$ levels were based on a 5-year average of the annual 90^{th} percentile hourly concentration measured at the MOE monitoring station in Guelph (14.8 µg/m³)."

Notwithstanding the previous comment, in regards to the use of the Guelph air quality dataset, why was the average and not the maximum 5-year 90^{th} percentile used? Significant between-year variations may lead to underestimates of base-line, background concentrations if only the average is used. Elaboration is required of year-to-year differences in the 90^{th} percentile value (if this dataset were to be justified as appropriate). Also, does the quality of the dataset used justify use of the 90^{th} percentile (as opposed to the maximum)?

Notwithstanding the previous criticism there should be a third-party check of the analysis of background data from the Guelph station used by RWDI.

Conclusions – further justification is required from RWDI, and, a detailed review of the data they used is required (if this dataset is justified, as per previous point of criticism).

"Background TSP was derived from the $PM_{2.5}$ data for Guelph, based on an estimated $PM_{2.5}$/ TSP ratio of 0.30. This value came from a published study of 500 monitoring sites in the US.[3] The resulting 90^{th} percentile background concentration is 49 µg/m³.

Background PM_{10} was also derived from the $PM_{2.5}$ data for the Guelph, based on an estimated $PM_{2.5}$/ PM_{10} ratio of 0.54 from the study noted above. The resulting 90^{th} percentile background concentration is 27 µg/m³."

RWDI used scaling factors to derive (by calculation) estimated background levels of PM10 and TSP (based upon measurements of the PM2.5 dust size fraction) as measurements of these larger size fractions were not conducted at the chosen site. RWDI obtained these scaling factors from a study by Lall et al. (Atmos.Environ. 2004), which represented measurements from Metropolitan locations in the US. However, there is a similar Canadian version of this study, which provides different scaling factors (Brook et al. J. Air & Waste Manage. Assoc., 1997) and includes data from rural southern Ontario. The values derived in the Canadian study indicates:

"On average across all sites, PM2.5 accounted for 49% of the PM10, and PM10 accounted for 44% of the TSP."

Therefore, the US version of ratios leads to an underestimate of background PM10 and TSP by 8% and 29%, respectively, when compared to the Canadian-based study. This suggests another source of underestimation of community-level exposures to air emissions in this study.

Conclusion – RWDI have used a less appropriate estimation method for PM10 and TSP background levels that leads to their underestimation, and thus underestimation of community-level impacts.

Values derived for ozone and NO2 should be checked at some point in the future.

AQA Report s. 6.5 CONVERSION OF NOX TO NITROGEN DIOXIDE

The Ozone Limiting Method for NO to NO2 conversion – not reviewed.

AQA Report s. 7 Emission Summary Table and Conclusions

Given numerous and significant problems with analysis methods, as described above, there is little use at this point reviewing RWDI's results. This section of their report was not reviewed in any great detail.

"7.2.2 SCENARIO 2 – CUMULATIVE EFFECTS MODELLING – CONVEYORS FROM FACE

The results of the dispersion modelling analysis indicate that with the inclusion of background air quality data, predicted concentrations of NO_2 and $PM_{2.5}$ are below the relevant criteria at all receptors. Predicted concentrations of TSP and PM_{10} exceed the relevant criteria at several locations, but the predicted frequency of excursions above the relevant criteria remains low, at 1.5% of the time at the most impacted receptor, and below 1% at all other locations.

7.2.3 SCENARIO 3 – CUMULATIVE EFFECTS MODELLING – HAUL TRUCKS

The results of the dispersion modelling analysis indicate that without the inclusion of background air quality data, predicted concentrations of NO_2 and $PM_{2.5}$ are below the relevant criteria at all receptors. Predicted concentrations of TSP and PM_{10} exceed the relevant criteria at several locations, but the predicted frequency of excursions above the relevant criteria is higher than for Scenario 1, but remains low, at less than 2.7% of the time at the most impacted receptor and below 1.2% at all other locations."

RWDI have admitted to exceedances to the relevant criteria. This is despite what has been noted above about non-conservative assumptions and missing information that may result in even higher off-site exposure estimates than what was shown by RWDI. This is significant given the number of non-conservative assumptions and missing analyses as described above, which could lead to even more exceedances potentially.

In addition, under s.7.2.3., RWDI speak to results *"without the inclusion of background air quality data"* and yet this is meant to be a cumulative effects assessment. Thus their analysis would seem to be incorrect.

Conclusion – given the issues noted above, the actual number of exceedances may be significantly higher than claimed by RWDI.

"7.3 CONCLUSIONS

This assessment includes several significant conservative modelling assumptions, which are important when considering the dispersion model predictions. These include:

- *The maximum operating scenario is applied to every day during the operating season for the 5-year simulation period, resulting in a coincidence of maximum operations and worst-case weather conditions which, in reality, will be a rare occurrence; and,*
- *Assumption of dry weather every day of the 5-year simulation period."*

It should be noted that these assumptions are standard, and required, and ensures that (on a 24-hour basis) maximal emissions are forced to coincide with worst-case meteorological conditions, as can happen. To do otherwise is not an acceptable practise. Despite that, RWDI assume the exceedances shown are acceptable.

Conclusion – RWDI are misidentifying a required practise as a source of additional conservatism when it is not.

"Noting these conservatisms, RWDI believes that the predicted frequency of excursions from the dispersion modelling analysis is within acceptable levels,"

It should be noted that, in compliance assessments, no such level of exceedances are acceptable. The basis of RWDI's belief should be explained clearly.

Conclusion –RWDI's claims that (i) exceedances are acceptable, and, (ii) that the level of exceedances they predict are acceptable, are not sufficiently supported.

6. RJ Burnside Review of the RWDI Air Quality Assessment

RJ Burnside (RJB) were retained by the Township of Guelph/Eramosa to review the subject air quality assessment by RWDI. Despite the detail that required review, RJB only had the following comment:

"The Emission 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")."

I do not understand what is meant by "*although the documentation took some time to interpret*." RJB's focus on an MOE ECA application would seem to ignore the more fundamental study on cumulative impacts. Given these two issues it would be of interest to enquire as to the expertise and experience of the RJB reviewers.

Conclusion – I believe that RJB's review was inadequate

7. CRC Terms of Reference Questions

CRC, in their Air Quality Peer Review Terms of Reference provided to me, required a number of questions to be addressed by me. I address those questions below.

- What air quality monitoring is being proposed by the applicant and is it adequate;

It may be that some limited monitoring is being proposed by the proponent (AQA s.3.1.1.1. Crystalline Silica) but this is not clear from their report as what was written is not understandable. It can only be said, at this point, that whatever is proposed is not adequate as it is not explained appropriately. Assuming what was meant was airborne monitoring for crystalline silica, then this still leaves other contaminants unmonitored, and therefore is still not adequate.

- What dust mitigation plan is being proposed by the applicant and is it adequate; and

Dust mitigation is proposed (primarily road dust watering) but it is not defined on a quantitative, verifiable basis; therefore it is not adequate.

- An evaluation of technical completeness.

Due to the numerous technical issues identified above I do not believe that the RWDI evaluation is technically complete.

- Determining whether the conclusions and recommendations in support of the development application are valid.

The conclusions and recommendations are not valid for the various issues noted above (lack of evaluations, non-conservative assessments, etc.) as the issues may well lead to higher, and perhaps significantly higher, community-level exposures.

- Has the applicant properly identified the implications of the proposed operation for the adjacent mushroom farm and is the proposed mitigation with regards to this particularly sensitive use adequate?

The applicant has not assessed the effect of emissions on any ecological elements and other operations around the site including the mushroom farm; therefore, any mitigation mentioned is without basis with respect to this receptor. The mushroom farm may represent a particularly sensitive receptor with regards to the requirement for controlled environments for its growing operations.

8. Conclusions

RWDI's conclusions, that the resultant air quality levels are acceptable, are not supported by their analysis because many components of the analysis are missing and many analyses were conducted on a non-conservative basis. Considerable reworking of the analysis is required, as set forth below.

9. Further Work Required

These are provided in the approximate order that they should be conducted:

1. Complete a full review of all data and calculations conducted by RWDI and presented in their assessment.

2. Major reworking of the AQA, corrections and explanations based on the issues raised in the screening-level analysis presented in this report, and the more fulsome review mentioned in 1, above.

3. Use the (corrected) preliminary modelling study to help identify locations to conduct background monitoring.

4. Conduct background air monitoring; meanwhile conduct site-specific sampling (for aggregate composition, for example).

5. Re-do modelling with site-specific input and site-specific background data.

6. Assess need for mitigation and predict effectiveness of mitigation (e.g., road dust watering controls) on a quantitative, conservative basis.

Curriculum vitae

FRANCO DIGIOVANNI, PhD
Senior Air Quality Modeller, Partner and Manager of Air Quality Modelling Section,
Airzone One Limited (since 1999)
Email: fdi-giovanni@airzoneone.com

Services Provided:

- Air quality modelling, emissions determinations and inventories, air regulatory compliance
- Specialized dispersal modelling work relevant to dust, agriculture and forestry (pesticide spray optimization, seed production field management, crop pathogen protection)
- Air Quality measurements
- Occupational Hygiene – worker exposure measurements
- Indoor air Quality – mould/fungal measurements and interpretation

Education:

2012 Qualified Ontario Toxic Substance Reduction Planner (Ministry of the Environment)

1985-1989 PhD in Physical Geography (University of Hull, England) on "Mathematical Modelling of Pollen Deposition in Closed Canopy Woods".

- Developed a K-theory dispersal model for dispersal of tree pollen through heterogeneous woodlands from multiple sources and solved numerically. Estimated pollen spectrum the forest floor, and used as an analogy for the pollen spectrum in a woodland hollow to aid in interpretation of spatially-precise palaeoecological studies. Verified using climatological input data and pollen deposition patterns in woodlands.

1982-1985 **BSc (HONS)** in Geology at Imperial College (Lond.), England, UK.

Employment history:

1999-present: Senior Air Quality Consultant – Airzone and predecessor companies.

- Provides air quality and bioaerosol consulting services.
- Provides permitting (Certificate of Approval/ECA) and emissions reporting (NPRI, Ontario Reg. 127 etc.) – supervises group of 7 persons providing this service.
- Provides indoor air mould and spore collection, analysis and interpretation services.
- Provides air quality and occupational exposure measurement services including airborne TSP, PCBs/PAH, VOCs and inhalable particulate matter in industrial and commercial premises.

September 1994 – June 1999 Scientific consultant
Air Quality Consulting - DiGiovanni Scientific Consulting and Products

- Providing consultation to government and industry on outdoor bioaerosols
- Development of forecast model used for the "Pollen Report" on The Weather Network
- Numerous contracts for Environment Canada on dry deposition of airborne acid rain species
- IR cloud sensor development for instrument manufacturers

August 1993 - August 1994 Contract Scientist with Climate Processes and Earth Observations Research Div., Climate Research Branch, Atmospheric Environment Service, Environ. Canada.

1991- August 1993 NSERC Visiting Fellow to Canadian Government Laboratory (Canadian Climate Center), Atmospheric Environment Service, Environ. Canada.

1989-1991 **Postdoctoral Fellow** Dept. of Environmental Biology, U. Guelph, Guelph, ON, Canada.

- Modelling of dispersal of airborne conifer pollen to establish isolation zones for pedigree seed production for Ontario's forestry sector. Developed a Lagrangian model for particulate (pollen) dispersal, conducted field tests of model (measuring pollen dispersal from point- and area-source releases and meteorological data), and added user-friendly front-end for seed orchard managers to use as a management tool.

Peer-reviewed scientific publications:

DiGiovanni, F. and Kevan, P.G. 2008. Comment on "Session V: Estimating Likelihood and Exposure", by Zaida Lentini, Environ. Biosafety Res.5 (2006) 193–195." Environ. Biosafety Res. 7 105-108.

DiGiovanni, F. and Fellin, P. (2002). Transboundary Air Pollution. In: Environmental Monitoring, edited by Hilary I. Inyang and John L. Daniels,. In Encyclopaedia of Life Support Systems (EOLSS), Developed under the Auspices of the UNESCO, Eolss Publishers, Oxford ,UK, [http://www.eolss.net]

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DiGiovanni, F., Kevan, P.G. and Caron, G. 1996. Prediction of the timing of maximum pollen release from jack pine (Pinus banksiana Lamb.) in northern Ontario, Canada. Forestry Chronicle 72(2):166-169.

DiGiovanni, F., Kevan, P.G. and Nasr, M.E. 1995. Settling velocities of some pollen and spores and their variability. Grana 34:39-44.

Banks, L. and DiGiovanni, F. 1994. A wind tunnel comparison of the rotorod and samplair pollen samplers. Aerobiologia 10(2-3): 141-145.

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DiGiovanni, F. and Beckett, P.M. 1990. On the mathematical modelling of pollen dispersal and deposition. J. Appl. Meteorol. 29: 1352-1357.

DiGiovanni, F, Beckett, P.M. and Flenley, J.R. 1989. Modelling of dispersion and deposition of tree pollen within a forest canopy. Grana 28: 129-139.

Selected technical, governmental and consulting reports:

Since 2000, I have written approx. 60 air quality modelling impact assessment reports for regulatory approval in Ontario and in other jurisdictions, and also for legal (land use/land rezoning) disputes. These have included dust studies for surface mining (aggregate) operations. I have also designed, implemented and reported on numerous indoor mould assessments.

Airzone One Ltd. 2013. Air Emissions Assessment for an Environmental Impact Assessment for a garbage incinerator in the Caribbean. Prepared for XXXXXX, Ontario.

Airzone One Ltd. 2013. An Air Emissions Assessment of the Land Use Compatibility of the Proposed XXXXXX Project. Assessed using MOE D-6 guidelines. Prepared for XXXXXX, Ontario.

Airzone One Ltd. 2012. Review of Draft Terms of Reference (Air) for an Environmental Impact Assessment for a proposed garbage dump in S. Ontario. Prepared for XXXXXX, Ontario.

Airzone One Ltd. 2011-present. Various reports to support dust monitoring for major TTC construction project in the GTA.

Airzone One Ltd. 2012-13. Reviews for World Bank on proposed lignite-fuelled electricity generating plant in Eastern Europe (continuing).

Airzone One Ltd. 2012. Approximately 15 toxic substance reduction plans developed and reviewed.

Airzone One Ltd. 2012. Background concentration determination for impact assessment of proposed XXXXX Bypass Transportation project. Prepared for XXXXXX, Ontario.

Airzone One Ltd. 2012. An Air Emissions Assessment of the Land Use Compatibility of the Proposed XXXXXX Subdivision. Assessed using MOE D-6 guidelines. Prepared for XXXXXX, Ontario.

Airzone One Ltd. 2010-11. Guidance Documents to Support Air Emission reporting and Permitting Requirements under Bylaw 2010-035. Prepared for Town of Oakville, Ontario.

DiGiovanni, F. 2010-11. Witness Statements (and testimonial appearance) in regards to a Joint Board hearing in regards to the proposed extension of an aggregate pit next to Mount Nemo, Burlington, Ontario. Expert witness on behalf of the City of Burlington opposing the proposed extension.

Airzone One Ltd. 2010. Contributing Author to Development of Air Emission reporting and Permitting Municipal Bylaw 2010-035. Prepared for Town of Oakville, Ontario.

DiGiovanni, F. and Davis, C. 2010. Review of the Draft Air Quality Assessment for the Oakville Generating Station: Environmental Review Report (ERR). Appendix A of Comment/Feedback Document submitted to TransCanada by Fogler, Rubinoff LLP on behalf of the Town of Oakville.

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DiGiovanni, F. 2009. Witness Statements (and testimonial appearance) in regards to an OMB hearing in regards to the proposed establishment of an aggregate pit in Puslinch, Ontario. Expert witness on behalf of the Cranberry Area Residents and Ratepayers Association opposing the proposed pit.

Airzone One Ltd. 2008. Mould Clearance Sampling Report. Prepared for Sisters of St. Joseph, Ontario.

Airzone One Ltd. 2006. The Equatorial African Deposition Network (EADN): Program Manual for Monitoring Atmospheric Deposition of Nutrients and Other Contaminants in the Equatorial Region of Africa. Prepared for World Bank, Africa.

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Glover, R., DiGiovanni, F. and Trevors, J.T. 2003. Field Sampling of the Canada Blue Tanning Co. Premises for the Presence and Levels of Spores of *Bacillus anthracis* (Anthrax). Prepared for DL Services, Brighton, Ont.

DiGiovanni, F. 2003. Air Emission Summary and Dispersion Modeling Report for Impacts of Proposed New Laboratories at the XXXXX on Air Quality Measurements at the XXXX. AirZOne Report J3018.

DiGiovanni, F. 2002. Impacts of Proposed Developments in XXXXXX on the Programs of the XXXXXX. AirZOne Report J2001-47.

DiGiovanni, F. 2001. Air quality impacts of proposed XXX XXXX condominium on the residents of XXXX XXXX. AirZOne Report J2001-16.

DiGiovanni, F. 2001. Physical modelling of conifer pollen dispersal: Task 1 – Model verification. AirZOne Report 0-4167-36.

DiGiovanni, F. 2000. Report on STAC Audit for XXXXXXX pulp and paper mill, XXXXX. Conor Pacific Report 0-4171-08.

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Workshops, Conferences and Meetings organized:

- Co-Chaired (with D. Joyce, Ontario Ministry of Natural Resources) scientific workshop on "Challenges in Pollen Dispersal and Pollen Contamination" (Feb 5th 1992) at Centre for Atmospheric Research Experiments (Egbert) (Proc. publ. in April 1992).
- Chaired workshop on atmospheric pollen dispersal and other pollination aspects (August 16th 1991) at University of Guelph, Guelph, Ontario.
- DiGiovanni, F. (Organizer) 1991. Island Lake Tree Improvement Area - Pollen dispersal study 1990. Jan. 28th, U.Guelph, Ontario.

Teaching and training:

1986-89	Teaching Assistant in department of Geography: undergraduate statistics, basic computing, computer cartography, sediment analysis.
1990/1991	7 summer students and technician - training and supervising
	Tutored bi-national graduate level course (in pollination biology at UNAM, Mexico City).
1992/1993	2 MSc student (on Committee; assumed position of Graduate Faculty at U.Guelph)

	6 summer students - training and supervising
	teaching assistant - 400-level course in Math department (U. Guelph) -
1994	1 MSc student (completion of Committee duties).
	Thesis: Roussy, A.-M. 1994. Alleles, cones and pollen: A discreet look into Jack Pine (*Pinus banksiana* Lamb.). M.Sc. Dissertation, University of Guelph. 64pp.
1998	Teaching - Air Quality (Environmental Engineering Technology Program - Conestoga College)
2004 - 2007	Teaching - Air Quality Control course - Sheridan College
2001-present	**T**raining and mentoring for staff of 7 in air quality modelling, air emissions permitting and emissions reporting.

RWDI
CONSULTING ENGINEERS & SCIENTISTS

Tel: 519.823.1311
Fax: 519.823-1316

RWDI AIR Inc.
650 Woodlawn Road West
Guelph, Ontario, Canada
N1K 1B8
Email: solutions@rwdi.com

CANADA'S BEST MANAGED COMPANIES

June 6, 2014

Mr. Greg Sweetnam, B.Sc.
Vice President, Resources
James Dick Construction Limited
P.O. Box 470
Bolton, ON L7E 5T4

Re: RWDI Response to Airzone One Ltd. Screening-Level Review
Air Quality Assessment for the Proposed Hidden Quarry
RWDI Reference No. 1201429

Email: gsweetnam@jamesdick.com

Dear Mr. Sweetnam,

RWDI has reviewed the "Screening-level review of James Dick Construction Ltd. air quality assessment re: Proposed Hidden Quarry" prepared by Dr. Franco DiGiovanni of Airzone One Ltd., and has prepared this letter to respond to the comments contained in Dr. DiGiovanni's review.

General Overview

Section 4 of the report from Airzone One Ltd. is entitled "Requirements of an Air Quality Assessment." It says: "...actual measurements will not be available for a proposed aggregate project; instead, we have to rely on predicted changes in air quality (using air quality computer models)..." RWDI agrees with this statement and our assessment consisted of an MOE-approved computer model simulation, following MOE regulations, guidance and accepted practices.

Section 4 also states: "As the site does not yet exist much of the input data required to conduct the assessment also does not exist. In those cases estimates for those data must be made on a conservative basis." It goes on to say that "there is information available from other existing or past aggregate operations" and "data from those other sites may be used as an estimator." RWDI also agrees with these statements and took this approach in its assessment.

Section 4 goes on to state that "The key issue in assessing those data is dealing with the range of data values from those other sites. Unless one has a good reason to argue against it, it is prudent to choose the upper limit of the range, the value that will result in the highest emissions or impacts." RWDI profoundly disagrees with this statement and considers it to be inconsistent with sound engineering and scientific principles. It is not appropriate to choose the upper limit of the range for every uncertain input that goes into the model. This would lead to unrealistically high results that would not be informative for decision-making purposes.

The term "bias" is used to characterize whether a parameter has a tendency to be an overestimate or underestimate of reality. A high bias means that the parameter most likely overestimates reality, and a low bias means that it most likely underestimates reality. Unbiased means that there are equal chances

that the parameter overestimates or underestimates reality. Sound scientific practice attempts to be unbiased, i.e., realistic. However, when many of the model inputs are unknown and uncertain, this is difficult to do. The general practice in this case is to ensure that, while many of the uncertain inputs in the model are selected in an unbiased manner (middle of the range), some are selected so that they are biased on the high side (upper end of the range). This ensures that the model results have a high bias without being excessively biased and unrealistic. Table 1 summarizes the approach taken by RWDI for key input parameters of the modelling.

Table 1 shows that most of the input parameters used in the RWDI assessment are biased high (at or approaching the upper limit of the range) and, therefore, the overall effect is expected to be a high bias in the model results, i.e., they are likely to overestimate reality.

One set of parameters not shown in the table is the assumed effectiveness of control measures implemented at the site (e.g., 95% for watering of the internal unpaved haul road, 1.2 g/m^2 silt loading on paved entrance road). The reason is that control effectiveness is not an input parameter. Rather, it is an outcome of the modelling. The values adopted in our report represent the levels effectiveness that were determined from preliminary model runs and/or first guesses to be needed to achieve acceptable results. Mitigation procedures (watering amount and frequency) are recommended with the aim of achieving these levels of effectiveness.

Detailed Response

Table 2 provides a detailed response to the 44 comments provided in Dr. DiGiovanni's review.

Summary

RWDI believes that the 2012 Air Quality Assessment (AQA) is both technically complete and conservative, and adequately addresses the air quality issues posed by the proposed Hidden Quarry.

With respect to Dr. DiGiovanni's review, we reiterate that RWDI profoundly disagrees with Dr. DiGiovanni's opinion on biases, and considers it to be inconsistent with sound engineering and scientific principles. It is not appropriate to choose the upper limit of the range for every uncertain input that goes into the model. This would lead to unrealistically high results that would not be informative for decision-making purposes.

Yours very truly,

RWDI AIR Inc.

Mike Lepage, M.Sc., ACM, CCM
Project Director, Principal

Brian Sulley, B.A.Sc., P.Eng.
Senior Specialist

MFL/BGS/kta

Table 1: Key Uncertain Input Parameters

Parameter	RWDI Approach	Comments
Meteorology	High bias	Based on worst-case from 5 years of hourly data, and assumes weather is always dry
Activity levels at the site	High bias	Based on maximum anticipated production/shipping levels associated with the licence limit, even though most aggregate operations infrequently attain their licence limit.
Locations of operations	High bias	Based on reasonable worst-case location of extraction and other operations.
Fallout of dust on site	High bias	Assumed all emitted dust leaves the site and none falls out within the site, even though operations will generally be below grade and the site has extensive tree cover.
Haul road silt levels	Unbiased	Used a middle-of-the range value from published data for other sites
Material moisture levels	High bias	Used middle-of-the range values from published data and previous measurements by RWDI for above-water aggregate extraction; whereas, this will be predominantly an underwater extraction operation.
Background contaminant concentrations	High bias	While highway 7 traffic was not explicitly included, an above-average background concentration was used (90^{th} percentile).

Table 2: Response to Comments Contained in Dr. DiGiovanni's (Airzone) Review

No.	Airzone One Ltd. Comment	RWDI Response
1	This statement [that precise flow of material may change between different pieces of processing equipment], would seem to provide a caveat to their assessment; this may mean that their assessment may not be reflective of the actual worst-case emissions whereas it should be reflective of the worst case emissions.	The maximum throughput of the processing plant is the primary driver of the emissions, and is set at a maximum value of 500 tonnes per hour. Once material enters the wash screen, it no longer generates significant emissions due to the high moisture content, so changes in the precise flow of this material are not relevant to the assessment. The assessment therefore does capture the worst case.
2	Further review on the operating schedule is required to verify RWDI's claims.	The modelling assessment conducted for AQA reflects the operating scenario as presented in the AQA and excluded operations between December 25 and April 1.
3	Valid and complete site-specific data is required in order to predict the composition of the dust that will be generated from the pit; this has not been provided. This renders RWDI's assessment uncertain and thus unreliable.	Calcium carbonate, crystalline silica and other compounds are included in an updated chemical analysis of both the unconsolidated deposit (sand and gravel) and the Amabel dolostone. This analysis is attached to this letter report. The data confirms RWDI's experience that levels of all trace metals and compounds identified in the assessment will be below the relevant criteria (when applied as a percentage of the predicted PM_{10} or TSP concentrations, as appropriate), when those criteria are met.
4	Missing combustion by-products assessments.	RWDI has conducted environmental assessments for highway projects throughout Ontario, and based on RWDI's analysis and experience, NO_2 is a suitable surrogate for examining potential impacts from diesel-fuelled vehicle emissions. The primary reason for including benzo(a)pyrene in the Henning Pit assessment was due to the presence of an asphalt recycling operation. There are no plans for asphalt recycling at the proposed Hidden Quarry.
5	Assessment on stripping and rehabilitation missing.	The scenario in which the use of quarry haul trucks was assessed during above-water extraction operations represents a larger amount of material handling and vehicle travel than occurs during stripping and rehabilitation, and is therefore the worst-case scenario as required by the regulations. No further assessment is warranted.

No.	Airzone One Ltd. Comment	RWDI Response
6	RWDI's claim on soil moisture levels is not sufficiently supported.	This comment pertains to stripping of overburden. As stated at item 5 above, this activity does not represent the worst-case scenario, regardless of the moisture levels in the soil. Nevertheless, the data presented for Illinois supports RWDI's field experience indicating that soil moisture levels are generally high during stripping of overburden.
7	RWDI's claim on wind erosion frequency is not sufficiently supported.	Materials stockpiled at the site will generally consist of non-homogenous materials containing a significant proportion of non-erodible elements (stone). The US EPA, in chapter 13.2.5 of AP-42 summarizes the results of field tests for such materials, indicating that threshold wind speeds for wind erosion exceed 10 m/s (36 km/h) at 7m above the surface. This finding is consistent with RWDI's general experience in the field. In relation to published information from the US EPA, therefore, the AQA report for the quarry is conservative in its statement that wind erosion begins to occur when the wind gusts exceed 15-20 km/h and becomes significant when the gusts exceed about 30 km/h. Use of 30 km/h as a relevant wind speed threshold is conservative compared to the minimum wind erosion threshold of 36 km/h cited by the US EPA. The estimated frequency of exceeding 30 km/h was based on a review of publicly available meteorological data from three locations in the surrounding area. Wind Roses are provided on Figure 6.1.1 of the AQA, and the quoted frequencies can be verified by examination of those plots. RWDI expects that if Mr. DiGiovanni were to review the meteorological data for this area, he would arrive at the same conclusion based on the data.
8	Road particulate assessments missing from compliance assessment.	Mr. Di Giovanni misunderstands Section 7.4.1 of MOE Guideline A10. Section 7.4.1 actually refers to a specific set of facilities (identified by the relevant North American Industrial Classification System, or NAICS Code) that must include metals from road dust emissions in their compliance assessment. An aggregate facility such as the proposed Hidden Quarry falls under NAICS Code 212315, which is not included on Table 7-2 in Section 7.4.1. Therefore, dust emissions from internal haul roads can be excluded from the compliance assessment. RWDI's interpretation of the MOE guidance has been confirmed to RWDI by the MOE on numerous occasions. In any case, additional model runs were performed as part of the cumulative effects assessment that included the haul roads.

No.	Airzone One Ltd. Comment	RWDI Response
9	Clarification required on above-water-table blasting.	Section 1.2 of the AQA clearly lists the activities in both the above-water and below-water portions of the extraction. Blasting is not included in the above-water extraction.
10	Clarification in the Site Plans required on source locations.	The processing plant is located in the area defined on the Site Plans. The source locations shown on Figure 5.2B were selected as representative of operations throughout the life of the proposed Hidden Quarry, at locations where operations would pose the highest predicted impacts. The very nature of operations at aggregate facilities requires that some of these sources will move as the quarry operates, and therefore a set of reasonable worst-case locations are used. A requirement to fix the locations of sources such as haul routes or extraction operations to a specific UTM coordinate is impractical and not warranted.
11	RWDI's claim that truck loading estimates are applicable to conveyor transfers is not sufficiently supported.	A quick review of the U.S. EPA emission factor suggested by Dr. DiGiovanni (conveyor transfers of wet material provided in Chapter 11.19-2) provides a value of 0.00007 kg TSP per Mg of aggregate handled. RWDI used the bulk transfer factors from Chapter 13.2.4 of AP-42. At 1m/s, the factor used by RWDI is essentially the same, at 0.000056 kg TSP per Mg of aggregate handled. At 2 m/s however, the factor used by RWDI is 3 times higher than that proposed by Mr. DiGiovanni, and this trend continues with increasing wind speed. RWDI therefore used a higher emission factor for all but the lowest wind speeds. This is conservative, and is fully supported by publicly available information. In any case, this is a minor source with little implications for the overall predicted dust levels.
12	RWDI's claim that moisture values [for haul truck loading and dumping operations] used are minimal is not sufficiently supported.	The value of 5% for moisture content was conservatively based on previous measurements by RWDI at aggregate sites where unconsolidated aggregates were extracted. RWDI's measurements show moisture values consistently higher than 5%. Dr. DiGiovanni has not provided any experience of his own with respect to moisture measurements of material from active pit faces.

No.	Airzone One Ltd. Comment	RWDI Response
13	RWDI's use of a non-conservative moisture value is not sufficiently supported.	As noted in our letter, Sound scientific practice attempts to be unbiased, i.e., realistic. However, when many of the model inputs are unknown and uncertain, this is difficult to do. The general practice in this case is to ensure that, while many of the uncertain inputs in the model are selected in an unbiased manner (middle of the range), some are selected so that they are biased on the high side (upper end of the range). This ensures that the model results have a high bias without being excessively biased and unrealistic. The table 1 summarized the approach taken by RWDI for key input parameters of the modelling. Overall, the approach used by RWDI is biased high and, therefore, appropriate. It is not appropriate to choose the upper limit of the range for every uncertain input that goes into the model. This would lead to unrealistically high results that would not be informative for decision-making purposes.
14	RWDI's claim of a supplemental control efficiency is not sufficiently supported.	It is normally assumed that there are negligible emissions from handling of washed stone, and it is common practice for air quality experts to assume 100% control when dealing with aggregate sites. This practice is supported by observations made by RWDI and other respected air quality consulting firms over decades of work on aggregate sites. Regardless, RWDI has used 90%, which is conservative given the washed nature of the stone.
15	RWDI's claim that the paved road silt loading level used is appropriately conservative is not sufficiently supported.	The value adopted for modelling, was based on preliminary model trials indicated what level of silt loading would be needed to achieve acceptable results at all receptors. Therefore, the paved road silt loading is an outcome of the modelling, rather than an input parameter that needs to be conservative. RWDI is recommending dust management procedures for the paved haul route that are aimed at attaining this value. RWDI has been involved in extensive sampling of road surface silt loadings at industrial facilities in Ontario. At a large industrial that uses aggressive road sweeping procedures, several years of sampling has indicated that silt loadings are consistently below 1 g/m^2. Dr. DiGiovanni cites published values in the US EPA's AP-42, but those values do not pertain to a road that is subject to an aggressive cleaning program. Therefore, they are not applicable to the controlled scenario that RWDI was assessing in the AQA.

No.	Airzone One Ltd. Comment	RWDI Response
		Dr. DiGiovanni has not provided any experience of his own with respect to silt loading on aggressively cleaned haul roads.
16	RWDI's claim that the unpaved road silt level is appropriate is not sufficiently supported.	The value used by RWDI represents an average value from data reported in the literature for unpaved routes at aggregate operations (US EPA, AP-42, Chapter 13.2.2). Therefore, it is an unbiased estimate of the average silt loading along the unpaved road. As noted in the introduction, the general practice to ensure that, while many of the uncertain inputs in the model are selected in an unbiased manner (middle of the range), some are selected so that they are biased on the high side (upper end of the range). This ensures that the model results have a high bias without being excessively biased and unrealistic. While the unpaved road silt loading value is an unbiased estimate, Table 1 above highlighted the various other ways in RWDI applied a high bias to the assessment. As such, the use of an unbiased estimate for road surface silt loading is appropriate.
17	RWDI's claim on watering road dust efficiency is not sufficiently supported.	The 95% level of control is an outcome of the modelling, not an input. It represents the level of control found to be needed to achieve acceptable results at the nearest receptors. Published studies show that it is achievable. Rosbury (Dust Control at Hazardous Waste Sites. EPA/540/2-85/003, 1985) summarized results from various studies showing that levels of control as high as 98% were attained in some cases. He went on to prescribe a watering rate that wold achieve near 100% control (approximately 1.7 L/m²/h). The US EPA (AP-42, Chapter 13.2.2) showed that by maintaining a road surface moisture level of 5 times that of the ambient soil, a 95% level of control could be achieved. It is clear therefore that the 95% level of control prescribed by RWDI is attainable through sufficient watering. This finding of the studies is consistent with RWDI past experience in observing the effect of intensive watering programs.
18	Further review is required to verify RWDI's claims on the characterisation of source parameters.	This was conducted by the Township's peer reviewer and no concerns were raised. No additional action required.
19	RWDI's claim that these alternative meteorological datasets are more appropriate is not sufficiently supported.	RWDI used the MOE's preferred dataset in the assessment, as is stated in Section 6.1.2 of the report. The other data sets referred to in S. 6.1.1 of the report were used only to provide a qualitative discussion of potential wind frequencies at the site. .

No.	Airzone One Ltd. Comment	RWDI Response
20	RWDI's claim that using datasets with lower wind speeds provides conservative ("high-end") estimates of wind erosion is not sufficiently supported.	Dr. DiGiovanni has misread the RWDI report and, in fact, the report states the opposite.
21	Further review is required to verify RWDI's claims that they included all appropriate receptors.	This was conducted by the Township's peer reviewer and no concerns were raised. No additional action required.
22	Further review is required to verify RWDI's claims on terrain data used.	RWDI used the terrain data provided by the MOE for use in dispersion modelling assessments. This approach is standard practice for dispersion modelling in Ontario. Base elevations within the quarry were based on the Site Plans. The Township's peer reviewer raised no concerns with the base elevations used. No additional action required.
23	Annualized assessments for certain contaminants are missing	RWDI has assessed annualized concentrations for TSP and PM2.5. Ontario has an annual average AAQC for TSP of 60 µg/m³. The proposed annual-average Canadian Ambient Air Quality Standards (CAAQS) for PM2.5 is 10.0 µg/m³ which takes effect in 2015, and 8.8 µg/m³, which takes effect in 2020. RWDI's modelling shows compliance with these criteria for all scenarios
24	Assessments missing of ecological exposures to air quality contaminants.	Information on air quality contaminants were provided to GWS Ecological & Forestry Services Inc. and Gray Owl Environmental Inc. for consideration in the Level II Natural Environment Technical Report. The report states clearly that: "With respect to dust control, the notes on the ARA Site Plans (Stovel, 2012) are considered sufficient to ensure that residual woodland and adjacent woodlands are effectively protected from dust damage to their foliage." No additional action required.
25	RWDI's claim that there are no "non-background" sources within 5 km is not sufficiently supported.	RWDI agrees that RWDI's methodology for arriving at this conclusion was not fully explained in the AQA. A clarification is provided here. A review of the National Pollutant Release Inventory (NPRI) shows no reporting facilities within 5 km of the site, which is supported by aerial photography and was confirmed during site visits to the area.

No.	Airzone One Ltd. Comment	RWDI Response
		There is a small hardwood flooring manufacturing facility located on 7th Line, to the east of the proposed Hidden Quarry, for which RWDI has previously done air quality modelling work. This site is equipped with modern sawdust collection systems, and is not expected to be a major local source of emissions, and is downwind of the site for the prevailing wind conditions. With respect to Highway 7, 2010 traffic data from the Ministry of Transportation shows average annual daily traffic volumes on this section of Highway 7 of only 8,100 vehicles per day. In comparison, the MOE monitoring station in Guelph is located less than 300 metres southwest of Woolwich Street, with has a traffic volume of 26,700 for the same year. Edinburgh Road, located less than 800m to the southwest of the monitoring station, has a traffic volume of 16,825 vehicles per day. Speedvale Avenue, located less than 800m to the northwest of the monitoring station, has a traffic volume of 16,994 vehicles per day. London Road, located less than 550m south of the monitoring station, has a traffic volume of 6,494 vehicles per day. Lastly, the station is generally downwind of Guelph's industrial area, which includes over 20 facilities that reported to the NPRI. RWDI's conclusion that there are no major local sources of emissions is valid. There is certainly no justifiable reason to require local monitoring prior to the establishment of the proposed Hidden Quarry, given that sources of similar air emissions surrounding the Guelph monitoring station are significantly larger in scale.
26	RWDI's claim that the Guelph data is conservative compared to all areas in Rockwood is not sufficiently supported.	See discussion of non-background sources at item 25 above.
27	Further justification is required from RWDI, and, a detailed review of the data they used is required (if this dataset is justified, as per previous point of criticism).	The information used by RWDI is publicly available information through the MOE's Air Quality in Ontario Reports. With respect to the Guelph monitoring station had 8561 hours of valid observations for PM2.5 in 2011 (compared to 8760 hours the year), and a similar number of observations in previous years. The data set for this location is therefore suitable for this assessment.

No.	Airzone One Ltd. Comment	RWDI Response
		Given the decreasing trend in PM2.5 concentrations both at the Guelph monitoring location, and throughout Ontario as a whole over the last decade, using the 5-year average of the 90th percentile is indeed conservative. In fact, the most recent MOE report (2011 Air Quality in Ontario Report) report shows a corresponding value of 13 µg/m³, which is below the average value used in the AQA.
28	RWDI have used a less appropriate estimation method for PM10 and TSP background levels that leads to their underestimation, and thus underestimation of community-level impacts.	The differences to which Dr. DiGiovanni reflect some of the uncertainty in the estimates of the background concentrations of PM_{10} and TSP. However the differences are small and are not material to the findings of the assessment. This source of uncertainty is adequately accounted for in the conservatisms built into the analysis, such as using the 90th percentile background values.
29	Values derived for ozone and NO2 should be checked at some point in the future.	This was conducted by the Township's peer reviewer and no concerns were raised. No additional action required.
30	Given the issues noted above, the actual number of exceedances may be significantly higher than claimed by RWDI. In addition, under s.7.2.3., RWDI speak to results "without the inclusion of background air quality data" and yet this is meant to be a cumulative effects assessment. Thus their analysis would seem to be incorrect.	For the numerous reasons already cited, RWDI disagrees with Dr. DiGiovanni's conclusion that actual number exceedances may be significantly higher. RWDI agrees that there is a typographical error in Section 7.2.3 of the AQA. The statement to which Dr. DiGiovanni refers should read: The results of the dispersion modelling analysis indicate that <u>with</u> the inclusion of background air quality data, predicted concentrations of NO_2 and $PM_{2.5}$ are below the relevant criteria at all receptors. Regardless, Table 7.1C, which presents the results for this scenario, clearly shows the results of the assessment, both with and without background data included.
31	RWDI are misidentifying a required practise as a source of additional conservatism when it is not.	RWDI profoundly disagrees with this statement. RWDI understands that these practices are required by MOE guidance for the very reason that they are conservative and impart a high bias to the modelling in order to offset the uncertainties. It does not matter that they are standard practice in dispersion modelling, they provide are significantly conservative (biased high) nevertheless.

No.	Airzone One Ltd. Comment	RWDI Response
32	RWDI's claims that (i) exceedances are acceptable, and, (ii) that the level of exceedances they predict are acceptable, are not sufficiently supported.	No jurisdiction requires 100% compliance with short-term standards, guidelines or objectives. Perhaps the most stringent jurisdictions are Ontario, Alberta and Newfoundland and Labrador. In these provinces, the general requirement is for the 99.9th percentile concentration to meet the limit. However, both Canada and the U.S. apply their national standard for $PM_{2.5}$ to the 98th percentile concentration. The U.S. also uses a 98th percentile for 1-hour NO_2 and a 99th percentile for 1-hour SO_2. Considering the high bias in RWDI's estimates of frequency of exceedance (the modelling assumes operations are fixed at maximum production and in worst-case locations throughout the year, and that weather is dry at all times), the results of both the conveyor scenario and the off-highway truck scenario meet the aforementioned tests. In the off-highway truck scenario, the predicted levels of TSP and PM_{10} do not meet the criteria at the 99.9th percentile level at some receptors, but meet it at the 98th percentile level (except for TSP at one receptor, where it is met at the 97th percentile level), which is consistent with the spirit of the national standard for respirable particulate matter.
33	I believe that RJB's review was inadequate.	Dr. DiGiovanni has questioned the credentials of the Township peer reviewer, which is a serious allegation, without providing any sound substantiation.
34	It may be that some limited monitoring is being proposed by the proponent (AQA s.3.1.1.1. Crystalline Silica) but this is not clear from their report as what was written is not understandable. It can only be said, at this point, that whatever is proposed is not adequate as it is not explained appropriately. Assuming what was meant was airborne monitoring for crystalline silica, then this still leaves other contaminants unmonitored, and therefore is still not adequate.	RWDI's report clearly states that: "To ensure this aspect of air quality standard is met, the silica content will be monitored as part of the normal chemical analysis of particulate matter at the site." The silica content of the material processed at this site will naturally be found in the particulate generated at the site. Silica testing of the material will therefore be a suitable means of estimating the silica content of the particulate generated.
35	Dust mitigation is proposed (primarily road dust watering) but it is not defined on a quantitative, verifiable basis; therefore it is not adequate.	See our response to comment #17.

No.	Airzone One Ltd. Comment	RWDI Response
36	Due to the numerous technical issues identified above I do not believe that the RWDI evaluation is technically complete.	RWDI has responded to all of Dr. DiGiovanni's alleged "technical issues" in the responses above, and strongly disagrees with this statement.
37	The conclusions and recommendations are not valid for the various issues noted above (lack of evaluations, non-conservative assessments, etc.) as the issues may well lead to higher, and perhaps significantly higher, community-level exposures.	See the response at item 36.
38	The applicant has not assessed the effect of emissions on any ecological elements and other operations around the site including the mushroom farm; therefore, any mitigation mentioned is without basis with respect to this receptor. The mushroom farm may represent a particularly sensitive receptor with regards to the requirement for controlled environments for its growing operations.	With respect to ecological elements, see the response at Item 24. With respect to the mushroom farm, Dr. DiGiovanni is speculating with regard to any unique impacts and has provided no evidence to support his suggestion.
39	Complete a full review of all data and calculations conducted by RWDI and presented in their assessment.	Data and model input files not already included in the report can be made available on request.
40	Major reworking of the AQA, corrections and explanations based on the issues raised in the screening-level analysis presented in this report, and the more fulsome review mentioned in 1, above.	See our response to comment #36.
41	Use the (corrected) preliminary modelling study to help identify locations to conduct background monitoring.	As per our response to comments #25 and #27, this is not warranted.
42	Conduct background air monitoring; meanwhile conduct site-specific sampling (for aggregate composition, for example).	As per our response to comments #25 and #27, this is not warranted.

No.	Airzone One Ltd. Comment	RWDI Response
43	Re-do modelling with site-specific input and site-specific background data.	See our response to comment #37.
44	Assess need for mitigation and predict effectiveness of mitigation (e.g., road dust watering controls) on a quantitative, conservative basis.	See our response to comment #37.

ATTACHMENT A

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Mineralogy
Attn :
Phone: -
Fax:-

27-May-2014

Date Rec. : 14 May 2014
LR Report : **CA02478-MAY14**
Client Ref : MI4513-MAY14

CERTIFICATE OF ANALYSIS

Final Report

Sample ID	SiO2 %	Al2O3 %	Fe2O3 %	MgO %	CaO %	Na2O %	K2O %	TiO2 %	P2O5 %	MnO %	Cr2O3 %	V2O5 %	LOI %	Sum %
1: M15 Dolostone Core	0.35	0.11	0.25	19.7	28.8	0.04	0.04	< 0.01	0.01	0.04	< 0.01	< 0.01	47.6	97.0
2: HQ Gravel	7.32	1.28	0.84	15.5	30.2	0.30	0.27	0.08	0.04	0.06	< 0.01	< 0.01	42.3	98.3

Control Quality Assay
Not Suitable for Commercial Exchange

Tom Watt
Project Coordinator

OnLine LIMS

0000170076

James Dick Construction
Custom XRD/MI4513-MAY14
05/30/2014

Chemical Balance

M15 Dolostone Core

Name	Assay[1]	SQD[2]	Delta	Status
CaO	28.8	30.4	-1.57	Both
MgO	19.7	21.7	-2.02	Both
SiO2	0.35	0.34	0.01	Both
Fe2O3	0.25	-	0.25	XRF
Al2O3	0.11	0.02	0.09	Both
MnO	0.04	-	0.04	XRF
K2O	0.04	-	0.04	XRF
Na2O	0.04	0.01	0.03	Both
CO2	-	47.5	-47.5	SQD

HQ Gravel

Name	Assay[1]	SQD[2]	Delta	Status
CaO	30.2	30.8	-0.59	Both
MgO	15.5	16.8	-1.30	Both
SiO2	7.32	7.55	-0.23	Both
Al2O3	1.28	1.10	0.18	Both
Fe2O3	0.84	0.72	0.12	Both
Na2O	0.30	0.01	0.29	Both
K2O	0.27	1.00	-0.73	Both
TiO2	0.08	-	0.08	XRF
MnO	0.06	-	0.06	XRF
P2O5	0.04	-	0.04	XRF
H2O	-	0.03	0.03	SQD
CO2	-	42.1	42.1	SQD

1. Values measured by chemical assay.

2. Values calculated based on mineral/compound formulas and quantites identified by semi-quantitative XRD.

R.J. Burnside & Associates Limited 6990 Creditview Road, Unit 2 Mississauga ON L5N 8R9 CANADA
telephone (905) 821-1800 **fax** (905) 821-1809 **web** www.rjburnside.com

BURNSIDE
[THE DIFFERENCE IS OUR PEOPLE]

January 22, 2015

Via: Email (kwingrove@get.on.ca)

Ms. Kim Wingrove
Chief Administrative Officer
Township of Guelph/Eramosa
8348 Wellington Road 124
P.O. Box 700
Rockwood ON N0B 2K0

Dear Kim:

Re: Hidden Quarry Air Quality Report
AirZone One's Review and RWDI's Response
Project No.: 300032475.0000

R.J. Burnside & Associates Limited (Burnside) has been retained to review the Air Quality Assessment related documents regarding the James Dick Construction Limited (JDCL) proposal for a quarry located in the Township of Guelph-Eramosa, Wellington County. Initially, RWDI Air Inc. (RWDI) prepared an Air Quality Assessment on behalf of JDCL. Burnside reviewed that document in November 2012. Subsequently, Airzone One Ltd. (Airzone) was retained by the Concerned Residents Coalition to prepare a review of the same Air Quality Assessment. RWDI provided a response to the Airzone review. For this review, Burnside was retained to provide a balanced review of the Airzone review and RWDI response to that review.

The relevant documents are listed in Table A:

Table A:

File	Description	Abrev.
Air Quality Report.pdf Title: "Proposed Hidden Quarry, Township of Guelph-Eramosa, Wellington County, Final Report, Air Quality Assessment" Dated: September 6, 2012	RWDI prepared an Air Quality Assessment to assess the predicted air contaminant emissions from the proposed James Dick Construction Limited (JDCL) quarry called "Hidden Quarry" in the Township of Guelph-Eramosa, Wellington County.	AQA
032475 Hidden Quarry Assess ESDM Report.pdf Title: "Memo to Dave Hopkins, Review of Hidden Quarry" Dated: November 14, 2013	Burnside's review of AQA dated November 14, 2012. As this document was not previously distributed, it has been attached in Appendix A.	RJB

File	Description	Abrev.
AirZone One Screening-level review of JDCL AQ Report.pdf Title: "Screening-level review of James Dick Construction Ltd. air quality assessment re: Proposed Hidden Quarry" Dated: April 15, 2014	Airzone One Ltd.'s review of the "Proposed Hidden Quarry, Township of Guelph-Eramosa, Wellington County, Final Report, Air Quality Assessment" on behalf of the Concerned Resident's Coalition (CRC).	AZO
rwdi response to airzone one.pdf Title: "RWDI Response to Airzone One Ltd. Screening-Level Review Air Quality Assessment for the Proposed Hidden Quarry" Dated: June 6, 2014	RWDI's response to issues raised by Airzone One Ltd in their review "Screening-level review of James Dick Construction Ltd. air quality assessment re: Proposed Hidden Quarry".	RSP

Other documents used as part of the review which were assigned abbreviations are listed in Table B.

Table B:

File	Description	Abrev.
Guideline A-10 Procedure for Preparing an ESDM Report (March 2009) - 3614e03.pdf	MOE guidance document directing proponents in how to prepare an ESDM in support of an Environmental Compliance Approval.	A10
O.Reg 419_05 Air Quality 1Feb2013.pdf	Ontario Regulation 419/05	OReg419

Overall Characterization

Burnside was retained by the Township of Guelph-Eramosa to review the documents in Table A. The position of the reviewer is that this review should follow the spirit of R.R.O. 1990, Reg. 194, S.53.03 Expert Witness which is that a technical expert will provide opinion based evidence that is fair, objective, and non-partisan regardless of the party engaging the expert.

If RWDI was deemed to have responded sufficiently to the Airzone comment, further discussion was not provided.

The RJB document as noted in Table A is an interoffice memorandum prepared by the author of this correspondence. Although a number of improvements to the AQA as prepared by RWDI were noted in the memorandum, only a summary statement was included from this memorandum in the general review letter submitted to the municipality on January 11, 2013. In hindsight, it would have been useful to include the additional detail as per the memorandum. In the RJB, Burnside provided 11 specific comments. Those comments could be summarized as identifying several places where the documentation was insufficient as previously noted

Airzone provided a large number of comments which RWDI subsequently numbered (total of 44). A summary of the AZO would appear to be similar to the RJB summary: There are numerous places in the AQA document that did not provide sufficient documentation.

RWDI has attempted to provide a substantial amount of that missing documentation in the text of the RSP.

Overall, the documents in Table A show:

- The proponent can receive an Environmental Compliance Approval for the property (as summarized in the initial general review letter of January 11, 2013),
- Including road dust, there are some exceedences of the appropriate particulate criteria,
- The number of exceedences predicted depends on the scaling factor used to predict the background values for PM_{10} and TSP based on the $PM_{2.5}$ background values. Using either scaling factor, the number of exceedences is likely acceptable since the exceedences will only happen when the meteorological conditions match the model and the production is at a maximum, which the proponent indicates is unlikely. The difference between scaling factors is within the uncertainty of each factor.

Based on these points, the AQA shows that the HiddenQuarry is unlikely to cause an adverse effect to sensitive receptors in the area.

Additional detail is provided below. To make it easier for the reader, the location in the appropriate and related portion of a document is given **in bold** and the quote from the original text of that document is provided *in italics*. Burnside comments are provided in regular text.

General Overview (RSP Letter) – Conservative Worst-Case

AZO, Section 4.1, paragraph 3: *…The key issue in assessing those data is dealing with the range of data values from those other sites. Unless one has good reason to argue against it, it is prudent to choose the upper limit of the range, the value that will result in the highest emissions or impacts.*

In RSP, General Overview, paragraph 3: *… RWDI profoundly disagrees with this statement and considers it to be inconsistent with sound engineering and scientific principles. It is not appropriate to choose the upper limit of the range for every uncertain input that goes into the model. This would lead to unrealistically high results that would not be informative for decision-making purposes.*

In A10, section 8.2, paragraph 3-5 (page 52 of 131):

In summary, the emission rate estimating must be either:

- *"conservative"[11], as represented by paragraph 1 of subsection 11(1); or*
- *as accurate as possible, as represented by the methodologies set out in paragraphs 2 and 3 of subsection 11(1)."*

In many cases, emission rate estimating is an iterative process where estimates start out conservative and are then refined to be more accurate and less conservative when earlier iterations result in a prediction of an exceedence of a MOE POI Limit. Although the emission rate estimating methodologies described in paragraph 2 and 3 of subsection 11(1) of the Regulation can be selected at any time, they also represent the end of the iterative or refinement process.

[11] For the purpose of this Procedure Document the term "conservative" refers to an estimated emission rate that is certain to be higher than the actual emission rate.

OReg419 Section 11:

Source of contaminant emission rates

11. (1) An approved dispersion model that is used for the purposes of this Part shall be used with an emission rate that is determined in one of the following ways for each source of contaminant and for each averaging period applicable to the relevant contaminant under section 19 or 20, whichever is applicable:

1. *The emission rate that, for the relevant averaging period, is at least as high as the maximum emission rate that the source of contaminant is reasonably capable of for the relevant contaminant.*
2. *The emission rate that, for the relevant averaging period, is derived from site specific testing of the source of contaminant that meets all of the following criteria:*
   - i. *The testing must be conducted comprehensively across a full range of operating conditions.*
   - ii. *The testing must be conducted according to a plan approved by the Director as likely to provide an accurate reflection of emissions.*
   - iii. *The Director must be given written notice at least 15 days before the testing and representatives of the Ministry must be given an opportunity to witness the testing.*
   - iv. *The Director must approve the results of the testing as an accurate reflection of emissions.*
3. *The emission rate that, for the relevant averaging period, is derived from a combination of a method that complies with paragraph 1 or 2 and ambient monitoring, according to a plan approved by the Director as likely to provide an accurate reflection of emissions. O. Reg. 516/07, s. 7 (1); O. Reg. 507/09, s. 9 (1).*

The text of the regulation above provides insight into the level of conservativeness generally expected by agencies in Ontario. Where the estimate is not "conservative", the report would be expected to document the justification for a less conservative emission rate.

Over the last 10 years, the MOE has been requiring better and better documentation. This report was written in 2012 and so to expect 2014 levels of documentation is unrealistic; however, expecting 2012 levels of documentation is not unrealistic. The comments identified in the R.J. Burnside & Associates Limited document were intended to hold the authors to that level of documentation.

Table 1 (RSP Table 1) - Material Moisture Levels

RSP, Table 1, Material moisture levels: *Used middle-of-the range values from published data and previous measurements by RWDI for above-water aggregate extraction; whereas, this will be predominantly an underwater extraction operation.*

The site will *be* "predominantly an underwater extraction operation" but the initial extraction will be *above-water* and so the above-water moisture levels will be representative of extraction emissions; however, the majority of the extraction over the life of the facility will "be predominantly an underwater extraction operation".

Therefore, while the worst-case is appropriately specified, that situation will exist for a relatively short period of time relative to the life of the site.

It might be more representative to characterize the RWDI approach for this parameter as unbiased. Note that this change would not alter the final opinion of the document.

Comment 4 (RSP Table 2) – Missing combustion By-Products Assessments.

AQA section 3.1.1.3 (p. 9 of 80): *With respect to emissions of combustion by-products from on-site mobile equipment and the drag-line, the principal contaminants of interest are typically nitrogen oxides (NOx), $PM_{2.5}$, PM_{10}, and TSP and these are used as surrogates for all products of combustion.*

AZO p.9 of 25: *It is more reasonable to have followed the general procedure that RWDI did in their Henning Pit analysis (although some of the details of their procedure were questionable). Thus, BaP should have been included in their analysis for the present JDCL assessment. In their Henning Pit assessment, RWDI demonstrated that BaP has the highest potential to exceed the air quality standard; thus it would potentially be the contaminant of greatest concern.*

RSP, comment 4: *RWDI has conducted environmental assessments for highway projects throughout Ontario, and based on RWDI's analysis and experience, NO_2 is a suitable surrogate for examining potential impacts from diesel-fuelled vehicle emissions.*

The primary reason for including benzo(a)pyrene in the Henning Pit assessment was due to the presence of an asphalt recycling operation. There are no plans for asphalt recycling at the proposed Hidden Quarry.

A10 section 7.1.1 Combustion of Natural Gas and Propane (page 36 of 131): *The significant contaminant from the combustion of natural gas and propane is typically nitrogen oxides. Other contaminants, for this type of source, are generally emitted in negligible amounts.*

While the A10 guidance does not apply directly to emissions from the combustion of diesel, it does illustrate the methodology recommended by the MOE. Presentations by the MOE have indicated that the reason for the above guidance is that they have determined that the nitrogen oxide emission factors are the largest percent of criteria of all the contaminant emission factors for products of combustion from natural gas so that for any source of natural gas combustion, the nitrogen oxide limit will be reached before any other contaminant.

Previous MOE guidance directed the proponent to model nitrogen oxides and any other contaminant emitted by the site that is also emitted as a product of combustion which is what RWDI has done.

Since there are no other sources of the contaminants produced as products of combustion, it seems reasonable to assess the emission of nitrogen oxides against its criteria since the other contaminants will show a lower percentage of criteria.

Using the emission factors in AP-42, "3.3 Gasoline And Diesel Industrial Engines", Table 3.3-1 and comparing to the various criteria in Schedule 3 of OReg419 shows the same relationship: emission factors will always result in nitrogen oxide POI concentrations meeting criteria before any other contaminant reaches its respective criteria.

Comment 8 (RSP Table2) – Fugitive Road Dust and Storage Piles in ECA Application

AQA section 3.3.2.1 (page 12 of 80): *JDCL will develop a Best Management Practice Plan, which will serve as a guideline for dust management practices at the facility. With the implementation of this plan, the facility is exempt from assessing particulate emissions from paved roadways, unpaved roadways, and aggregate storage piles located on-site, as per guidance in Section 7.4.1 of MOE Guideline A10.*

AZO (p.11 of 25), paragraph 1: *… MOE guideline s.7.4.1, which only refers to no requirement to assess metals in dust; other components still need to be assessed.*

RSP, Table 2, comment 8: *Mr. Di Giovanni misunderstands Section 7.4.1 of MOE Guideline A10.*

Section 7.4.1 actually refers to a specific set of facilities (identified by the relevant North American Industrial Classification System, or NAICS Code) that must include metals from road dust emissions in their compliance assessment. An aggregate facility such as the proposed Hidden Quarry falls under NAICS Code 212315, which is not included on Table 7-2 in Section 7.4.1. Therefore, dust emissions from internal haul roads can be excluded from the compliance assessment. RWDI's interpretation of the MOE guidance has been confirmed to RWDI by the MOE on numerous occasions.

In any case, additional model runs were performed as part of the cumulative effects assessment that included the haul roads.

A10, section 7.4.1, paragraph 1: *Fugitive particulate from on-site roadways and storage piles (that are susceptible to wind erosion) must be included in an ESDM report when the particulate contains significant quantities of contaminants (e.g., metals) that contribute to an MOE POI Limit that may cause a health effect. As set out below, in certain circumstances fugitive particulate does not have to be included in the ESDM report if the facility has implemented a best management practices approach to fugitive dust.*

A10, section 7.4.1, Heading 2: *Fugitive dust emitted from facilities in the sectors listed in Table 7-3 is generally not anticipated to contain significant quantities of metals. Nevertheless, fugitive particulate from on-site roadways and storage piles from facilities within the sectors listed in Table 7-3 must be included in the assessment of compliance with MOE POI Limits unless the facility:*

1. *implements a BMP plan;*
2. *includes a BMP plan as an Appendix to the ESDM report;*
3. *retains a BMP plan and implementation on-site for inspection by the MOE; and …*

It should be noted that proponents may be asked to include sources of fugitive dust in the ESDM report if the best management practices plan is not acceptable to the MOE.

The position in both AZO and RSP agree that JDCL's quarry would appear in Table 7-3 under the heading "2123 Non-Metallic Mineral Mining and Quarrying" so heading 2 applies.

AQA section 3.2.1.4, paragraph 3: *JDCL will also develop a Best Management Practice Plan (BMPP), which will serve as a guideline for dust management practices at the facility. As Section 7.4.1 of MOE Guideline A10 allows for the exclusion of stockpiles when a BMPP is in place, and given the washed nature of the aggregate, emissions from the aggregate stockpiles are expected to be insignificant.*

Therefore, while "*particulate from on-site roadways and storage piles can be omitted if a BMP Plan is provided*", the AQA does not provide a BMP plan (requirement 2) and so does not meet all the requirements of A10 but does indicate that one will be prepared. The AQA indicates that the BMP can be written to achieve the mitigation suggested but does not provide the details. Burnside is confident that a BMP plan will be written for the Site that will demonstrate the level of mitigation indicated and so can be prepared at a later time.

Note that while the road dust emission is ignored as part of the ECA Application assessment portion of the AQA document, it is not ignored in the "Cumulative Effects Modelling" portion of the report.

Comment 12 (RSP Table 2) – Soil Moisture Content

AQA section 4.2.1 (page 14 of 80): *A moisture value of 5% was used to reflect the high moisture content of material taken directly from the working face. This is consistent with RWDI's experience at sand and gravel operations in Southern Ontario.*

AZO (p.11 of 25), last paragraph: *RWDI needs to explicitly prove that 5% is a reasonably conservative value to use. In this case, a conservative value would be the lowest moisture value (driest) that it could reasonably be. In this we cannot depend on "RWDI's experience at sand and gravel operations in Southern Ontario" so we cannot verify if those other experience(s) are representative of the situation at the proposed Hidden Quarry. Rather than assume "trust" in RWDI's "experience," RWDI must, instead, provide explicit evidence of their claims. Without such explicit evidence, these claims remain uncertain and unverifiable.*

RSP, Table 2, comment 12: *The value of 5% for moisture content was conservatively based on previous measurements by RWDI at aggregate sites where unconsolidated aggregates were extracted. RWDI's measurements show moisture values consistently higher than 5%.*

If possible, RWDI should provide a brief summary of the results they do have, perhaps with sample analysis sheets. If not, a statement like "In the past, RWDI has measured soil moisture content more than x times with resulting values between y and z and a mean/median of a." would provide assurance that, if required, RWDI can demonstrate that their value is defensible.

Comment 14 (RSP Table 2) – Supplemental Control Efficiency

AQA section 4.2.3 (page 15 of 80): *The amount of aggregate material handled at each location was assumed to be equivalent to the production rate of the material stockpiled at that location. A supplemental control efficiency of 90% was applied to reflect the washed nature of the aggregate.*

AZO (p.12 of 25), paragraph 7: *We require quantitative evidence of RWDI's "supplemental control efficiency of 90%" claim…*

RSP, Table 2, comment 14: *It is normally assumed that there are negligible emissions from handling of washed stone, and it is common practice for air quality experts to assume 100% control when dealing with aggregate sites. This practice is supported by observations made by RWDI and other respected air quality consulting firms over decades of work on aggregate sites.*

Regardless, RWDI has used 90%, which is conservative given the washed nature of the stone.

AP-42 Chapter 13.2.4 Aggregate Handling and Storage Piles, section 13.2.4.2, paragraph 2: *When freshly processed aggregate is loaded onto a storage pile, the potential for dust emissions is at a maximum. Fines are easily disaggregated and released to the atmosphere upon exposure to air currents, either from aggregate transfer itself or from high winds. As the aggregate pile weathers, however, potential for dust emissions is greatly reduced. Moisture causes aggregation and cementation of fines to the surfaces of larger particles. Any significant rainfall soaks the interior of the pile, and then the drying process is very slow.*

The washing process is intended to remove the fines from the rest of the aggregate leaving a clear stone. Based on the AP-42 quote, the majority of the emissions would be expected to occur when the aggregate is first loaded onto a storage pile. Since the washed aggregate will still be wet at that time, the expectation of dust being emitted from this source is low. Further, the AP-42 text indicates that the remaining fines will be bound because of "aggregation and cementation of fines to the surfaces of larger particles" as the pile ages and so there will be less dust released later.

This assessment of the process clearly suggests that a 90 % reduction is reasonable.

Comment 18 (RSP Table 2) – Source Characterization

AQA, Section 6, paragraph 2 (p. 22 of 80): *Sources were modelled as a series of volume sources with parameters based on information obtained from the Site Plan and typical dimensions of processing equipment and vehicles used at other facilities of this nature. The modelled source parameters are consistent with guidance from the NSSGA[2]. Internal haul roads were modelled as adjacent volume sources, also in accordance with guidance from the National Sand Stone and Gravel Association and the U.S. EPA.*

AZO (p.12 of 25), 2nd last paragraph: *The volume source specifications used by RWDI require a third-party check. This should be completed as part of a more detailed review.*

RSP, Comment 18: *This was conducted by the Township's peer reviewer and no concerns were raised. No additional action required.*

Burnside was not able to retrieve a copy of "Modelling Fugitive Dust Sources", National Stone, Sand & Gravel Association, Alexandria, VA., 2004 without paying for it as it is a copyrighted document. An earlier document[1] provides a detailed method for modelling haul roads using AERMOD. Where it could be determined, the method of determining parameter values in the earlier document was the same as the method used in the Lakes Environmental's "Haul Road" calculator.

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[1] "Analysis Of Haul Road Emission Test Data For Determining Dispersion Modeling Parameters", Arron Heinerikson, Abby Goodman, and Kathryn Anderson, Trinity Consultants, 25055 West Valley Parkway, Suite 101, Olathe, Kansas 66061, August 15, 2003.

Lakes Environmental's "AERMOD Air Dispersion Modelling Course" in the "Lakes_AERMOD_Course_Slides.pdf" from the course presented in Toronto on September 16-17, 2013, on slide 292 indicates that examples of volume sources include "Examples: building roof monitors, multiple vents, conveyor belts, haul roads".

Burnside did not identify any missing sources.

Comment 21 (RSP Table 2) – Sensitive Receptors

AQA, Section 6.1.2, paragraph 2 (p. 23 of 80): *In addition, 18 discrete receptor locations were included in the assessment. These receptors represent residences near the quarry.*

AZO (p.15 of 25), paragraph 2: *As part of a more detailed review, there should be a third-party check that all appropriate human receptors have been included in the assessment, including future potential, as-of-right, land uses.*

RSP, Comment 21: *This was conducted by the Township's peer reviewer and no concerns were raised. No additional action required.*

Burnside used Google Earth and Google Street View to review the area for sensitive receptors. Burnside identified a number of locations[2] which would be considered sensitive receptors that were not identified in AQA; however, in every case, there was an identified receptor closer to the site than the omitted receptor. Given that the impact will be higher closer to the site, the existing list of receptors is expected to adequately show all the relevant impacts.

Comment 22 (RSP Table 2) – Terrain Data

AQA, Section 6.1.4, paragraph 1 (p. 23 of 80): *Terrain information for the area surrounding the facility was obtained from the MOE Ontario Digital Elevation Model Data web site. The terrain data is based on the North American Datum 1983 (NAD83) horizontal reference datum. These data were run through the AERMAP terrain pre-processor to estimate base elevations for receptors and to help the model account for changes in elevation of the surrounding terrain. Base elevations for sources are based on information contained on the Site Plan and are assumed to be at the elevation of the first lift.*

AZO (p.15 of 25), paragraph 5: *Cross reference to the Site Plan is required to verify the credibility of this assumption; further explanation may be required.*

RSP, Comment 22: *RWDI used the terrain data provided by the MOE for use in dispersion modelling assessments. This approach is standard practice for dispersion modelling in Ontario. Base elevations within the quarry were based on the Site Plans. The Township's peer reviewer raised no concerns with the base elevations used. No additional action required.*

Burnside agrees that the methodology described for the incorporation of terrain data is the appropriate method to incorporate height elevations.

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[2] 4216 Highway 7, 4248 Highway 7, 5198 Highway 7, and 14207 Fifth Line Nassagaweya.

Comment 27 (RSP Table 2) – Background PM2.5 Levels

AQA, Section 6.4, paragraph 7 (p. 25 of 80): *Background PM2.5 levels were based on a 5-year average of the annual 90th percentile hourly concentration measured at the MOE monitoring station in Guelph (14.8 µg/m³).*

AZO (p.16 of 25), paragraph 6: *Notwithstanding the previous comment, in regards to the use of the Guelph air quality dataset, why was the average and not the maximum 5-year 90th percentile used? Significant between-year variations may lead to underestimates of base-line, background concentrations if only the average is used. Elaboration is required of year-to-year differences in the 90th percentile value (if this dataset were to be justified as appropriate). Also, does the quality of the dataset used justify use of the 90th percentile (as opposed to the maximum)?*

Notwithstanding the previous criticism there should be a third-party check of the analysis of background data from the Guelph station used by RWDI.

RSP, Comment 27: *The information used by RWDI is publicly available information through the MOE's Air Quality in Ontario Reports. With respect to the Guelph monitoring station had 8561 hours of valid observations for PM2.5 in 2011 (compared to 8760 hours the year), and a similar number of observations in previous years. The data set for this location is therefore suitable for this assessment.*

Given the decreasing trend in PM2.5 concentrations both at the Guelph monitoring location, and throughout Ontario as a whole over the last decade, using the 5-year average of the 90th percentile is indeed conservative. In fact, the most recent MOE report (2011 Air Quality in Ontario Report) report shows a corresponding value of 13 µg/m^3 which is below the average value used in the AQA.

Burnside has verified that the MOE published value[3] for $PM_{2.5}$ at the Guelph monitoring station in 2011 is 13 µg/m^3. The 90th percentile values $PM_{2.5}$ at the Guelph monitoring station are listed in the table below.

Year	$PM_{2.5}$ 90th percentile value (µg/m^3)
2011[4]	13
2010[5]	14
2009[6]	12
2008[7]	15
2007[8]	17
2006[9]	16

Average of 2006 through 2010 values = 14.8 µg/m^3.

[3] "Air Quality in Ontario Report & Appendix (2011) - stdprod_104486.pdf" page 52 of 96.
[4] "Air Quality in Ontario Report & Appendix (2011) - stdprod_104486.pdf" page 52 of 96.
[5] "Air Quality in Ontario Report & Appendix (2010) - stdprod_095558.pdf" page 50 of 90.
[6] "Air Quality in Ontario Report & Appendix (2009) - stdprod_081228.pdf" page 28 (34 of 52).
[7] "Air Quality in Ontario Report & Appendix (2008) - std01_079215.pdf" page A1 (79 of 110).
[8] "Air Quality in Ontario Report & Appendix (2007) - std01_079175.pdf" page 71 (79 of 118).
[9] "Air Quality In Ontario Report And Appendix 2006.pdf" page 66 of 81.

The 90th percentile background value is the value typically used as the background in air quality assessments for environmental assessments.

Comment 28 (RSP Table 2) – PM10 and TSP Background Estimation Method

AQA, Section 6.4, paragraphs 8&9 (p. 25 of 80): *Background TSP was derived from the PM2.5 data for Guelph, based on an estimated PM2.5/ TSP ratio of 0.30. This value came from a published study of 500 monitoring sites in the US.3 The resulting 90th percentile background concentration is 49 µg/m³.*

Background PM10 was also derived from the $PM_{2.5}$ data for the Guelph, based on an estimated $PM_{2.5}/PM_{10}$ ratio of 0.54 from the study noted above. The resulting 90th percentile background concentration is 27 µg/m³.

AZO (p.16-17 of 25): *RWDI used scaling factors to derive (by calculation) estimated background levels of PM10 and TSP (based upon measurements of the PM2.5 dust size fraction) as measurements of these larger size fractions were not conducted at the chosen site. RWDI obtained these scaling factors from a study by Lall et al. (Atmos.Environ. 2004), which represented measurements from Metropolitan locations in the US. However, there is a similar Canadian version of this study, which provides different scaling factors (Brook et al. J. Air & Waste Manage. Assoc., 1997) and includes data from rural southern Ontario. The values derived in the Canadian study indicates: "On average across all sites, PM2.5 accounted for 49% of the PM10, and PM10 accounted for 44% of the TSP."*

RSP, Comment 28: *The differences to which Dr. DiGiovanni reflect some of the uncertainty in the estimates of the background concentrations of PM_{10} and TSP. However the differences are small and are not material to the findings of the assessment.*

This source of uncertainty is adequately accounted for in the conservatisms built into the analysis, such as using the 90th percentile values.

The background concentrations provided using the scaling factors provided by RWDI and Airzone One are in the table below.

RWDI value for PM2.5	90th Percentile PM2.5	Calculated PM10	Calculated TSP
AQA	14.8	27.41	49.33
AZO	14.8	30.20	68.65
Difference (µg/m3)		2.80	19.31
% increase (AZO-AQA/AQA)		10.2%	39.1%
Criterion (µg/m^3)		25	120
Difference as a % of Criterion [Difference (µg/m^3) / Criterion (µg/m^3)]		11.2%	16.1%

A slightly longer quote of the document referenced in AZO[10] says *On average across all sites, $PM_{2.5}$ accounted for 49 % of the PM_{10}, and PM_{10} accounted for 44 % of the TSP. However, there was considerable variability among sites, with the mean $PM_{2.5}$ to PM_{10} ratio ranging from 0.36 to 0.65. This ratio varied substantially from measurement to measurement, but at most sites a majority (>50 %) of the ratios were within ± 10 % of the median value.*

The values presented appear to agree with all the above statements.

Comment 29 (RSP Table 2) – Background O3 and NO2

AQA, Section 6.4, paragraph 10 & 11 (p. 25 of 80): *Background O_3 concentrations were obtained from the MOE monitoring station in Guelph. A 5-year average of the annual 90th percentile hourly and daily concentrations was adopted.*

NO_2 concentrations were not measured at the Guelph station prior to 2010, so data from the MOE monitoring station in Kitchener were used for the years prior to 2010. NO_2 levels in Kitchener in 2010 were similar to but slightly higher than in Guelph, and therefore it is expected that using NO_2 data from Kitchener will be conservative, and is therefore appropriate. The MOE does not provide 90th percentile values of the 24-hour average concentrations, therefore, as a conservative simplification, the 90th percentile 1-hour average concentration was used as the 24-hour value.

AZO (p.17 of 25), paragraph 3: *Values derived for ozone and NO2 should be checked at some point in the future.*

RSP, Comment 29: *This was conducted by the Township's peer reviewer and no concerns were raised. No further action required.*

Burnside verified that the values in AQA, Table 6.4 (page 37 of 80) corresponded to the values in the appropriate MOE reference.

Comment 33 (RSP Table 2) – RJ Burnside Review Was Inadequate

AZO (p.18 of 25), paragraph 8: *I do not understand what is meant by "although the documentation took some time to interpret." RJB's focus on an MOE ECA application would seem to ignore the more fundamental study on cumulative impacts. Given these two issues it would be of interest to enquire as to the expertise and experience of the RJB reviewers.*

RSP, Comment 33: *Dr. DiGiovanni has questioned the credentials of the Township peer reviewer, which is a serious allegation without providing any sound substantiation.*

The author to this report is Harvey Walter Watson. I am a Professional Engineer (P.Eng.) registered in the Province of Ontario (number 90401571). I am the Technical Group Leader of the Air and Noise Group at R.J. Burnside & Associates Limited (Burnside). I have been employed at Burnside as a professional Engineer in this role since 2012 and in a similar position at DJA Environmental Consultants Inc. starting in 2002. I have an Honours Bachelors of Applied Science degree (B.A.Sc.) in Chemical Engineering, with a minor in English and a specialization in Environment, 1991.

[10] "Journal of Air & Waste Management - Issue 47_1 (1997) pages 2-17.

I have been actively engaged in the environmental field for over 20 years. I have been preparing Environmental Compliance Approval (ECA) Applications full time since 2003. In that time I have written and submitted to the Ministry of the Environment (MOE) more than 100 Applications all of which have been approved and I continue to prepare ECA Applications. I am a member of the Air Practitioners Group in Ontario which brings issues to the MOE of concern to the regulated community. I am a past member of the AWMA's Best Practises Committee which prepared guidance to the entire province on the best practises used for the submission of ECA Applications to the MOE. Prior to that, I spent 8 years writing software that companies used to monitor their environmental programs and subsequently assisting companies to configure that software to match their real world situation.

Yours truly,

R.J. Burnside & Associates Limited

Harvey Watson, P.Eng.
Technical Group Leader, Air and Noise
HW:sj

Don McNalty, P.Eng.
Vice President, Public Sector

Enclosure(s) Appendix A - 032475 Hidden Quarry Assess ESDM Report.pdf

cc: Elizabeth Howson, Macaulay Shiromi Howson Ltd (enc.) (Via: Email – howson@mshplanning.ca)

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