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To: Neil Hannington, Issues and Project Coordinator

From: Amanda Graham, Air Quality Analyst

Subject: Meridian Brick Canada Ltd.
Air Quality Assessment Report, December 19, 2017; and
Report for a Short Term Predictive Ambient Air Quality Monitoring Program performed at the Aldershot Centre Quarry – October 2017, November 24, 2017

Technical Support Section has completed a review of the Air Quality Assessment and Short Term Predictive Ambient Air Quality Monitoring Program prepared by Pinchin Ltd. for Meridian Brick Canada Ltd. For your consideration, below are general comments on the reports followed by a detailed technical review. Based on the information provided, potential off-site impacts from the quarry operations cannot be determined at this time.

The Air Quality Assessment Report does not show any exceedances of the model predicted maximum concentrations when compared against O.Reg. 419/05 air quality standards. However, based on the information provided, a complete review of the results could not be completed at this time.

The report also compared the sum of the model predicted maximum concentrations and existing background concentrations (cumulative concentrations) against the Ambient Air Quality Criteria (AAQC). This assessment resulted in the maximum PM_{10} and crystalline silica cumulative concentrations being above the 24 hour AAQCs for each modelled scenario. However, the methodology used to calculate background particulate concentrations resulted in an overestimation of these concentrations. Please also note that the AAQCs are desirable concentrations of a contaminant in air, not regulatory standards.

The intent of the short-term ambient monitoring program was to estimate potential downwind impacts from the quarry. However, this type of assessment typically requires a long-term monitoring program that captures both seasonal and process variability. The short-term monitoring program captured only one day where wind direction was consistent throughout the sampling period, resulting in clear downwind samples. The only sample that showed a detectable concentration of crystalline silica was reported on this day.

Based on the monitoring station locations and the short-term nature of the monitoring program, the results have not adequately assessed potential downwind impacts of the quarry operations. A long-term monitoring program done in consultation with the ministry and following the ministry's guidelines should be considered to assess off-site impacts from the quarry.

Air Quality Assessment Report – Technical Comments

The Air Quality Assessment Report was completed on a voluntary basis and therefore was not reviewed against any specific ministry guidelines. In order for the ministry to undertake a complete review of the modelling results and the subsequent cumulative concentrations for comparison against the ministry's standard expectations, at a minimum, the following changes should be made to the current report:

1. The report should include the AERMOD output maximum concentration contour plots that illustrate the receptor grid, discrete receptors and isopleth contours for each contaminant of concern, averaging time and scenario modelled.

2. The background PM and PM_{10} concentrations calculated from $PM_{2.5}$ monitoring data were estimated using the US-EPA AP-42 method for Generalized Particle Size Distributions for Combustion-Mixed Fuels. Typically, for determining ambient rather than combustion sources of particulates, the ratios $PM_{2.5}/PM_{10}=0.54$ and $PM_{2.5}/PM=0.3$ are used (Lall et al., 2004).

   In addition, while the US-EPA AP-42 method of calculating PM was done correctly, the calculations for determining PM_{10} were not. Table 6.6 reports concentrations of PM_{10} that are greater than PM for all averaging times.

   If PM_{10} concentrations were recalculated correctly using the US-EPA AP-42 method, the resulting PM_{10} and silica concentrations would be lower than what are currently presented in the report.

   If the background particulate concentrations were to be recalculated using the preferred Lall et al. ratios, the resulting PM concentrations would be higher than what is currently presented in the report using the US-EPA AP-42 method. The resulting PM_{10} and silica concentrations would be very similar to the correct application of the US-EPA AP-42 method and therefore lower than what is currently presented in the report.

   Assuming the model predicted maximum concentrations are correct, the number of cumulative concentrations that are elevated above the AAQCs would change if the US-EPA AP-42 method were to be applied correctly to the background $PM_{2.5}$ concentrations. In this case, the 1-5 year scenario would show both silica and PM_{10} cumulative concentrations above the 24 hr AAQCs, and only the silica cumulative concentration would be above the 24 hr AAQC during the 6-15 year scenario. The 16-25 year scenario would not show any cumulative concentrations above the AAQCs. Currently, all crystalline silica and PM_{10} cumulative concentrations are elevated above the corresponding 24 hour AAQCs for each modelling scenario.

   If the Lall et al. ratios were to be applied to the background $PM_{2.5}$ concentrations, the same number of PM_{10} and silica cumulative concentrations would be above the 24 hr AAQCs as the correctly applied US-EPA AP-42 scenario. However, the 1-5 year scenario would also show the PM cumulative concentration to be above the 24 hour AAQC.

   Please note that the AAQCs are desirable concentrations of a contaminant in air, not regulatory standards. They are based on protection against adverse effect on health or the environment. The effects considered may be health, odour, vegetation, soiling,

visibility, corrosion or other effects. While the AAQC for silica is based on health, the AAQC for PM is based on visibility.

The report should be revised to either correctly apply the US-EPA AP-42 method if justification for using that method over the Lall et al. ratios can be provided, or apply the Lall et al. ratios to the background $PM_{2.5}$ data.

3. Tables A4a and A4b should indicate the location of the maximum predicted concentration and whether or not it is at or near one of the discrete sensitive receptors.

4. Section 4.1 of the report should clarify what months are considered to be "winter" and explain why the average weight of the haul trucks, as opposed to the maximum weight, was selected to characterize the "worst case operating conditions". This section should also clarify if the estimated pile size used to characterize the "worst case operating conditions" is the maximum potential pile size.

5. The report should clarify from which meteorological station data was used.

6. The report should be revised to compare $PM_{2.5}$ cumulative concentrations against the more stringent Canadian Ambient Air Quality Standards (CAAQS) rather than the AAQCs. It does not appear that any $PM_{2.5}$ cumulative concentrations would be above the CAAQS.

The following additional information is also required to complete a review of the Air Quality Assessment Report:

1. The AERMOD modelling input and output files should be provided for review. Please note that the MOECC will be posting an Information Notice on the Environmental Registry in April, 2018 to replace the current regulatory version of AERMOD.

2. Additional information is required to further explain the emission estimating techniques mentioned in Table A3.

3. Additional documentation is required to support the selection of an 80% control efficiency applied for water suppression and the natural high water content of shale used to characterize the "worst case operating conditions".

4. The MSDS should be submitted for review.

<u>Ambient Air Quality Monitoring – Technical Comments</u>

1. The ministry's *Operations Manual for Air Quality Monitoring in Ontario* (2018) recommends that samplers be situated at least 20 metres from trees. It also requires unrestricted air flow around the sampler through an arc of at least 270 degrees. It is unclear whether Stations 2 and 3 meet these criteria, but it appears from Figure 1.2.3 that Station 1 does not. The interference of trees around these stations, which were intended to capture quarry emissions, may have contributed to the resulting particulate concentrations that were similar to or less than the nearby Burlington AQHI station, and crystalline silica concentrations that were mostly below detection.

   It is also unclear why Stations 2 and 3 were positioned close together and in the area East of the quarry. It is preferred to have as many of the cardinal wind directions captured by a monitor as possible to increase the opportunity to both capture downwind

concentrations regardless of wind direction during sampling and to capture simultaneous upwind and downwind conditions.

2. Station 1, which is situated in a clearing that is bound by vegetation to the West, North and East, is influenced by localized wind tunnelling. This is shown in the Station 1 wind roses, which show northwest winds that are not detected by nearby meteorological stations. The Station 1 wind roses also show lower wind speeds compared to nearby stations.

   Onsite meteorological data should not be used for data analysis. It is recommended to use both the Environment Canada Hamilton RBG CS station and the local meteorological tower at Meridian Brick's Burlington Quarry.

3. The Operations Manual further states that particulate monitors should not be located on unpaved surfaces. From the Google Earth images provided it appears that all three stations were located on unpaved ground. Therefore, the results meant to capture downwind impacts from quarry operations are also representative of unpaved ground and nearby unpaved roads.

4. Section 4.5 states that Station 1 was likely the predominant downwind station during the daytime periods. However, winds originated from a southerly direction for only 3.5 hours on October 6th and 1 hour on October 17th are not "predominant" daytime conditions. Furthermore, a 24 hour particulate sample should be compared with 24 hour meteorological conditions, particularly since fugitive emissions from piles are a 24 hour source of particulate emissions.

   Using the Burlington Quarry and Hamilton meteorological stations, on October 3rd winds originated from the North/Northwest, the Southwest and the Southeast quadrants. Therefore, none of the stations were only upwind or only downwind of quarry operations during the sampling period.

   Conditions on October 6th were similar to those on October 3rd, where winds originated from the Northwest, Southeast and Southwest throughout the day. PM_{10} concentrations were similar between the three stations and $PM_{2.5}$ concentrations were lower at Stations 1 and 2 but similar to those at Station 3. Crystalline silica was not detected.

   October 17th was the only sampling day where winds did not experience significant shifts in direction. During the sampling period, winds originated from the Southwest quadrant, resulting in Stations 2 and 3 being downwind of the quarry. On this day particulate concentrations were similar to or lower than those observed on October 6th. However, this was the only day where results showed a detectable concentration of crystalline silica (quartz). Although Station 1 was upwind of the quarry, it was also likely influenced by the nearby trees and therefore only representative of local particulate concentrations. Since there wasn't a monitoring station to the West of the quarry, there were not any unencumbered upwind concentrations to compare against the downwind results.

   On October 20th wind directions were similar to those on October 3rd and 6th with no clear station representing only upwind or downwind conditions. Particulate results at Station 2 were also invalid. PM_{10} concentrations were higher at Stations 1 and 2 compared to October 6th and 17th while $PM_{2.5}$ concentrations were similar to previous sampling days. Crystalline silica was not detected.

5. Section 3.3 indicates that the $PM_{2.5}$ monitor at Station 2 did not appear to have run during the sample period. It also states that the PM_{10} monitor door was open when the sampler was set up and that the filter holder assembly was open when samples were collected. These samples are considered to be invalid, as indicated in Table 4.3. Results from these samples should not be included in the assessment.

6. Please note that the Canadian Ambient Air Quality Standards have replaced the Canada Wide Standards for $PM_{2.5}$ and should be used for comparison against sampling results.

7. For clarity, the wind rose legends should include the time as well as date. For example, the wind rose for the October 3rd sampling day is currently titled October 3rd-4th, when the sampling period was only on October 3rd from midnight to midnight. It is also difficult to distinguish wind speeds between 0.5 and 1 km/hr compared to 1-5 km/hr as these bins are both blue in the wind roses provided.

If there are any questions or concerns regarding the above comments, please feel free to contact Amanda Graham at 416-326-5745 or amanda.graham@ontario.ca

References

Lall, R., Kendall, M., Ito, K., Thurston, G., 2004. Estimation of historical annual PM2.5 exposures for health effects assessment. *Atmospheric Environment* 38(2004) 5217-5226.

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