

# “Peer Review Addendum” in Response to the NOH Applicant Written Response (revised 1 October, 2012) to the Peer Review – revised 2 October, 2012

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2 October, 2012

Review conducted by:

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## **Introduction**

A peer review of an Application for s.5 Approval under the Oakville Health Protection Air Quality Bylaw 2010-035 submitted by the New Oakville Hospital (NOH) was undertaken. The finding of the review was that further justification was required to confirm results for FPM (PM<sub>2.5</sub>). Therefore, the applicant provided a response to address items indicated in the peer review report. The responses were reviewed and the conclusions are outlined below.

## **Summary of Conclusions of the Peer Review**

The evaluation for the response of each item is provided in Appendix 1 and 2 and is consistent with the comments provided in the Peer Review Report.

After a review of the responses the following items remain to be addressed.

1. A number of the issues raised in the peer review, such as those relating to the variability of average and worst-case scenarios, could not be provided by the applicant since the NOH is not operational and the information is unavailable at this time. The provision of this information, when it is available, should be a condition of the approval and the additional information may trigger some re-assessment.
2. Application Item 3.4(iii): The letter provided does not clearly demonstrate the applicability for the use of a 125% factor for maximal emissions, in this assessment. Confirmation of this factor should be included as a condition in the permit and should be re-assessed when operations commence.
3. Application Item 3.5(i): No Evaluation of Lab Fume Hood Exhausts: The applicant should verify that toluene and xylene will not be emitted through the laboratory fume hoods. Provision of information on toluene and xylene usage in the fume hood should be a condition of the approval and the additional information may trigger some re-assessment.
4. Application Item 3.7: The applicant used a nominal emission rate rather than a “do-not exceed” emission rate provided by the manufacturer for calculation of diesel generator emissions. Since the emission rates used in the analysis are lower than the guaranteed emission rates, use of the guaranteed rates in the analysis should be a condition of the permit or equipment should be confirmed to conform to the actual emission rates used in the modelling analysis.

5. Application Item 4.2.1(i): The applicant has completed a self-contamination study. After a review, and sensitivity assessment, Airzone concluded that the proposed facility's emissions will not cause a significant health effect at sensitive receptors on the hospital building.

All other responses to the comments in the Peer Review Report are satisfactory and require no further review.

## Appendix 1 Responses to Provision of Application Material by the Applicant

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### 1. Application Item 3.4 - Raw materials, Products and Processes

(vi) Provide the relationship between the average and maximum process rate(s) and operating conditions/hours of operation;

Some information provided in ss.2.4-2.7.5 of the Application report.

**Applicant Response:** It is assumed that the Peer Review is referring to the natural gas usage at the NOH. The NOH is not operational and there is no further information available at this time. Detailed operational data may be made available once the NOH is fully functional.

**Peer Review Response:** Since this information is not available, the provision of this information when it is available should be a condition of the approval and may trigger some re-assessment.

(vii) Provide information on the variability of production rates around the average;

No information was provided on variability of fuel consumption rates around the average.

**Applicant Response:** See Letter provided by Carillion Canada Provided in Attachment 1.

**Peer Review Response:** Since this information is not available, the provision of this information when it is available should be a condition of the approval and may trigger some re-assessment.

### 2. Application Item 3.5 - Emission Sources and Processes

(iii) Include a table with the identification/ID code, SCC codes and the annual average and maximum emissions of health-risk air pollutants for each source.

Provided (Table 4) – SCC codes not included.

**Applicant Response:** SCC codes are provided.

**Peer Review Response:** The applicant has provided this information.

### 3. Application Item 4.2.1 - Facility Emissions Estimate Requirements/Estimation Methods (same as ESDM)

(i) average and worst-case annual emission rates,

Provided (as above) for CALPUFF modelling but worst-case annual emission rates were not used in the same structure modelling analysis.

**Applicant Response:** An evaluation of same structure contamination was carried out using the worst case emissions and the results and CALMET data analysis are provided in Attachment 2. See Section 1, Response 5 for a summary table of the results

**Peer Review Response:** The applicant has provided same structure contamination analysis using worst-case emissions.

(ii) frequency with which emissions within 90% of the worst-case emissions levels may occur (as per s.3.2.1.2)

Not provided.

(iii) variability around the average emission rates

Not provided (as above.)

**Applicant Response:** No further information is available at this time. Detailed operational data may be made available once the NOH is fully functional

**Peer Review Response:** Since this information is not available, providing it at the earliest possible time should be a condition of an approval.

#### **4. Application Item 4.2.2 - Meteorological Data Background Concentrations (ozone, NH<sub>3</sub>, FPM), Chemistry Model(s) Used Species Modelled, Grids, Special Receptors Identified**

Deviations from defaults must be fully explained.

Deviations from TDIs – Applicant used the non-default value for the MSPLIT variable (set to 1) which deviates from the Town's (and US EPA's) default value of 0. See detailed review for discussion.

**Applicant Response:** The CALPUFF modelling has been revised with the MSPLIT variable set to the default value of "0". Electronic copies of the relevant CALPUFF input and output files will be provided separately.

**Peer Review Response:** The applicant has used the default value of "0" for the MSPLIT variable in the revised modelling assessment.

#### **5. Application Item 5. - Mapping**

Model numerical outputs must be provided in the form of Summary Values tables as described earlier.

Summary Values Table was provided as Table 11. The table did not include the higher impact values found in the same-structure contamination study. Please update the Table.

**Applicant Response:** An updated Table 11 is provided below which includes the same-structure contamination. The maximum cumulative concentration for same-structure contamination was calculated using the sum of the average background FPM concentrations and the facility-induced concentration. The average background value was calculated from the background data provided by the Town of Oakville. The maximum background value was calculated using the maximum annual average of the data provided by the Town of Oakville.

**Peer Review Response:** The applicant has provided an updated table that uses the worst-case year of the five year data set.

- a) Model numerical outputs must be provided in the form of Summary Values tables as described earlier.

Mapping of model output was not provided as it was indicated that impacts were below the Town's  $0.2 \mu\text{g m}^{-3}$  (annual) threshold value.

**Applicant Response:** Contour maps for each emission scenario were provided in the original HPAQB application package. Updated contour plots are provided in Attachment 3.

**Peer Review Response:** The contour maps have now been provided by the applicant.

## **6. Application Item 6. - Health Risk Assessment**

After responding to all questions and verifications requested in this review the requirement for a health risk assessment should be re-evaluated.

**Applicant Response:** Based on revised modelling results, the NOH facility does not significantly affect the existing airshed in Oakville or on site sensitive receptors as the facility-induced FPM concentrations are than  $0.2$  micrograms per cubic metre annually, a criterion defined by the Oakville Health Protection Air Quality By-Law. As a result, a health risk assessment is not required.

**Peer Review Response:** Based on results using version 6.262 of CALPUFF (agreed usage by Town staff for this application) and a review and sensitivity analyses for same-structure contamination, we can conclude that estimated impacts will not exceed those indicating a significant public health effect.

## Appendix 2: Responses to Detailed Technical Critique of Application for Approval

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### 1. Application Item 3.3: Issue of Alteration of Building Shape:

The Applicant did not use the full hospital building shape for dispersion modelling purposes but rather a highly simplified version. Use of a “simplified” shape requires analysis for the effect that the simplification had on the dispersion modelling results (e.g., a sensitivity analysis). The Applicant is requested to provide this.

**Applicant Response:** Building wake effect is never accurate since all the downwash models are built on a simple set of building configurations as developed in wind tunnel experiments. Using a more complex building configuration does not necessary result in improved accuracy, nor does generating a more conservative concentration mean a model is more accurate.

Referring to Figure 4 of the report, the heights of the other structures and tiers (i.e., Block A is 24.9 m, Block C is 19.8 m, Block P is 17.9 m) are lower than the heights of the primary structures (Buildings 1, 2 and 3). BPIP files demonstrating no difference between using the simplified shape and more complex shape are provided in Attachment 4.

**Peer Review Response:** The use of simplified building shape does not demonstrate a difference and is acceptable.

### 2. Application Item 3.4(iii): Issue of Maximal Annual Gas Consumption:

The Applicant indicated that maximal annual gas consumption would be 125% of the average value based on an analysis by Enermodal Engineering. However, a description of that analysis, provided in Appendix D of the Application, does not explicitly mention this 125% factor. I recommend that verification of this factor be a condition of the permit to be issued.

**Applicant Response:** See letter provided by Carillion Canada provided in Attachment 1.

**Peer Review Response:** The letter provided that this factor is an industry standard but does not provide any reference to show the use of this factor. This factor should be included as a condition in the permit and should be re-assessed when operations commence.

### 3. Application Item 3.4(iv): No Information Provided on Variability of Fuel Consumption:

No information was provided on the possible variability of fuel consumption (especially natural gas) around the average. The Applicant is requested to provide this information so as to provide perspective on the average emission rates, and therefore average impacts estimated.

**Applicant Response:** See letter provided by Carillion Canada provided in Attachment 1.

**Peer Review Response:** Providing this information, when it becomes available, should be a condition of the approval and further assessment may be required.

#### **4. Application Item 3.5(i): No Evaluation of Lab Fume Hood Exhausts:**

The Applicant indicated that no emissions of FPM or precursors were expected from the hospital lab fume hoods. While it is reasonable not to have information at this stage, I recommend that a re-evaluation of these emissions be conducted, as a Condition of Approval, when the hospital is fully operating.

**Applicant Response:** The laboratory fume hoods will be used to exhaust vapour from the evaporation of chemicals and liquids on heaters which would not be of any significance to the FPM or its precursors. No further work is required.

**Peer Review Response:** There is a requirement to model toluene and xylene as precursors to FPM. The applicant should also verify that toluene and xylene will not be emitted through the laboratory fume hoods. Information to be provided should be a condition of the approval; the additional information may trigger some re-assessment.

#### **5. Application Item 3.7(iii): Emission Rates Calculated:**

1. The Applicant indicated that the emissions from the diesel-fired generators should be based on the lower ("nominal") of the range of data provided by the manufacturer (in Appendix B of the Application report). This was justified based on the maintenance level expected for the generators; however, the manufacturer information provided does not mention maintenance level as a factor for the range of emission data provided. Please provide further justification/explanation.

**Applicant Response:** The nominal emissions profile for the diesel engines were used for the modelling assessment as these are representative of a "nominal" engine as per the Caterpillar Application and Installation Guide in Appendix B of the report. The NOH emergency generators will be maintained according to Standard Operating Procedures which will be documented and available for review by 3<sup>rd</sup> parties such as the Ontario Ministry of the Environment. In addition, these diesel generators are considered as critical systems that must be operational if a power outage occurs and thus must be kept at optimum working order.

**Peer Review Response:** The Caterpillar user guide does not mention maintenance levels as a determinant of "nominal" emissions. Nominal emissions are defined as the expected emissions but are not guaranteed by the manufacturer. The "not to exceed" values are guaranteed. If the applicant prefers to use the "nominal" rather than the "not to exceed" emission rate, verification of this emission rate should be a condition in the permit.

2. In Appendix C of the Application report the diesel generator's sulphur dioxide emissions are calculated based on an assumed 30% operating load and fuel input rate. However, examination of the manufacturer data indicates that the diesel fuel consumption rate at 30% operating load is 66 gallons per hour. This has an equivalent fuel weight usage of 469 pounds/hour or 9,043,980 BTU/hr energy equivalent. This is almost three times as much as the energy equivalent value used by the Applicant and would result in emissions almost three times as much. The calculations need to be explained or revisited. If, as a result of any recalculations prompted by this review, annual emissions for pre-cursor compounds are found to be above major emitter limits, then it is mandatory that they be included in the impact analysis.

**Applicant Response:** Emergency diesel generator emissions using the US EPA emission factors have been revised using the manufacturer's fuel consumption rating and are provided in Attachment 5. Updated emission summary tables are also provided in Attachment 5.

**Peer Review Response:** The applicant has updated the calculations and provided updated tables to reflect these changes. These updated values have also been used in the updated modelling files provided with the response.

3. For directly emitted particulate matter (PM) from the hospital's gas-fired boilers, the Applicant used the US EPA emission factor of 7.6 pounds of PM emitted per million cubic feet of gas burnt. However, the manufacturer data provided in Appendix B of the Application report indicates an emission rate of 0.01 pounds of PM emitted per million BTU of gas burnt; this is equivalent to 10.2 pounds per million of cubic feet of gas, a value 1.3 times higher than used by the Applicant. Further clarification of this is required.

**Applicant Response:** Boiler emissions have been revised to use the manufacturer's data where possible and are provided in Attachment 5. Updated emission summary tables are also provided in Attachment 5.

**Peer Review Response:** The applicant has updated the calculations and provided updated tables to reflect these changes. The applicant has included these values in revised modeling and same structure.

**6. Application Item 4.2.1(i): Same Structure Contamination Analysis Did Not Use Worst-Case Emissions (as required) to Predict Worst-Case Impacts:**

This is required by the Town in order to provide Council with information on the upper limit of FPM impacts at receptors on the hospital.

**Applicant Response:** Same structure contamination or self-contaminant is estimated using building wake effect concentrations developed from wind tunnel measurements. They represent short-term episodic concentrations (i.e. 1-hr averages) that must be extrapolated to annual averages. In Golder's professional opinion, using worst-case emissions with a short-term

episodic hourly result to extrapolate to an annual average is an extreme extrapolation of results and may not accurately represent real world conditions.

However, to meet the requirements of the HPAQB, an evaluation of the same structure contamination was carried out using the worst case emissions and the results are provided in Attachment 2. The results of the same-structure contamination assessment demonstrate that sensitive receptor concentrations of FPM do not exceed the 0.2 ug/m<sup>3</sup> annual limit.

**Peer Review Response:**

After a review, and sensitivity assessment, Airzone concluded that the proposed facility's emissions will not cause a significant health effect at sensitive receptors on the hospital building.

**7. Application Item 4.2.1(ii): No Estimate Provided of Frequency of Worst-Case Emissions:**

This is required by the Town in order to provide Council with information on the frequency with which worst-case impacts can occur.

**Applicant Response:** Worst-case emissions are based on the operations of the natural-gas fired boilers (steam and hot water) at the hospital. The equipment has not been procured and since the hospital is not yet in operation, the demand on the equipment is not available to estimate the frequency of worst-case emissions. It is expected that worst-case emissions would occur during the winter season when steam and hot water requirements may be greater.

**Peer Review Response:** Since this information is not available, the provision of this information when it is available should be a condition of the approval and may trigger some re-assessment.

**8. Application Item 4.2.2: Did Not Use Town-Approved Dispersion Model**

The Applicant used a variant of the Town-approved dispersion model CALPUFF. The CALPUFF dispersion model is a United States Environmental Protection Agency (US EPA)-approved airborne pollutant dispersion model. The Town has adopted, as default, the US EPA-approved version (v.5.8). However, the Applicant used an alternate version (v.6.263) because of problems they encountered using the approved version. Information is requested on attempts to modify their modelling scenario in order to use the approved version.

**Applicant Response:** An error message (already supplied with the revised report) was encountered when first using V5.8. Proof of this error was also provided with the revised report. No attempts were made to modify the modelling scenario as changes to source parameters would not accurately represent the facility. Therefore, the alternate version (V6.263), in which the error has been corrected, was used for all modelling runs. It is in our opinion that adjusting the inputs to fit the model does not suggest improved results but leads to other inaccuracies.

**Peer Review:** The applicant only provided a printout of the error message received when attempting to use v5.8, but did not provide the modelling files for verification. Town staff have approved use of this model.

**9. Application Item 4.2.2: Did Not Use Town-Approved Model Input Value (for variable MSPLIT):**

In the dispersion modelling the variable MSPLIT controls the behaviour of the emitted pollutant cloud. The Town has adopted the US EPA default value of "0" for this variable. However, the Applicant used an alternate value ("1") on the basis that the default value caused a problem with their model calculations.

We attempted to reproduce this problem by running The Applicant's input files with MSPLIT set back to the Town default of "0." The model used by the Applicant and supplied to us (v.6.263) did not function; however, the Applicant also supplied a slightly earlier version of the model (v.6.262) which did work. When running the supplied input files through v.6.262, and MSPLIT set back to the Town default of "0," we encountered no problems and so were not able to reproduce the problem.

**Applicant Response:** The CALPUFF modelling has been revised with the MSPLIT variable set to the default value of "0". We believe the problem with MSPLIT can be attributed to using CALPUFF on a different compiler as well as using a Linux version of the model. Electronic copies of the relevant CALPUFF input and output files will be provided separately.

**Peer Review Response:** The applicant has used the default value of "0" for the MSPLIT variable.

**10. Application Item 4.2.2: Same-Structure Analysis Did Not Reference an Averaging Period Conversion Factor Appropriate to Same-Structure Contamination:**

The Applicant used a conversion factor to convert hourly average concentrations to annualized concentrations. However, they used a conversion factor that may not be applicable to pollutant dispersion over a building structure; the applicant should review guidance provided by the American Society of Heating, Refrigeration and Air-Conditioning Engineers. This same guidance is recommended by the MOE in their Air Dispersion Guideline for Ontario (March 2009) for same-structure contamination.

**Applicant Response:** As suggested in the above, the modelling of self-contamination is complex and Golder relied on wind tunnel results to generate hourly concentrations. The use of the conversion factor is acceptable as this method is used to calculate the annual average in the US EPA SCREEN3 model (see attachment 6).

**Peer Review Response:** The conversion factor used by applicant is the same value as the one provided in the MOE guidance as stated above which is acceptable to use in this assessment.

**11. Application Item 4.2.2: Same-Structure Analysis Did Not Demonstrate Compliance with the Town FPM Threshold:**

The Applicant used a method where impacts at same-structure sensitive receptors were summed from all hospital emissions sources. However, using the example of Table 10 in the Application report, the sum of the impacts at the receptor "Entrances" equals  $0.269 \mu\text{g m}^{-3}$  which is higher than the Town threshold of 0.2. Instead, the sum is presented as 0.182; please provide an explanation.

**Applicant Response:** Updated tables for both the average and worst cases are provided below.

**Peer Review Response:** The analysis for same structure contamination was done using an adjustment with frequency of re-entrainment wind directions. See item 6 above.

**12. Application Item 5: Summary Value Table Incomplete:**

The Summary Value Table did not incorporate impact values from the same-structure contamination modelling. Please include these in the Summary Value Table

**Applicant Response:** An updated table is provided in Section 1, Response 5 of this document.

**Peer Review Response:** An updated table was provided with impact values from the same structure contamination included.