Proposed Milton Quarry East Extension
JART COMMENT SUMMARY TABLE – Air Quality

Please accept the following as feedback from the Milton Quarry Joint Agency Review Team (JART). Fully addressing each comment below will help expedite the potential for resolutions of the consolidated JART objections and individual agency objections. **Additional, new comments may be provided once a response has been prepared to the comments raised below and additional information provided**.

	JART Comments (October 2022)	Reference	Source of Comment	Applicant Response November 2022	JART Response
Report/Date: Air Quality Assessment November 16, 2021			**Author: RWDI**		
1.	**The AQ report's conclusion does not agree with the AQ reports tabulated model results.** The AQ report concludes that the proposed extension will not result in any adverse air quality impact to surrounding sensitive receptors, with appropriate mitigation measures in place. The report states that, for both scenarios, when background concentrations are added to the predicted impacts from operations at the proposed extension, "**the cumulative concentrations remain below the relevant criteria at all receptor locations**." However, examination of Tables 3 and 4 in the AQ report show that when background concentrations were added to modeled PM10 impacts, the resulting maximum predicted concentrations exceeded the criteria level at many of the sensitive receptors, including up to 184% of the relevant criteria for PM10, as many as 28 excursions above the criteria over 5 years, and were more than 80-90% of the criteria for PM2.5 at many of the receptors for both scenarios. Table 3 indicates that, for Scenario 1, the predicted 24-hour average PM10 concentration exceeded the AAQC criteria (50 µg/m3) at 14 of the 24 modeled receptor locations (maximum receptor: 79 µg/m3, which is 158% of the criteria concentration). Table 4 shows that, for Scenario 2, the predicted 24-hour average PM10 concentration exceeded the criteria (50 µg/m3) at 15 of the 24 modeled receptor locations (maximum receptor: 92 µg/m3, which is 184% of the criteria concentration). The proposed project, on its own (without background concentrations added), exceeded the relevant criteria for PM10 at two of the receptor locations for Scenario 1, and at three of the receptor locations for Scenario 2. It is therefore not at all evident, according to the AQ report summary, that the project would not have any adverse air quality impacts, despite the report's assertions.	General	Gray Sky Solutions	A clerical error occurred during the compilation of the final AODA-compliant version of the Air Quality Assessment. Incorrect versions of Tables 3 and 4 were provided. These versions reflected an unmitigated scenario. Updated versions of these tables were provided to Dr. Gray on September 30, 2022, which also reflected updates and refinements to the modelling assessment. This issue has been addressed.	
2.	**The air quality modeling results (predicted concentrations) that appear in the modeling files do not appear to agree with the results shown in the AQ report.** Modeling files were received for the two scenarios (archived files were labeled SC1.ZIP and SC2.ZIP). Within each archive (ZIP) file, there were folders for each modeled pollutant (PM, PM10, PM2.5, Silica, and NOX). Each pollutant folder contains an AERMOD input control file, the AERMOD executable program file, two 5-year (1996-2000) meteorological data files, an hourly (variable) emission file, a file containing receptor location information, and a number of AERMOD output files (containing the model results). The AERMOD input control file, hourly emission file, receptor data file, and the two meteorological data files are input to the AERMOD program upon execution. The list of modeled sources are identical between the Scenario 1 and Scenario 2 model input control files (with the exception of the HAUL9 source, which was not included in the Scenario 2 input control file), however a number of the modeled sources have zero emission rates within each scenario (and therefore could have been omitted from the input files with no difference in the results). Sources were	General	Gray Sky Solutions	As discussed with Dr Gray, the modelling files provided with the original assessment were developed through several iterations that unfortunately made the files difficult to follow. Revised model files were provided to Dr. Gray on September 30, 2022, that addressed these organizational issues, making them easier to follow. This issue has been addressed.	

modeled as either POINT sources or VOLUME sources within AERMOD, with all emission rates input in units of gram/second (g/s). Source modeling parameter data for point sources are base elevation, release height, stack exit temperature, stack exit velocity, and stack diameter. Volume source parameter data are base elevation, release height, and the initial lateral (horizontal) and vertical dimensions. A number of line sources were modeled as adjacent VOLUME sources, including dust and exhaust from haul load truck traffic (HAUL) and loader truck traffic (TLOAD). Tables 1 and 2, below, show the sources and modeled PM10 emission rates (g/s) for all sources that had non-zero emission rates for each scenario. The number of individual line source units that were modeled for each HAUL and TLOAD source is identified. Emission rates for sources that were modeled using a constant emission rate are shown in the "Constant" column. A number of sources were modeled using variable (hourly) emission rates, in which the hourly emission rates for every hour of the 5-year modeling period are specified in the hourly emissions input file. The 5-year average PM10 emission rates for these sources are shown under the "Variable" column in Tables 1 and 2. At the bottom of each table, the total of all modeled emissions (the sum of the constant emission rate sources and the average rate for the variable emission rate sources) is shown. The average modeled PM10 emission rate for all Scenario 1 sources is 8.83 g/s (**70.1 lb/hour**). The average modeled PM10 emission rate for all Scenario 2 sources is 3.45 g/s (**27.4 lb/hour**), which is 39% of the average Scenario 1 emissions rate.

Table 1. Modeled PM_{10} Emissions for Scenario 1 (g/s)

Source	Constant	Variable 5 -yr Average
BLAST	1.00000	
PCRSH1	0.04290	
PCRSH3	0.01250	
GCRSH2	0.01250	
CO6	0.00053	
CO7	0.00053	
CO8	0.00053	
SC1011	0.05140	
CCRSH2	0.00625	
LOAD1		0.03979
LOAD2		0.03979
EXC1		0.03979
CO9		0.20183
CO14		0.08215
PILE1		0.04196
PILE2		0.00847
PILE3		0.01579
PILE4		0.01579
PILE5		0.01579
PILE6		0.00847
PILE7		0.04196
LOAD4		0.02569
LOAD5		0.02572
LOAD6		0.02572
LOAD7		0.02572
LOAD8		0.02572
LOAD9		0.02572
LOAD10		0.02572
LOAD13		0.01267
PILE12		0.00192
PILE13		0.00192
PILE14		0.00192
LOAD15		0.01742
PILE11		0.01267
LOAD3		0.20183
VOL1	0.23600	
VOL2	0.16100	
HAUL1 (H1): 227 units	1.63000	
HAUL2 (H2): 300 units	1.59000	
HAUL3 (H3): 15 units	0.07310	
HAUL5 (L002): 64 units	0.07100	

Table 1, continued

TLOAD1 (TL1): 5 units	0.09050	
TLOAD2 (TL2): 5 units	0.09050	
TLOAD12 (TL12): 3 units	0.02360	
TLOAD3 (TL3): 3 units	0.02430	
TLOAD4 (TL4): 3 units	0.02430	
TLOAD5 (TL5): 3 units	0.02430	
TLOAD6 (TL6): 3 units	0.02430	
TLOAD7 (TL7): 3 units	0.02430	
TLOAD8 (TL8): 3 units	0.02430	
TLOAD9 (TL9): 3 units	0.02430	
VOL3		0.48148
VOL4		0.59614
HAUL6 (H6): 106 units	0.16200	
GEN3	0.03330	
GEN4	0.03330	
PILE15		0.02068
LOAD16		0.02068
PCRSH4	0.06000	
GCRSH3	0.02870	
CO15	0.00511	
SC1213	0.21100	
CO16	0.00511	
CO17	0.00511	
CO18	0.00511	
PILE16		0.00347
CCRSH4	0.03320	
PILE17		0.00347
PILE18		0.00347
LOAD17		0.04513
GEN5	0.04440	
GEN6	0.04440	
HAUL7 (H7): 206 units	0.47000	
TLOAD10 (TL10): 3 units	0.02850	
CCRSH5	0.01690	
HAUL 9 (L001): 66 units	0.22200	
SUM, CONSTANT	6.671	
SUM, VARIABLE (hourly)		2.156
ALL SOURCES	**8.828**	

Table 2. Modeled PM_{10} Emissions for Scenario 2 (g/s)

Source	Constant	Variable 5-yr Average
BLAST	1.00000	
PCRSH2	0.06000	
PCRSH3	0.01250	
GCRSH1	0.02870	
GCRSH2	0.01250	
CO1	0.00511	
CO2	0.00511	
CO3	0.00511	
CO4	0.00511	
CO5	0.00106	
CO6	0.00053	
CO7	0.00053	
CO8	0.00053	
SC89	0.21100	
SC1011	0.05140	
CCRSH1	0.03320	
CCRSH2	0.00625	
LOAD1		0.00733
LOAD2		0.00733
EXC1		0.00733
LOAD13		0.00826
LOAD11		0.02068
PILE12		0.00207
PILE13		0.00207
PILE14		0.00207
LOAD15		0.00812
PILE8		0.00347
PILE9		0.00347
PILE10		0.00347
LOAD12		0.02407
PILE11		0.00769
HAUL1 (H1): 219 units	0.22100	
HAUL3 (H3): 15 units	0.23900	
HAUL4 (H4): 61 units	0.33100	
HAUL5 (L0004): 36 units	0.03250	
TLOAD1 (TL1): 14 units	0.19200	
TLOAD2 (TL2): 13 units	0.18200	
TLOAD11 (TL11): 9 units	0.04980	
TLOAD12 (TL12): 7 units	0.03140	
HAUL6 (H6): 109 units	0.03650	
GEN1	0.04440	
GEN2	0.04440	
GEN3	0.03330	
GEN4	0.03330	
HAUL8 (L0005): 221 units	0.39300	
PILE19		0.02068
CCRSH3	0.01690	
SUM, CONSTANT	3.319	
SUM, VARIABLE (hourly)		0.128
ALL SOURCES	**3.447**	

AERMOD allows the user to generate different output source groupings (subsets of all the individual modeled sources), in which the modeled concentrations are summed. For example, source groups were created to sum the concentration impacts of all the individual VOLUME source units within each line source (HAUL1, HAUL2, etc.). Source groups were also created with the names **SC1** and **SC2** (in *both* Scenario 1 and Scenario 2 model runs), presumably to account for the impacts from sources for each scenario (however the modeled emission rates in each scenario were different, so the SC2 group in the Scenario 1 model run does not reflect the Scenario 2 model results, and likewise, the SC1 group in the Scenario 2 model run does not reflect the Scenario 1 model results).

There was also a source group within each of the two scenario model input files named **ALL**, which consists of the summed concentration of all modeled sources. For Scenario 1, the ALL source group did not include the background concentration (which is shown in Tables 2, 3, and 4 of the AQ report as **25 µg/m³** for the 24-hour average PM_{10} concentration). For Scenario 2, a background concentration of **1.0 µg/m³** was added to the ALL source group (but not to the SC2 source group), which does not account for the correct reported PM_{10} background level in the AQ report. The modeled sources in the **SC1** source group are the following:

BLAST	PCRSH1	VOL1	VOL2	VOL3	VOL4	PCRSH3	GCRSH2	CO5[1]
SC1011	CCRSH2	CO6	CO7	CO8	LOAD1	LOAD2	EXC1	CO9
LOAD3	CO14	PILE1	PILE2	PILE3	PILE4	PILE5	PILE6	PILE7
LOAD4	LOAD5	LOAD6	LOAD7	LOAD8	LOAD9	LOAD10	LOAD11[2]	LOAD13
PILE12	PILE13	PILE14	LOAD15	HAUL1	HAUL2	HAUL6	TLOAD1	TLOAD2
TLOAD3	TLOAD4	TLOAD5	TLOAD6	TLOAD7	TLOAD8	TLOAD9	HAUL5	GEN3
GEN4								

The modeled sources in the **SC2** source group are the following:

BLAST	PCRSH2	GCRSH1	CO1	SC89	CCRSH1	CO2	CO3	CO4
PCRSH3	GCRSH2	CO5	SC1011	CO6	CO7	CO8	LOAD1	LOAD2
EXC1	LOAD11	CCRSH2	PILE8	PILE9	PILE10	TLOAD12	PILE11	LOAD13
LOAD12	PILE12	PILE13	PILE14	LOAD15	HAUL3	HAUL4	HAUL5	HAUL6
TLOAD2	TLOAD11	GEN1	GEN2	GEN3	GEN4			

Upon examination of the source descriptions in the SC1 model input control file as well as the listing of the sources in Appendices A through E in the AQ report, it appears that the following sources (with non-zero PM_{10} emissions) are actually part of Scenario 1, but were left out of the SC1 source group in the model input control file:

LOAD16	PCRSH4	GCRSH3	CO15	SC1213	CO16	CO17	CO18	PILE16
CCRSH4	PILE17	PILE18	LOAD17	GEN5	GEN6	HAUL3	HAUL6	HAUL7
TLOAD12	TLOAD10	HAUL9	CCRSH5	PILE15				

[1] Source CO5 was included in source group SC1 but has zero emissions for Scenario 1.
[2] Source LOAD11 was included in source group SC1 but has zero emissions for Scenario 1.

The 23 omitted sources from source group SC1 account for 17.4% of the total PM_{10} emissions for all Scenario 1 modeled sources.

Similarly, the following sources (with non-zero PM_{10} emissions) appear to be part of Scenario 2, but appear to have been left out of the SC2 source group in the model input control file:

HAUL 1	HAUL 8	TLOA D1	CCR SH3	PILE 19				

The five omitted sources from source group SC2 account for 24.5% of the total PM_{10} emissions for all Scenario 2 modeled sources.
If all the 23 omitted sources for Scenario 1 and the 5 omitted source for Scenario 2 (as identified above) were included in the SC1 and SC2 source groups, respectively, the SC1 and SC2 source groups would exactly match the ALL source groups in the two scenario model runs (and therefore there would be no need to specify the SC1 and SC2 source groups).

The input control files also include a number of diurnal (hour of day) and seasonal profiles for many of the constant modeled sources, which allow the user to scale the emission rates using scale factors (typically between 0 and 1) to restrict or reduce emissions during certain hours of the day or during some of the months during the year. For example, emissions due to blasting at the workface (source: BLAST) have been completely turned off during night hours throughout the year, restricting emissions from those sources to between 7 am and 7 pm for both modeled scenarios. For source PCRSH2 and 19 other sources[3], emissions (for both scenarios) are restricted to between 7 am and 11 pm throughout the year. Under Scenario 1, for HAUL2 and 12 other sources (including all nine TLOAD3 to TLOAD11 sources, HAUL5, HAUL6, and HAUL8), emissions occur 24 hours per day, however emissions from these 13 sources during January, February, and December are scaled by 0.75. Under Scenario 2, for sources HAUL5, HAUL6, HAUL8, TLOAD11, and TLOAD12, emissions occur 24 hours per day, however monthly emission scaling factors vary from 0.25 (January) to 0.95 (August). For source GCRSH2 and 10 other sources[4] (for both scenarios), emissions do not occur at all during January, February, and December, and are restricted to between 7 am and 7 pm during the other 9 months of the year. Emissions from source HAUL1 are zero for all hours of the day during January, February, and December under Scenario 2, and are scaled by 0.75 between 7 am and 7 pm (and are zero between 7 pm and 7 am) during those three months. During the other nine months of the year, emissions from HAUL1 for both scenarios are restricted to between 7 am and 7 pm. All other modeled sources with constant emissions operate (and therefore have emissions) during all hours of the year.

Source parameters for all modeled sources are specified in the AERMOD input control file. These source parameters were tabulated in Appendix F of the AQ report. However, the Appendix F table is missing entries for the following sources: CCRSH3-5, GCRSH3, CO15-18, SC1213, PCRSH4, LOAD16-17, PILE16-19, and GEN5-6. Also, there are a number of sources listed in Appendix F as being emitted under only Scenario 1 or Scenario 2, but are actually emitted under both scenarios.
More importantly, a number of base elevations for Scenario 1 sources appear to have been entered incorrectly. The base elevations for the modeled sources range from 230 m to 342 m, which must be specified in the AERMOD input control file. The

[3] The 19 other source are: PCRSH4, CO1-4, CO15-18, SC89, SC1213, CCRSH1, CCRSH3-5, HAUL4, HAUL7, GCRSH1, and GCRSH3.
[4] The 10 other sources are: CO5-8, SC1011, CCRSH2, GEN3-4, TLOAD12, and HAUL3.

	initial pollutant release elevation within the AERMOD model's computation of concentration impacts is computed as the base (ground) elevation plus the release height (above the ground). For Scenario 1, the base elevations for all units of line sources HAUL1, HAUL2, HAUL5, HAUL7, and HAUL9[5] were specified as 0.0 m, which will cause the modeled concentrations at the receptors, which are located at elevations ranging from 229 m to 345 m, to be incorrectly computed.[6] Most importantly, the modeled concentrations that are in the model output files for the ALL source group or the SC1 source group (for the Scenario 1 model run) or the SC2 source group (for the Scenario 2 model run) **DO NOT AGREE** with the results shown in Tables 3 and 4 of the AQ report. For example, for Scenario 1, the model output file shows a maximum 24-hour average PM_{10} concentration (without background) of **21.74 µg/m^3** for the ALL source group. The AQ report (Table 3) shows a maximum 24-hour average PM_{10} concentration (at the residential receptor located at UTM: 584832, 4821596) of **54 µg/m^3** (without background). For Scenario 2, the model output file shows a maximum 24-hour average PM_{10} concentration of **20.42 µg/m^3** for the ALL source group (with background of 1 µg/m^3). The AQ report (Table 4) shows a maximum 24-hour average PM_{10} concentration (at the residential receptor located at UTM: 581594, 4821943) of **67 µg/m^3** (without background) and **92 µg/m^3** (with background). Similar observations (modeling file output concentrations not matching the AQ report values in Table 3 and 4) were also made for the other modeled pollutants.[7] For example, the Scenario 1 model output files show a maximum 1-hour average NO_2 concentration of **168.6 µg/m**, (without background), whereas the AQ report (Table 3) shows a maximum 1-hour average NO_2 concentration of **138 µg/m^3**. (both at the same receptor location). The maximum 24-hour NO_2 concentration of **49.2 µg/m^3** (without background) that appears in the modeling file output file matches the maximum 24-hour NO_2 concentration of 4**9 µg/m^3** in the AQ report (Table 3). The modeled maximum 1-hour NO_2 concentration was *higher* than the AQ report value, which is the opposite for the 24-hour averages for PM_{10} and $PM_{2.5}$.[8] If, in fact, the concentrations appearing in the model output files represent the correct model results for Scenarios 1 and 2, then Tables 3 and 4 of the AQ report need to be revised to reflect that fact (which would then support the conclusions stated earlier in the AQ report that the project would not have adverse air quality impacts). If, on the other hand, the model results shown in Tables 3 and 4 of the AQ report are correct, then the associated modeling files that correspond to these results need to be provided.				
3.	**Many of the emission factors used to develop estimates of emission rates may not, in fact, be appropriate for the sources at the Milton Quarry facility, and could lead to significant underprediction of the air quality impacts due to the quarry's activities.** Appendices A through E of the AQ report are emission spreadsheet tables which attempt to show the calculations of emission rates for the various operations at the quarry. For blasting operations, the number of blasts per hour and the blast surface	Appendices A - E	Gray Sky Solutions	Ontario Ministry of the Environment Conservation and Parks ("MECP") Guideline A10 and Ontario Regulation 419/05 (Local Air Quality) provide the framework for conducting air quality assessments in Ontario. The U.S. EPA emission factors used in the Air Quality Assessment are the <u>industry standard</u> in Ontario and are accepted by the MECP for air quality assessments conducted	

[5] Base elevations for HAUL8 sources were also specified as 0.0 m in the Scenario 1 model input control file, however the emissions for this source were zero.
[6] Comparisons between the ratio of modeled maximum 24-hour PM_{10} concentrations divided by the emission rates for sources HAUL1 and HAUL5 for Scenario 2 (modeled with base elevations ranging between 295 m and 342 m) versus Scenario 1 (modeled with base elevations = 0 m) show that the modeled concentration impacts for Scenario 2 (with appropriate elevations) were about **3 to 4 times higher** than the concentration impacts for Scenario 1 (with 0 m base elevations).
[7] The model input control files for PM (TSP), $PM_{2.5}$, NO_2, and silica are identical to the PM_{10} input file, with the exception of the emission rates.
[8] The model output files show a maximum 24-hour average $PM_{2.5}$ concentration of **4.5 µg/m^3**, (without background), whereas the AQ report (Table 3) shows a maximum 24-hour average $PM_{2.5}$ concentration of **10 µg/m^3** (at the same receptor location). The predicted maximum annual $PM_{2.5}$ concentration in the model output file (0.86 µg/m^3) agrees with the value in Table 3 of the AQ report (1 µg/m^3).

	area were combined to estimate the emission rate for each pollutant (TSP, PM10, PM2.5, and silica) using emission factors (kg/blast) from US EPA's AP-42. The data quality rating for the blasting emissions factors (from US EPA's AP-42) is C (Average). For Bulk Materials Handling (Appendix B) and Processing (Appendix C), emission rates were estimated for the various operations based on the processing rate (Mg/hour) and emission factors (kg/Mg) obtained from AP-42. The data quality ratings for material handling emission factors are all A (Excellent). The data quality ratings for processing emission factors are C (Average), D (Below Average), or E (Poor). Emission rates for Fugitive Dust from Mobile Equipment (Appendix D) and Combustion Exhaust from Mobile and Stationary Equipment (Appendix E) were estimated based on traffic volumes and vehicle emission factors (g/km) for mobile sources, and power usage (kW-hr) and emission factors (g/kW-hr) for stationary equipment. The data quality ratings for mobile source fugitive dust emission factors are B (Above Average) for PM10 and PM2.5, and C (Average) for TSP and Silica. Emission factors for mobile source exhaust were obtained from US EPA's MOVES model (no emission factor ratings are provided). PM10 emissions that were estimated using marginal emission factor ratings (C, D, or E) account for 1.89 g/s (21%) of the total modeled PM10 total 8.83 g/s) for Scenario 1, and 1.46 g/s (42%) of the total modeled PM10 (3.45 g/s) for Scenario 2. For most of the sources at the Milton quarry, RWDI relied on US EPA AP-42 emission factors, many of which have low data quality ratings, and some of which are not directly applicable to the source in question at the proposed facility. The AP-42 document clearly states that those emissions factors that are rated as marginal in quality (rated C, D, or E) should only be used as a last resort, if no local or site-specific data are available. It is highly recommended that source-specific emission factors should be sought, either from source testing at the facility, or from directly applicable source tests from similar nearby sources. The Milton quarry has been operating for a number of years, and site-specific source test data could have easily been obtained that would provide better emission factor estimates for materials processing operations than those from AP-42. Although there may not be are any better (textbook) or more recent data sources for some of these activities, many of the AP-42 emission factors were obtained from old sources (over 40 years old) and are only marginally related to the activities at the Milton quarry. Using such low quality emission factors will potentially result in significantly large uncertainties in the modeled air quality impacts. A range of potential emission levels (and exposures) should be developed based on lower and upper bound emissions factors (which generally exist in AP-42 and its supporting documents). A careful review of each of the emissions factors used in the RWDI analysis should be conducted to determine those emission factors that are not representative of actual emission levels at the Milton facility, and the potential errors (and possible underprediction) due to the use of the emission factors to estimate emission levels. Source testing of existing operations at the facility should also be conducted where applicable. Within the documentation (appendices) provided in AP-42 is important information regarding the sources of the data that were used to develop the emissions factors, including ranges of values that were obtained from source tests at various source locations. These data could be used to evaluate the potential range of emission factors that may be appropriate for the quarry and could therefore be used to develop an analysis of the uncertainty of the emissions factors and the resulting uncertainty of the modeling results (which may be considerable) that were obtained using the AP-42			under Ontario Regulation 419/05, as well as environmental assessments. I have been practicing air quality in Ontario for 21 years, and I have never had the MECP question the use of these factors. Furthermore, RWDI has conducted ambient air monitoring programs at several aggregate sites in Ontario. The results of these programs support the use of these factors. Regardless, to address Dr. Gray's comments, RWDI undertook an additional assessment where these emission factors were multiplied by a factor of 10 and showed that the predicted impacts of the proposed extension remain within acceptable levels. This is discussed further under Comment 11. No further action is required.	

	emissions factors. An uncertainty (sensitivity) analysis would provide a range of potential air quality concentration impacts, rather than a single estimate of the impacts.				
4.	**The emission appendices include a few notes (comments) with assumptions regarding the estimation of emission rates, but do not include the assumptions relied upon to determine activity levels.** Appendices A through E of the AQ report include a number of comments addressing issues such as the assumed silica and silt content, moisture content, hours of operation, and control efficiencies. However the report does not describe the assumptions that were made to determine the activity levels for each operation, how the activity levels were estimated, and whether the assumed activity levels represent worst case conditions. In addition, emissions from existing operations at the facility versus emissions from operations associated with the proposed extension (expansion) should be clearly identified. The dispersion modeling should include emissions from both existing and proposed operations, but it is not completely apparent (upon examination of the AQ report) whether this is the case.	Appendices A - E	Gray Sky Solutions	All activity levels reflect the maximum production rates provided by CRH. The air quality assessment includes emissions from both the existing quarry operations and the proposed extension. Scenario 1 considers the continued operation of the existing Main Plant, in addition to the proposed extension. Scenario 2 replaces the Main Plant with portable plants, in addition to the proposed extension. This is now easier to follow with the simplified modelling files. No further action is required.	
5.	The base elevations for five of the HAUL sources in SC1 (HAUL1, HAUL2, HAUL5, HAUL7, and HAUL9) were corrected. As expected, this change resulted in much higher modeled concentrations for SC1.		Gray Sky Solutions	Correct, these were updated, and the revised modelling provided to Dr. Gray on September 30, 2022. No further action required.	
6.	The list of sources modeled for Scenario1 and Scenario 2 are now identical, with differences only in the emission rates (sources that are not part of either SC1 or SC2 are given zero emission rates). In the original modeling files, a number of source parameters (other than the emission rates) were different between the two scenarios; most notably, for the four HAUL sources that have non-zero emissions in both scenarios (HAUL1, HAUL3, HAUL5, and HAUL6) and for the three loader traffic sources that have non-zero emissions in both scenarios (TLOAD1, TLOAD2, and TLOAD12), the specified locations of the sources were different (with a different number of road segments) in the original modeling. For the revised modeling, the number of road segments (units), the locations, and base elevations from the original SC1 modeling were used for both the revised SC1 and SC2 modeling for these seven sources. Also, the locations, number of road segments, and base elevations for HAUL8 in the SC2 modeling were changed between the original and revised modeling (HAUL8 has zero emissions in SC1 and is therefore not part of that scenario).		Gray Sky Solutions	Correct. The revised modelling files are now easier to follow and are better aligned organizationally with the emission tables in the Appendices. The revised modelling files were provided to Dr. Gray on September 30, 2022. No further action required.	
7.	The following tables show the PM10 emission rates (and number of road segments, or "units") for all sources with non-zero emissions in the original and revised SC1 and SC2 modeling. The values (number of units and emission rates) highlighted in red in the revised modeling tables are different than in the original modeling files (by more than just round-off differences): **Table 1. Modeled PM10 Emission Rates for Scenario 1 (g/s)** **Original Modeling** **Revised Modeling**		Gray Sky Solutions	It appears that Dr. Gray has switched the headings on these tables. The revised modelled emissions rates are actually on the left for both scenarios, while the original modelled emissions rates are on the right. With respect to the differences, the emission rates actually increased in the revised modelling. A small error was noted in the average vehicle weight. As a result, the emissions are now slightly more conservative than in the original assessment. This was not noted when the updated files were	

Source	Constant	Variable 5 -yr Average
BLAST	1.00000	
PCRSH1	0.04300	
PCRSH3	0.01300	
GCRSH2	0.01300	
CO6	0.00053	
CO7	0.00053	
CO8	0.00053	
SC1011	0.05100	
CCRSH2	0.00630	
LOAD1		0.03979
LOAD2		0.03979
EXC1		0.03979
CO9		0.20183
CO14		0.08215
PILE1		0.04196
PILE2		0.00847
PILE3		0.01579
PILE4		0.01579
PILE5		0.01579
PILE6		0.00847
PILE7		0.04196
LOAD4		0.02569
LOAD5		0.02572
LOAD6		0.02572
LOAD7		0.02572
LOAD8		0.02572
LOAD9		0.02572
LOAD10		0.02572
LOAD13		0.01267
PILE12		0.00192
PILE13		0.00192
PILE14		0.00192
LOAD15		0.01742
PILE11		0.01267
LOAD3		0.20183
VOL1	0.24000	
VOL2	0.16000	
HAUL1 (H1): 227 units	1.63440	
HAUL2 (H2): 300 units	1.80000	
HAUL3 (H3): 15 units	0.07350	
HAUL5 (L002): 64 units	0.08320	
TLOAD1 (TL1): 5 units	0.09000	
TLOAD2 (TL2): 5 units	0.09000	
TLOAD12 (TL12): 3 units	0.02370	
TLOAD3 (TL3): 3 units	0.02430	
TLOAD4 (TL4): 3 units	0.02430	
TLOAD5 (TL5): 3 units	0.02430	
TLOAD6 (TL6): 3 units	0.02430	
TLOAD7 (TL7): 3 units	0.02430	
TLOAD8 (TL8): 4 units	0.02440	
TLOAD9 (TL9): 3 units	0.02430	
VOL3		0.48148
VOL4		0.59614
HAUL6 (H6): 106 units	0.21200	
GEN3	0.03300	
GEN4	0.03300	
PILE15		0.02068
LOAD16		0.02068
PCRSH4	0.06000	
GCRSH3	0.02900	
CO15	0.00510	
SC1213	0.21000	
CO16	0.00510	
CO17	0.00510	
CO18	0.00510	
PILE16		0.00347
CCRSH4	0.03300	
PILE17		0.00347
PILE18		0.00347
LOAD17		0.04513
GEN5	0.04400	
GEN6	0.04400	
HAUL7 (H7): 206 units	0.47380	
TLOAD10 (TL10): 3 units	0.02850	
CCRSH5	0.01700	
HAUL 9 (L001): 66 units	0.25080	
SUM, CONSTANT	6.981	
SUM, VARIABLE (hourly)		2.156
ALL SOURCES	**9.138**	

Source	Constant	Variable 5 -yr Average
BLAST	1.00000	
PCRSH1	0.04290	
PCRSH3	0.01250	
GCRSH2	0.01250	
CO6	0.00053	
CO7	0.00053	
CO8	0.00053	
SC1011	0.05140	
CCRSH2	0.00625	
LOAD1		0.03979
LOAD2		0.03979
EXC1		0.03979
CO9		0.20183
CO14		0.08215
PILE1		0.04196
PILE2		0.00847
PILE3		0.01579
PILE4		0.01579
PILE5		0.01579
PILE6		0.00847
PILE7		0.04196
LOAD4		0.02569
LOAD5		0.02572
LOAD6		0.02572
LOAD7		0.02572
LOAD8		0.02572
LOAD9		0.02572
LOAD10		0.02572
LOAD13		0.01267
PILE12		0.00192
PILE13		0.00192
PILE14		0.00192
LOAD15		0.01742
PILE11		0.01267
LOAD3		0.20183
VOL1	0.23600	
VOL2	0.16100	
HAUL1 (H1): 227 units	1.62532	
HAUL2 (H2): 300 units	1.59300	
HAUL3 (H3): 15 units	0.07305	
HAUL5 (L002): 64 units	0.07104	
TLOAD1 (TL1): 5 units	0.09050	
TLOAD2 (TL2): 5 units	0.09050	
TLOAD12 (TL12): 3 units	0.02364	
TLOAD3 (TL3): 3 units	0.02433	
TLOAD4 (TL4): 3 units	0.02433	
TLOAD5 (TL5): 3 units	0.02433	
TLOAD6 (TL6): 3 units	0.02433	
TLOAD7 (TL7): 3 units	0.02433	
TLOAD8 (TL8): 4 units	0.02433	
TLOAD9 (TL9): 3 units	0.02432	
VOL3		0.48148
VOL4		0.59614
HAUL6 (H6): 106 units	0.16218	
GEN3	0.03330	
GEN4	0.03330	
PILE15		0.02068
LOAD16		0.02068
PCRSH4	0.06000	
GCRSH3	0.02870	
CO15	0.00511	
SC1213	0.21100	
CO16	0.00511	
CO17	0.00511	
CO18	0.00511	
PILE16		0.00347
CCRSH4	0.03320	
PILE17		0.00347
PILE18		0.00347
LOAD17		0.04513
GEN5	0.04440	
GEN6	0.04440	
HAUL7 (H7): 206 units	0.46968	
TLOAD10 (TL10): 3 units	0.02853	
CCRSH5	0.01690	
HAUL 9 (L001): 66 units	0.22176	
SUM, CONSTANT	6.669	
SUM, VARIABLE (hourly)		2.156
ALL SOURCES	**8.826**	

Table 2. Modeled PM10 Emission Rates for Scenario 2 (g/s)

Original Modeling **Revised Modeling**

sent to Dr. Gray. RWDI apologizes for not noting this.

The change in the number of “units” associated with each haul route were also updated for Scenario 2 as part of the organizational alignment and simplification of the modelling files. Scenarios 1 and 2 now have consistent haul routes.

No further action is required.

Source	Constant	Variable 5 -yr Average
BLAST	1.00000	
PCRSH2	0.06000	
PCRSH3	0.01300	
GCRSH1	0.02900	
GCRSH2	0.01300	
CO1	0.00510	
CO2	0.00510	
CO3	0.00510	
CO4	0.00510	
CO5	0.00110	
CO6	0.00053	
CO7	0.00053	
CO8	0.00053	
SC89	0.21000	
SC1011	0.05100	
CCRSH1	0.03300	
CCRSH2	0.00630	
LOAD1		0.00733
LOAD2		0.00733
EXC1		0.00733
LOAD 10	1.00000	
LOAD13		0.00826
LOAD11		0.02068
PILE12		0.00207
PILE13		0.00207
PILE14		0.00207
LOAD15		0.00812
PILE8		0.00347
PILE9		0.00347
PILE10		0.00347
LOAD12		0.02407
PILE11		0.00769
HAUL1 (H1): 227 units	1.63440	
HAUL3 (H3): 15 units	0.24000	
HAUL4 (H4): 61 units	0.32940	
HAUL5 (L0004): 64 units	0.08320	
TLOAD1 (TL1): 5 units	0.09000	
TLOAD2 (TL2): 5 units	0.09000	
TLOAD11 (TL11): 9 units	0.02880	
TLOAD12 (TL12): 3 units	0.02370	
HAUL6 (H6): 106 units	0.19080	
GEN1	0.04400	
GEN2	0.04400	
GEN3	0.03300	
GEN4	0.03300	
HAUL8 (L0005): 226 units	0.45200	
PILE19		0.02068
CCRSH3	0.01700	
SUM, CONSTANT	5.77169	
SUM, VARIABLE (hourly)		0.12809
ALL SOURCES	**5.900**	

Source	Constant	Variable 5 -yr Average
BLAST	1.00000	
PCRSH2	0.06000	
PCRSH3	0.01250	
GCRSH1	0.02870	
GCRSH2	0.01250	
CO1	0.00511	
CO2	0.00511	
CO3	0.00511	
CO4	0.00511	
CO5	0.00106	
CO6	0.00053	
CO7	0.00053	
CO8	0.00053	
SC89	0.21100	
SC1011	0.05140	
CCRSH1	0.03320	
CCRSH2	0.00625	
LOAD1		0.00733
LOAD2		0.00733
EXC1		0.00733
LOAD13		0.00826
LOAD11		0.02068
PILE12		0.00207
PILE13		0.00207
PILE14		0.00207
LOAD15		0.00812
PILE8		0.00347
PILE9		0.00347
PILE10		0.00347
LOAD12		0.02407
PILE11		0.00769
HAUL1 (H1): 219 units	0.22119	
HAUL3 (H3): 15 units	0.23850	
HAUL4 (H4): 61 units	0.33123	
HAUL5 (L0004): 36 units	0.03247	
TLOAD1 (TL1): 14 units	0.19180	
TLOAD2 (TL2): 13 units	0.18200	
TLOAD11 (TL11): 9 units	0.04977	
TLOAD12 (TL12): 7 units	0.03143	
HAUL6 (H6): 109 units	0.03652	
GEN1	0.04440	
GEN2	0.04440	
GEN3	0.03330	
GEN4	0.03330	
HAUL8 (L0005): 221 units	0.39338	
PILE19		0.02068
CCRSH3	0.01690	
SUM, CONSTANT	3.31924	
SUM, VARIABLE (hourly)		0.12809
ALL SOURCES	**3.447**	

8.	As shown in Table 2, above, source LOAD10 was included in the revised SC2 modeling, with a constant PM10 emission rate of 1.00 g/s. The LOAD10 source was modeled in SC1 with hourly variable emissions (with a 5-year average emission rate of 0.02752 g/s), and was not included in the original SC2 modeling. It appears that this source was incorrectly included (i.e., modeled with a non-zero emission rate) in the revised SC2 modeling and likely should not have been included in the revised SC2 modeling.		Gray Sky Solutions	As noted above, it appears that Dr. Gray has switched the headings on these tables. Dr. Gray is correct that source LOAD10 should have been assigned an emission rate of 0 g/s for Scenario 2. This results in a more conservative estimate of impacts, although this source is not a major contributor to the overall off-site predicted impacts for TSP and PM10. This impact of this is seen most clearly in the PM2.5 and silica results for Scenario 2, making the results for these contaminants even more conservative than for TSP and PM10. No additional action is required.	
9.	For the revised SC1 modeling, four of the HAUL sources had increased PM10 emission rates (relative to the original modeling, marked in red in Table 1). The emissions rate increases (HAUL1: 13% increase, HAUL5: 17%, HAUL6: 31%, and HAUL9: 13%) accounted for an overall increase of ALL SC1 emissions from **8.83 g/s to 9.14 g/s**. For the revised SC2 modeling, four of the HAUL sources had increased PM10 emission rates and four of the TLOAD sources had decreased PM10 emission rates (relative to the original modeling, marked in red in Table 2). The emissions rate increases (HAUL1: 639% increase, HAUL5: 156%, HAUL6: 422%, HAUL8: 15%), and emission rate decreases (TLOAD1: 53% decrease, TLOAD2: 51%, TLOAD11: 42%, and TLOAD12: 25%) together accounted for an overall increase of ALL SC2 emissions (including the LOAD10 source, as described in point 4, above; with a revised PM10 emission rate of 1.00 g/s) from **3.45 g/s to 5.90 g/s**. It is unclear as to why the revised modeling had increased emission rates for the four SC1 HAUL and the four SC2 HAUL sources and decreased emission rates for the four SC2 TLOAD sources, which resulted in a 3.5% increase in overall (all source) PM10 emissions for SC1 and a 71.0% overall PM10 emissions increase for SC2 (without the LOAD10 source in SC2, the overall increase in PM10 emissions would have been 42%).		Gray Sky Solutions	This is correct. The average vehicle rates were corrected for these sources however this was not explicitly noted in discussions with Dr. Gray, which was an oversight. The original modelling used 28.1 tons for highway trucks. The correct vehicle average weight should be 37.5 tons. The revised emission estimates and modelling are therefore more conservative.	
10.	The original modeling was performed using hourly meteorological ("met") data that RWDI labeled as "TORONTO_CROPS" (provide by MECP) which was described by RWDI as a "very conservative meteorological data set". In the email I received from Brian Sulley (RWDI) with the revised modeling files, he indicated that "The MECP 'Crops' data set is meant for open areas, and provides very conservative results compared to the other MECP data sets." He also stated that: "With the corrections made to Scenario 1, that high level of conservatism was no longer suitable." In other words, when the errors in base elevation were corrected in the SC1 modeling, the model results no longer resulted in predicted concentrations that were under the acceptable threshold levels (for example, the AAQC criteria level for 24-hour PM10 of 50 $\mu g/m^3$ was exceeded). Therefore, the revised modeling was performed using a different set of met data, labeled as "TORONTO_FOREST", which was justified based on the fact that: "The lands surrounding the quarry are heavily forested, in some cases for several kilometers. In other directions, you still have several hundred metres of forest." While it is true that the land to the north and south of the Milton facility is forested for several kilometers, the forest only extends roughly 2 kilometers to the east and west of the quarry facility.		Gray Sky Solutions	Dr. Gray is incorrect. Air quality assessments in Ontario must be conducted in accordance with MECP Guideline A11, the Air Dispersion Modelling Guideline for Ontario. Ontario's MECP does not agree with the guidance provided in the AERMET user's guide. The AERMOD dispersion model is highly sensitive to surface roughness, and the Ontario MECP requires that meteorological data sets be selected based on the conditions at the subject site. Section 6.3.1 of MECP Guideline A-11 is completely clear on this: "The AERMOD ready regional	

Comparison of the “forest” met data with the “crops” met data show different values for a number of hourly micrometeorological values, including the sensible heat flux(H, W/m^2), surface friction velocity (u*, m/s), Monin-Obukhov length (L, m), convective velocity scale (w*, m/s), height of convectively-generated boundary layer (Zic, m), vertical potential temperature gradient above Zic (VPTG, K/m), height of mechanically-generated boundary layer (Zim, m), surface roughness length (Zo, m), and Albedo (r) (values of w*, Zic, and VPTG are only used during daytime hours when H is positive and L is negative).[9] The important difference is that the boundary layer heights (mixing depths) are much higher in the forest met data (relative to the crops met data), especially the mechanically-generated boundary layer heights during overnight and early morning hours, which are typically 4 to 10 times as high (the ratio is higher during warmer periods). The daytime boundary layer heights, which tend to be much higher than early morning boundary layer heights, are typically 2.5 to 3 times as high for the forest met data as compared to the crop met data. The effect of this difference in the AERMOD dispersion model is that predicted concentration impacts during hours with higher mixing depths (forest met data) will be much lower than hours with lower mixing depths (crop met data).[10] The following table presents a sample of the comparison between the two met data sets for a few hours of the five-year met data:[11]

Table 3. Comparison of Met Data Between CROPS and FOREST Met Data Sets

year	month	day	hour	H	u*	w*	VPTG	Zic	Zim	L	zo	Bo	r	WS	WD	TEMP	CCVR
CROPS																	
96	1	1	1	-21.5	0.212	-9.000	-9.000	-999	234	49.3	0.097	0.5	1.00	2.6	41	273.1	10
96	1	2	11	1.8	0.493	0.225	0.012	225	829	-5948.7	0.097	0.5	0.64	5.7	5	259.9	9
96	1	2	12	5.3	0.494	0.368	0.012	330	833	-2001.3	0.097	0.5	0.62	5.7	11	259.9	9
97	7	5	6	-10.5	0.220	-9.000	-9.000	-999	248	90.0	0.237	0.6	0.48	2.1	266	283.8	2
97	7	5	13	190.0	0.445	2.041	0.009	1589	711	-40.9	0.237	0.6	0.18	3.6	8	297.0	5
FOREST																	
96	1	1	1	-56.5	0.556	-9.000	-9.000	-999	994	339.7	0.900	0.5	1.00	2.6	41	273.1	10
96	1	2	11	6.6	0.948	0.394	0.007	330	2276	-8888.0	0.900	0.5	0.51	5.7	5	259.9	9
96	1	2	12	11.3	0.949	0.477	0.006	338	2222	-6672.3	0.900	0.5	0.48	5.7	11	259.9	9
97	7	5	6	-36.5	0.842	-9.000	-9.000	-999	1852	1449.2	1.300	0.3	0.44	2.1	266	283.8	2
97	7	5	13	123.0	0.742	1.448	0.009	874	1532	-294.4	1.300	0.3	0.14	3.6	8	297.0	5

There are two types of meteorological data that are input to the AERMET preprocessor which develops the met data that are input to AERMOD. The first is hourly surface data which are usually measured at a nearby airport tower (the surface met data that were used for this analysis were collected at the Toronto Airport).[12] The second is upper air (radiosonde) data which include wind and temperature measurements at various heights, and are collected from a sparse network of upper air stations (the upper air data for this analysis appear to have been collected at Buffalo, NY). In addition, surface characteristics (land use data) are input to AERMET, which specify (1) the surface roughness (or roughness length, which is a measure of the roughness of the surface of the ground, equal to the distance above ground level where the wind speed theoretically should be zero), (2) Bowen ratio (ratio of heat flux to moisture flux near the surface), and (3) Albedo (the proportion of light reflected from the surface), and are to be measured at the *same location* as the hourly surface met data. These data are combined within AERMET to construct the micrometeorological data, including the vertical mixing parameters, discussed in the previous paragraph.

The AERMET User’s Guide indicates very clearly that the selection of surface land use data should be specified to correspond with the location the surface meteorological tower, i.e., the location where the surface met data is collected, and NOT the location of the modeled pollutant source. This is due, for example, to the fact that the surface

meteorological data sets were generated by the 3 stage AERMET process for three different wind independent surface categories, called “URBAN”, “FOREST” and “CROPS”. These three categories/files allow users to choose the file that most accurately <u>reflects the land use conditions in the vicinity of their site</u>. For each of these three surface types, the ministry used a weighted average of surface parameters for the typical mix of land uses seen in Ontario for each land use class considered in the category. For example, the surface characteristics in the FOREST regional data sets were calculated assuming that typical forests in Ontario are comprised of a mix of 50% deciduous and 50% coniferous trees.”

While the MECP has since added a “SUBURBAN” data set, it is not pertinent to this discussion.

Therefore Dr. Gray’s comments are not consistent with the MECP’s Air Dispersion Modelling Guideline for Ontario and therefore do not represent the correct approach.

The use of the MECP “FOREST” data set is indeed the correct approach, based on a review of the 3-kilometre radius from the centre of the site.

The alternative modelling results were provided for TSP only as they are for comparative purposes only.

Including modelling for PM10, PM2.5, silica and NO2 would not provide any new or useful information that can not already be gleaned from the TSP results.

The revised modelling, as presented, complies with Ontario’s official modelling guidance, and is therefore appropriate.

No further action is required.

9 The hourly wind speeds (WS, m/s), wind directions (WD, degrees), ambient temperatures (TEMP, K), and percent cloud cover (CCVR, tenths) are identical between the two met data sets.

10 The mixing depth essentially acts as a barrier to vertical transport, so that a lower mixing depth will cause less vertical mixing of pollutant emissions, resulting in higher predicted concentrations.

11 Values of -9.000 for w* and VPTG and values of -999 for Zic represent missing data.

12 There is also an option to input one-minute wind data to supplement the hourly surface wind data.

<table>
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<td>roughness is used to vertically extrapolate wind speeds which are measured at the met tower and not at the site of the pollutant emissions. The hourly surface meteorological data were collected at the Toronto Airport, located approximately 30 km ENE of the Milton quarry. The area surrounding the airport is relatively flat and open with little or no forest or significant vegetation. The meteorological conditions at the airport should therefore not be modeled with forested surface conditions (which have much higher surface roughness values), and it is expected that the boundary layer heights (and mixing depths) and the resulting vertical dispersion at the airport will be similar to the dispersion conditions at the Milton quarry site. Therefore, the crops met data is the more appropriate data set to use for modeling dispersion of emissions at the quarry.

The revised set of modeling files included an alternative modeling case for SC1 with the revised emission rate data (as shown in Table 1, above), but using the CROPS met data (rather than the FOREST met data). However, this alternative modeling run was only performed for TSP. I ran the AERMOD model using the revised modeling files for PM10 and PM2.5 using the CROPS met data (the results are shown below, in Table 4).
The alternative CROPS modeling for SC1 provided by RWDI included an identical set of sources and TSP emission rates as in the revised SC1 modeling using the FOREST met data with two exceptions. For the SC1 CROPS model run, the HAUL6 source had 106 units, each with a TSP emission rate of 0.010 g/s (for a total of 1.060 g/s), whereas each of the 106 HAUL6 units in the revised SC1 modeling (with FOREST met data) had a TSP emissions rate of 0.014 g/s (for a total of 1.484 g/s). Also, the CCRSH5 source had a TSP emission rate of 0.0213 g/s in the SC1 CROPS modeling, whereas the revised SC1 modeling (using the FOREST met data) had a slightly different TSP The alternative CROPS modeling for SC1 provided by RWDI included an identical set of sources and TSP emission rates as in the revised SC1 modeling using the FOREST met data with two exceptions. For the SC1 CROPS model run, the HAUL6 source had 106 units, each with a TSP emission rate of 0.010 g/s (for a total of 1.060 g/s), whereas each of the 106 HAUL6 units in the revised SC1 modeling (with FOREST met data) had a TSP emissions rate of 0.014 g/s (for a total of 1.484 g/s). Also, the CCRSH5 source had a TSP emission rate of 0.0213 g/s in the SC1 CROPS modeling, whereas the revised SC1 modeling (using the FOREST met data) had a slightly different TSP emission rate of 0.0210 g/s. The SC1 CROPS modeling should have used identical TSP emission rates for ALL sources as in the SC1 FOREST modeling.</td>
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<td>11.</td>
<td>In my earlier review of the RWDI modeling, I had suggested that a sensitivity analysis be included in the air quality assessment due to the fact that a number of the emission factors (taken from US EPA's AP-42) were rated as marginal or below. The set of revised modeling files included a second alternative modeling run for SC1 in which the TSP emission rates for many of the sources were multiplied by ten to account for the uncertainty in the emission factors. The emission rates for the following sources were multiplied by ten in the "sensitivity" modeling:

<table>
<tr><td>PCRSH1</td><td>PCRSH3</td><td>GCRSH2</td><td>CO6</td><td>CO7</td><td>CO8</td></tr>
<tr><td>SC1011</td><td>CCRSH2</td><td>VOL1</td><td>VOL2</td><td>PCRSH4</td><td>GCRSH</td></tr>
<tr><td>CO15</td><td>SC1213</td><td>CO16</td><td>CO17</td><td>CO18</td><td>CCRSH</td></tr>
</table>

The alternative sensitivity modeling files only included modeling for TSP. I ran the AERMOD model using the revised PM10 emission rates for SC1 with the PM10 emissions rates for the 18 sources listed above multiplied by ten (the modeling results are shown below, in Table 4).

All HAUL and TLOAD TSP emission rates were unchanged in the sensitivity modeling. Likewise, the emission rates for all sources with hourly variable TSP emission rates</td>
<td></td>
<td>Gray Sky Solutions</td>
<td>This additional analysis was done purely for the benefit and interest of Dr. Gray. This approach is inconsistent with other air quality assessments conducted by RWDI and other firms in Ontario for hundreds of Aggregate Resource Act license application and Environmental Compliance Approval applications spanning decades.

The use of these factors is the industry standard in Ontario and is approved and accepted by the MECP. To RWDI's knowledge, the MECP has never questioned these factors, nor has the MECP ever asked for additional analysis of this nature.

Data quality ratings for air quality assessments in Ontario are normally determined using guidance in MECP Guideline A10: Procedure for Preparing an Emission Summary and Dispersion Modelling Report.</td>
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</table>

were unchanged in the sensitivity modeling. However, there are two (hourly constant) sources in which the emission factors used to estimate the emission rates were also marginal (in addition to the 18 sources listed above): BLAST and CCRSH5. These two sources should also have been included in the set of sources multiplied by ten in the sensitivity modeling.

The 18 sources that were multiplied by ten in the sensitivity modeling together account for 0.88029 g/s in the revised SC1 PM10 modeling, which were therefore increased to 8.8029 g/s in the sensitivity modeling. This resulted in an increase of the modeled PM10 emissions for ALL sources from **9.138 g/s** (revised PM10 modeling) to **17.061 g/s** (sensitivity PM10 modeling).

Based on MECP Guideline A10, the only U.S. EPA emission factors ranked as marginal or below are the aggregate processing sources. As a result, only the emission rates for processing sources were scaled up by a factor of 10.

In accordance with MECP Guideline A10, the emission estimates for blasting, material handling, paved and unpaved roadways have a data quality rating of "average" or better. Therefore, these estimates were not adjusted.

Dr. Gray appears to be incorrect with respect to source CCRSH5 (Cone Crusher - Portable Plant 3) This was indeed scaled up by a factor of 10 in the sensitivity analysis.

As noted in the response to Item 10, TSP provides a suitable surrogate for a comparative analysis. There was no benefit to conducting the same analysis for PM10 or other contaminants, especially since the modelling showed predicted impacts well within Ontario's benchmarks.

No further action is required.

12. Table 4, below, shows the results of the PM10, PM2.5, and TSP modeling for the original modeling, the revised modeling and the two alternative cases: (1) using CROPS met data and (2) sensitivity model runs (I obtained from RWDI the modeling files for the four original cases, the four revised cases using forest met data, the TSP SC1 revised case using crops met data, and the TSP SC1 revised sensitivity (SENS) case using forest data.[13] I independently ran the model for the PM10 SC1, PM10 SC2, and PM2.5 SC1 revised cases using crops met data, and the two PM10 SC1 revised SENS cases).

Table 4. Model Results

PM10	Met data	Model Results Without Background Max 24-hr		Background 24-hr		Model Results With Background 24-hr		AAQC criteria 24-hr		Notes
SC1 original	crops	21.74		25		46.74		50		w/ 5 HAUL sources located at 0 ht (incorrect)
SC1 revised	forest	7.16		25		32.16		50		HAUL hts fixed, emissions increased from 8.83 to 9.14 g/s
SC1 revised	crops	38.98		25		**63.98**		50		HAUL hts fixed, emissions increased from 8.83 to 9.14 g/s
SC1 revised SENS	forest	16.88		25		41.88		50		
SC1 revised SENS	crops	113.20		25		**138.20**		50		
SC2 original	crops	19.42		25		44.42		50		background = 1 subtracted
SC2 revised	forest	3.11		25		28.11		50		emissions increased from 3.45 to 5.90 g/s
SC2 revised	crops	19.78		25		44.78		50		emissions increased from 3.45 to 5.90 g/s
		Without Background		Background		With Background		CAAQS criteria		
PM2.5		Max 24-hr	Annual	24-hr	Annual	24-hr	Annual	24-hr	Annual	
SC1 original	crops	4.46	0.86	13	6.9	17.46	7.76	27	8.8	w/ 5 HAUL sources located at 0 ht (incorrect)
SC1 revised	forest	1.33	0.35	13	6.9	14.33	7.25	27	8.8	
SC1 revised	crops	7.11	1.33	13	6.9	20.11	8.23	27	8.8	
		Without Background		Background		With Background		AAQC criteria		
TSP		Max 24-hr	Annual	24-hr	Annual	24-hr	Annual	24-hr	Annual	
SC1 original	crops	50.75	10.21	45	23	95.75	33.21	120	60	w/ 5 HAUL sources located at 0 ht (incorrect)
SC1 revised	forest	30.65	7.78	45	23	75.65	30.78	120	60	
SC1 revised	crops	145.46	30.01	45	23	**190.46**	53.01	120	60	slightly different HAUL6 and CCRSH5 emission rates
SC1 revised SENS	forest	44.31	10.76	45	23	89.31	33.76	120	60	

The model results in Table 4 show that if the crops met data are used for PM10 and TSP, the modeled concentrations (including background) would exceed the relevant criteria levels for Scenario 1. The maximum modeled 24-hr average PM10

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As noted in Item 10, the revised modelling and the model results provided to Dr. Gray are correct and follow Ontario's appropriate modelling guidance. The use of methodologies from the United States that are not accepted for use in Ontario is not an appropriate approach.

The revised modelling was conducted for all contaminants for both Scenarios 1 and 2.

For Scenario 1, with ambient background values added, the contaminant with the highest percentage of the relevant benchmark was PM2.5, which was predicted to reach 82% of the annual Canadian Ambient Air Quality Standard (CAAQS). It must be noted that this is almost entirely due to the ambient background concentrations, which are already at 78% of the CAAQS. The highest percentage of the relevant benchmarks for all contaminants (with background) is summarized below for convenience:

Scenario 1

Cont.	Averaging Period (hours)	Predicted Conc. (µg/m³)	Percent of Benchmark (%)
TSP	24	76	63%
	Annual	31	51%
PM10	24	32	64%

[13] I also ran these modeling cases to confirm the RWDI results.

concentration (**63.98 µg/m³**) is 128% of the AAQC 24-hr PM10 criteria level, and the maximum modeled 24-hr TSP concentration (**190.46 µg/m³**) is 159% of the AAQC 24-hr TSP criteria level (120 µg/m³). As the RWDI modeling demonstrated, if the crops met data are used, there were **106 exceedances** of the 24-hr TSP criteria level over the 5-year modeling period.

In addition, the sensitivity modeling (with emission rates for 18 of the modeled sources multiplied by ten) using the crops met data would result in a maximum modeled 24-hr average PM10 concentration of **138.20 µg/m³**, which is 276% of the AAQC 24-hr PM10 criteria level (50 µg/m³).

PM2.5	24	14	53%
	Annual	7.2	82%
Silica	24	1.6	33%
NO2	1	109	27%
	24	48	24%

Scenario 2

Cont.	Averaging Period (hours)	Predicted Conc. (µg/m³)	Percent of Benchmark (%)
TSP	24	55	45%
	Annual	25	42%
PM10	24	28	56%
PM2.5	24	15	56%
	Annual	7.3	82%
Silica	24	3.3	66%
NO2	1	95	24%
	24	45	23%

As noted in the response to Comment 8, the impact of the incorrect emission rate for source "LOAD10" in Scenario 2 led to the higher values for PM2.5 and silica, even though TSP and PM10 were lower than Scenario 1. Once again, this minor error has only resulted in the predicted impacts for Scenario 2 being more conservative.

No further action is required.

13. The revised Appendix F lists the sources that are part of Scenario 1 (SC1) and Scenario 2 (SC2), as well as the modeled source parameters (base elevation, release height, horizontal and vertical dimensions for modeled VOLUME sources, and stack parameters for modeled POINT sources). I compared the sources listed in the revised Appendix F with the sources (with non-zero emissions) that were included in the revised modeling files for SC1 and SC2, and found the following omissions:

For SC1, sources CO5, GEN1, and GEN2 were listed in the revised Appendix F as part of SC1, but were not included in the SC1 modeling files. Sources HAUL3, HAUL5, TLOAD10, TLOAD12, GEN5, and GEN6 were modeled in SC1 but were not included in the revised Appendix F (as SC1 sources).

For SC2, source TLOAD10 was listed in the revised Appendix F as part of SC2, but was not included in the SC2 modeling files. Source HAUL1 and TLOAD1 were modeled in SC2 but were not included in the revised Appendix F (as SC2 sources). Source LOAD10 was also modeled in SC2 (incorrectly, as described in point 4, above) and not included in the revised Appendix F (as an SC2 source).

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Appendix F is purely an informational sheet summarizing the model parameters used in the model files. While this appendix is helpful, it is not material to the assessment.

It is acknowledged that CO5 should be in SC1, however this source is not material to the assessment. CO5 accounts for 0.04% of emissions from the site.

Appendix F simply provides source parameters for a standard / typical generator set (they are identical). However, RWDI acknowledges that this line item should read "GEN1-6", not GEN1-4". There are 6 different generators in different locations (GEN3-6 in Scenario 1, and GEN1-4 in Scenario 2).

It is acknowledged that HAUL3, HAUL5, TLOAD10, TLOAD12 should be listed in Appendix F for SC1. The parameters are unchanged, however.

As noted, source TLOAD10 should not have been included in SC2. This line should be replaced with TLOAD1. The parameters are unchanged, however.

It is acknowledged that HAUL1 should be listed in

				Appendix F for SC2. The parameters are unchanged, however. No further action is required.	