FINAL REPORT

J-AAR MATERIALS LIMITED JEDBURGH PLAINS

NORTH DUMFRIES, ONTARIO

AIR QUALITY ASSESSMENT
RWDI #2508601
October 28, 2025

SUBMITTED TO

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EXECUTIVE SUMMARY

RWDI was retained by Wrigley Developments Ltd. ("Wrigley Developments") c/o Orange Rock Developments ("Orange Rock") to conduct an air quality assessment for the sand and gravel pit at 1830 Wrigley Road located in Ayr, Ontario. The purpose of this assessment was to evaluate potential emissions associated with aggregate extraction and processing activities, and to determine whether predicted concentrations at nearby sensitive receptors comply with the Ontario Ministry of the Environment, Conservation and Parks (MECP) air quality standards, criteria, and guidelines.

The assessment and analysis considered emissions from portable crushing and screening plants, material handling operations, and supporting equipment, with hourly ozone data incorporated for NO_2 conversion in line with MECP guidance. Meteorological data, background concentrations, and receptor locations were applied to ensure representative modelling of site conditions.

Air dispersion modelling was completed for two scenarios representing equipment placement at the western and eastern extents of the property. The results are summarized in the full tables provided in the **Results** section. A summary of the maximum predicted concentrations at the most impacted receptors (MPOI) is provided in **Table 1**, below.

Table 1: Emissions Summary

Contaminant	Averaging Period at Maximum POI	Receptor ID	Receptor Type	Scenario	Facility Predicted Maximum POI Concentration in ug/m3	Facility Percentage of Relevant Criteria	Cumulative Predicted Maximum POI Concentration in ug/m3	Cumulative Percentage of Relevant Criteria
TSP	24-Hours	R08	Residence	1	57.0	47.5%	109.0	90.8%
	Annual	R01	Residence	1	5.05	8.4%	31.1	51.8%
PM10	24-Hours	R08	Residence	1	8.44	16.9%	37.4	74.9%
PM2.5	24-Hours	R01	Residence	1	3.73	13.8%	19.7	73.1%
	Annual	R01	Residence	1	0.789	9.0%	8.8	**99.9%**
Silica (<10µm)	24-Hours	R06	Residence	2	2.30	46.1%	4.3	86.1%
NOx	1-Hour	R07	Residence	2	227	56.7%	279.8	70.0%
	24-Hours	R06	Residence	2	21.4	10.7%	40.4	20.2%

The results indicate that the predicted concentrations of total suspended particulate matter (TSP), particulate matter (PM_{10} and $PM_{2.5}$), nitrogen oxides (NOx), and crystalline silica generally comply with applicable standards, criteria, and guidelines. The cumulative predicted annual concentration for $PM_{2.5}$ is close to exceeding the relevant criterion. However, this is a result of existing background concentrations, rather than emissions from the proposed facility. With appropriate mitigation and operational controls in place, the facility is not expected to cause significant adverse effects at nearby receptors.

Overall, the findings of this assessment demonstrate that the proposed operations can be undertaken in compliance with regulatory requirements and industry best practices for air quality protection.

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1. INTRODUCTION

RWDI was retained by Wrigley Developments Ltd. ("Wrigley Developments") c/o Orange Rock Developments ("Orange Rock") to complete an air quality assessment in support of an Aggregate Resources Act (ARA) License application for a proposed sand and gravel pit ("pit") at 1830 Wrigley Road ("the Site"), located in Ayr, Ontario. This assessment quantifies and evaluates air quality impacts from the various air emission sources for the proposed pit operations including aggregate material handling and processing, and all associated equipment.

2. SITE DESCRIPTION & OPERATIONS

The Site is located at 1830 Wrigley Road in Ayr, Ontario, and will typically operate from 7:00 AM – 7:00 PM Monday through Friday, as well as from 7:00 AM – 12:00 PM Saturday with an annual maximum extraction limit of 1,000,000 tonnes. The operations will occur primarily during the spring, summer, and fall seasons, with limited activity during the winter months.

To ensure the air dispersion modelling reflected representative site conditions, the monthly processing percentages shown in **Appendix B,** were applied within AERMOD as temporal profiles for the facility's emission sources. These values controlled how emissions were allocated across the calendar year in the model, with higher weights assigned to the active spring through fall period and reduced weights assigned to the winter months. The operating schedule was applied across all days of the week, allowing the use of meteorological conditions from each corresponding day in the historical dataset to reflect representative operating scenarios. This approach provided a realistic depiction of seasonal and diurnal patterns, rather than assuming uniform emissions throughout the year

The site is situated within a mixed-use area characterized by both residential and industrial land uses. An existing aggregate extraction site is located to the east of the operations. Residential uses are present to the northwest, southeast, and southwest. To the west, a proposed residential subdivision received Draft Plan of Subdivision and Zoning By-law Amendment approvals in February 2025.

Operations include the extraction of aggregate using a front-end loader or excavator, along with associated processing, transportation, stockpiling, and shipment of the finished material. Activities will occur in two phases: Phase A will involve extraction from the western portion of the site, with processing equipment located on the eastern side; Phase B will shift extraction to the eastern portion, with processing occurring on the quarry floor in the west. Processing will be conducted using portable screening and crushing plants powered by diesel-fired generators. **Figure 1** shows the Process Flow Diagram for the Crushing and Screening Plant.

Aggregate will primarily be shipped, and fill material imported and exported, using tri-axle trucks. While some use of tractor trailers may be anticipated, the emissions assessment is based on tri-axle truck activity, as this represents a higher traffic volume and therefore a conservative, maximum-emission scenario.

3. SENSITIVE RECEPTOR LOCATIONS

There are four existing residential receptors (R1–R4) located to the southeast, southwest, and west of the site. These include one-storey dwellings (R1–R2) and two-storey dwellings (R3–R4). In addition, five proposed residential receptors (R5–R9) associated with a planned subdivision to the west have been identified. These include four receptors situated along the shared property boundary and one located within the central portion of the future development. Proposed receptors R5–R8 are anticipated to be two-storey buildings, while R9 is expected to be a three-storey dwelling.

Both existing and proposed residences have been classified as sensitive receptors for the purposes of this air quality assessment. As air contaminant concentrations typically decrease with increasing distance from the source, receptors located farther from site operations are expected to experience lower levels of exposure.

4. CONTAMINANTS

The primary contaminant of interest is airborne dust generated by operations at the site:

- Suspended particulate matter (PM), consisting of particles with an aerodynamic diameter of 44 micrometres (µm) or less (known as TSP);
- Inhalable PM, consisting of particles with an aerodynamic diameter of 10 µm or less (PM_{10});
- Crystalline silica within the PM_{10} portion of the dust; and,
- Respirable PM, consisting of particles with an aerodynamic diameter of 2.5 µm or less ($PM_{2.5}$).

In addition to dust, on-site vehicles and heavy equipment also emit products of combustion. Nitrogen dioxide gas (NO_2), TSP, PM_{10}, and $PM_{2.5}$ were modelled as the key representatives of combustion products.

5. EMISSION SOURCES

The potential sources of emissions at the Site are as follows:

- Overburden stripping and rehabilitation operations;
- Extraction and stockpiling of virgin aggregate from the working face;
- Material handling operations (loading haul trucks, dumping material at the portable plant, and loading highway trucks for shipping);
- Material crushing, screening; and stockpiling;
- Movement of equipment over unpaved surfaces (loaders, haul trucks and highway trucks); and,
- Tailpipe emissions from on-site vehicles and heavy equipment.

Emissions from wind erosion of stockpiles were not included in the analysis. With the application of Best Management Practices for dust, wind erosion of stockpiles at aggregate sites is not a significant contributor to predicted concentrations of 24-hour and annual particulates, especially when compared to fugitive dust from processing, handling and roads. Wind erosion of stockpiles occurs only under high wind events. Conversely, maximum predicted impacts from fugitive dust sources normally occur under low wind conditions, where atmospheric turbulence is diminished. Therefore, modelling of these sources is not expected to materially affect the conclusions of the analysis.

Overburden stripping and rehabilitation operations do not occur during maximum production periods. These operations were therefore considered insignificant and not included in the assessment but are addressed through the Best Management Practice Plan ("BMPP") for Fugitive Dust. **Figure 2** presents modelled source locations for operations in representative locations for Scenario 1. **Figure 3** presents modelled source locations for operations in representative locations for Scenario 2. **Figure 4** illustrates the Jedburgh Plains property boundary relative to the external facility, the Cambridge Aggregates Ayr Pit, which was included as a modelled source.

6. EMISSION CALCULATIONS

Emissions were estimated in accordance with relevant guidance, using published emission factors. Detailed emission calculations are provided in the appendices to this report. The appendices contain details on assumptions, equipment types, sample calculations and other details that provide clarity as to RWDI's methodology. The emissions from sources that are wind-speed dependent (e.g., material handling) were calculated on an hour-by-hour basis, using the wind speed for each hour in the meteorological record. The emission values shown in the appendices for the wind-speed dependent emissions sources are example values, based on the average wind speed from the meteorological data.

- **Appendix A** provides emission estimates for bulk material handling, using emission factors from Chapter 13.2.4 (Aggregate Handling and Storage Piles). These emissions were calculated on an hour-by-hour basis, using the wind speed for each hour in the meteorological record. The emission values shown in the appendices for the wind-speed-dependent emissions sources are example values based on the average wind speed from the meteorological data used in the assessment.
- **Appendix B** provides emission estimates for aggregate processing equipment, using emission factors from Chapter 11.19.2 (Crushed Stone Processing and Pulverized Mineral Processing).
- **Appendix C** provides emission estimates for fugitive dust emissions from vehicles moving on unpaved roads, using emission factors from Chapter 13.2.2 (Unpaved Road).
- **Appendix D** provides emission estimates for tailpipe emissions from heavy equipment, vehicles, and stationary engines, using emission factors from the U.S EPA MOVES emissions software and the relevant Canadian diesel emission regulation limits for non-road diesel engines. These emissions are added to the fugitive dust emission estimates to provide a total emission estimate for TSP, PM_{10}, and $PM_{2.5}$.
- **Appendix E** provides data on nearby quarries obtained from the Ministry of Natural Resources and Forestry (MNRF) Pits and Quarries Online tool. The contaminant loads were scared accordingly to the maximum annual tonnage of each site and modelled as volume sources at their centroid locations to account for cumulative impacts.

7. AIR QUALITY THRESHOLDS

This air quality assessment involves predicting maximum and average concentrations of the identified contaminants and comparing those predicted concentrations to thresholds that have been established either provincially or nationally. The relevant objectives are the Ontario Ambient Air Quality Criteria (AAQC), with the exception of $PM_{2.5}$, for which no AAQC exists. For that reason, the Canadian Ambient Air Quality Standard (CAAQS) for $PM_{2.5}$ was used, as referenced in the AAQC documents.

It must be stressed that the CAAQS are non-regulatory and were developed as regional objectives for ambient concentrations of select air pollutants. These values are intended for use in a regional context and were not developed as facility level regulatory standards. While the study considers the CAAQS objective for comparison with predicted concentrations of PM, it is only because there are currently no facility level assessment criteria for $PM_{2.5}$ under Ontario's AAQCs.

In contrast, there is currently an AAQC for NO_2, so comparison to the 2025 CAAQS regional objective would be inappropriate in the context of this study. RWDI's approach is consistent with MECP practice. The "Air Quality in Ontario 2020 Report", published by the MECP follow the same approach by including the CAAQS criteria for PM2.5 but not including the CAAQS criteria NO2.

Table 2 shows the applicable AAQC and CAAQS objectives.

Table 2: AAQC and CAAQ Objectives

TSP	120	µg/m³ 24-Hour AAQC
	60	µg/m³ Annual AAQC
PM10	50	µg/m³ Interim AAQC
PM2.5	27	µg/m³ 24-Hour CAAQS
	8.8	µg/m³ Annual CAAQS
Silica	5	µg/m³ AAQC
NOx	400	µg/m³ 1-Hour AAQC
	200	µg/m³ 24-Hour AAQC

8. DISCUSSION OF MITIGATION MEASURES

The volume of truck and heavy equipment movement on unpaved surfaces within some areas of the site require above-average level of control, especially when operations are near sensitive receptors.

The level of control used in the assessment for dust on the internal haul route is an outcome of the modelling, not an input assumption requiring justification. It represents the level of control found to be needed to achieve acceptable results at the nearest receptors. Published studies show that it is achievable. Rosbury (1985)[1] summarized results from various studies showing that levels of control as high as 98% were attained in some cases. Rosbury went on to prescribe a watering rate that would achieve near 100% control (approximately 1.7 L/m²/h).

The U.S. EPA (AP-42, Chapter 13.2.2) showed that by maintaining a road surface moisture level of five times that of the ambient soil, a 95% level of control could be achieved. It is clear therefore that the levels of control prescribed by RWDI are attainable through sufficient watering. This finding of the studies is consistent with RWDI's experience in observing the effect of intensive watering programs.

For unpaved haul roads further removed from sensitive receptors or with lower traffic volumes, the level of mitigation noted above is often not required. In these cases, the frequency of watering can be reduced, and thus, no supplemental control efficiency was used.

[1] Rosbury, Keith D. "Dust Control at Hazardous Waste Sites". Hazardous Waste Engineering Research Laboratory, Office of Research and Development, U.S. EPA. EPA/540/2-85/003,

The dispersion modelling analysis reflects the implementation of controls.

9. ATMOSPHERIC DISPERSION MODELLING

The dispersion modelling was conducted to confirm that the proposed dust control recommendations will be sufficient to control off-site impacts at the sensitive impact locations. The modelling was conducted in accordance with the Ministry of the Environment, Conservation and Parks (MECP) Guideline A11: Air Dispersion Modelling Guideline for Ontario, using the U.S. EPA AERMOD dispersion model, version 22112. AERMOD assesses multiple sources of emissions at discrete off-site receptors and is the current state-of-the-art regulatory model accepted for use in Ontario by the MECP.

Site specific meteorological data obtained from the MECP website were used within the model, in accordance with the MECP's Guideline A11. Terrain information for the site was also obtained from the MECP, in accordance with Guideline A11. Base elevations for sources within the site reflect the quarry floor or appropriate elevations as provided by the proponent.

The model was run using the regulatory default options, without the addition of the dry depletion algorithms for particulate matter. The AERMOD model produced 1-hour, 24-hour, and annual average concentrations, as appropriate for each contaminant. As a conservative simplification, all sources were modelled as operating over the months March to November to simulate the entire maximum annual tonnage being processed in a condensed period.

Handling and processing sources were generally modelled using volume sources, in accordance with guidance from the National Stone Sand and Gravel Association (NSSGA)[2]. Haul routes and heavy equipment movements were modelled using adjacent volume sources, in accordance with guidance from the MECP and NSSGA. Point sources were modelled using the appropriate source parameters.

The dispersion modelling files are available electronically upon request.

10. LOCAL EMISSION SOURCES

Environment Canada's National Pollutant Release Inventory (NPRI) is Canada's legislated, publicly accessible inventory of pollutant releases. Data for 2023 (the most recent available at the time of this report) were reviewed for locally significant emission sources that would have similar emission profiles to the site. Four (4) facilities reported emissions to NPRI within five (5) kilometres of the site in 2023.

1. FS Partners, a division of Growmark, Ayr, located at 1107 Northumberland Street in Ayr, reported emissions of PM_{10} and $PM_{2.5}$. This facility is located over 2.25 km from the Site and therefore was not included explicitly as a source of emissions in the assessment, as the use of a suitable background air quality estimate will provide a sufficient estimate of cumulative impacts.

[2] National Stone Sand and Gravel Association, "Modeling Fugitive Dust Sources with AERMOD", January 2007.

2. Aevitas Inc., located at 75 Wanless Court in Ayr, reported emissions of mercury, which is not emitted due to operations at the Site. The Aevitas facility was therefore not carried further in the assessment.
3. DSM Nutritional Products Canada Inc., Cambridge Premix, located at 395 Waydom Drive in Ayr, reported emissions of copper, manganese and zinc, which are not emitted due to operations at the Site, but are subsets of TSP. However, given the DSM Nutritional Products Canada Inc. facility is greater than 3.5 kilometers away from the Site, it was not carried further in the assessment.
4. CBM Aggregates, David Pit, located at 2209 Cedar Creek Road in Cambridge, reported emissions of TSP, PM_{10} and $PM_{2.5}$. This facility is located well over 4 km from the Site and therefore was not included explicitly as a source of emissions in the assessment, as the use of a suitable background air quality estimate will provide a sufficient estimate of cumulative impacts.

With respect to other aggregate operations near the subject site, impacts from such operations are more localized, and, in RWDI's experience, are typically indistinguishable from regional background air quality levels at distances beyond one (1) kilometer. As a conservative measure, RWDI used two (2) kilometres for this review. The Ministry of Natural Resources and Forestry (MNRF) Pits and Quarries Online tool, as well as aerial photography for the area, was used to identify other aggregate operations. There are five (5) licensed sites located within two (2) kilometres of the site, but none reported emissions to the NPRI. The sites are listed below.

1. The Tom Hall Pit, licensed to the 2825618 Ontario Inc., located immediately to the west of the Site. This facility has an annual license limit of 350,000 tonnes. Although still licenced, the Tom Hall Pit is no longer in operation and has been filled to grade;
2. The Ayr Pit, licensed to Cambridge Aggregates Inc., located immediately to the east of the Site. This facility has an annual license limit of 500,000 tonnes. The facility is currently in operation and was included explicitly as a source of emissions in the assessment. Emissions from the Cambridge Aggregates Inc. Pit was modelled by scaling the emissions of Site by their respective annual license limits and then modelling the Cambridge Aggregates Inc. pit operations as a simple volume source. Emission calculations are provided in **Appendix E**;
3. The Greenfield Pit, licensed to Fast Rock Inc., located north of Greenfield Road, over 1.25 km from the Site. This facility has an annual license limit of 300,000 tonnes. The facility is no longer in operation, and was not included explicitly as a source of emissions in the assessment;
4. The Ayr Pit, licensed to St. Mary's Cement Inc. (Canada), located north of Greenfield Road, over 1.25 km from the Site. This facility has an annual license limit of 800,000 tonnes. This facility is currently in operation but was not included explicitly as a source of emissions in the assessment due to the distance from the Site, as the use of a suitable background air quality estimate will provide a sufficient estimate of cumulative impacts.
5. The Bromberg Pit, licensed to St. Mary's Cement Inc. (Canada), located north of Greenfield Road, over 1.25 km from the Site. This facility has an annual license limit of 800,000 tonnes. This facility is currently in operation but was not included explicitly as a source of emissions in the assessment due to the distance from the Site, as the use of a suitable background air quality estimate will provide a sufficient estimate of cumulative impacts.

Their locations relative to the site are shown in **Figure 4**.

11. BACKGROUND AIR QUALITY

Background ambient air monitoring data was used in conjunction with the emissions from the proposed operations. For the purposes of this assessment, 90th percentile background concentrations of particulate matter, nitrogen dioxide, and ozone were obtained from the nearest MECP monitoring station to the site (MECP Station 26060, located in Kitchener). This data is provided on **Table 3**. TSP and PM_{10} were estimated from station measured $PM_{2.5}$ data using factors derived from the analysis of extensive monitoring data from other sites, as presented by the 2004 report by Lall et. al.[3]. Silica was estimated using published data for cities in the northeast U.S.[4].

Table 3: Ambient Air Quality Data

Year	TSP [2]		PM_{10} [2]	Silica	$PM_{2.5}$		NO_2 [4]			
	90th Percentile 24-hour (µg/m³)	Annual Average (µg/m³)	90th Percentile 24-hour (µg/m³)	90th Percentile 24-hour [3] (µg/m³)	90th Percentile 24-hour (µg/m³)	Annual Average (µg/m³)	90th Percentile 1-Hour		90th Percentile 24-hour	
							(ppb)	(µg/m³)	(ppb)	(µg/m³)
2019	50	24	28	1.7	15	7.2	32	63	11	22
~~2020~~ [5]	~~43~~	~~22~~	~~24~~	~~1.4~~	~~13~~	~~6.6~~	~~23~~	~~46~~	~~9~~	~~18~~
2021	57	26	31	1.9	17	7.9	25	50	10	19
2022	53	25	30	1.8	16	7.5	28	55	10	20
2023	57	31	31	1.9	17	9.3	23	46	9	18
2024	43	22	24	1.4	13	6.7	27	53	9	17
Average	52	26	29	2	16	8	27	53	10	19

Notes:
[1] All data from MECP Station 26060 in Kitchener, Ontario
[2] Estimated from PM2.5 measurements using published factors (Lall et al., 2004)
[3] Estimated as 6% of PM10, from published data for cities in the northeast US (U.S. EPA, 1996)
[4] Conversion from ppb to µg/m³ based on 10°C
[5] 2020 Data removed from averaging due to the effects of the COVID19 pandemic

The use of historical data from a representative monitoring station operated by the MECP somewhere in the surrounding region is a widely accepted approach to estimating background air quality conditions. In the present case, the most representative station would be one that is in a rural location with a mix of farmland and woodlots, with settlement areas and some local industries nearby. There are no such monitoring stations operating anywhere in Ontario.

Therefore, the decision was made to use monitoring data from the closest station (Kitchener), even though this station is in a more urbanized environment. This is expected to overestimate concentrations of fine particulate matter and combustion by-products in a very rural area and, thereby err on the safe side.

[3] Lall, R., M. Kendall, K. Ito, and G. D. Thurston (2004). Estimation of Historical Annual $PM_{2.5}$ Exposures for Health Effects Assessments, Atmos. Env., 38, pp. 5217-5226.
[4] United States Environmental Protection Agency (1996). Ambient Levels and Noncancer Health effects of Inhaled Crystalline Silica and Amorphous Silica: Health Issue Assessment. EPA/600/R-95-115.

12. CHEMICAL REACTIONS AMONG CONTAMINANTS

The only chemical reaction among the emitted contaminants of relevance to local air quality impacts is the conversion of nitric oxide (NO) to nitrogen dioxide (NO_2). Oxides of nitrogen (NO_X) emitted in diesel exhaust are composed primarily of NO. However, once the exhaust is emitted to the atmosphere and begins to mix with outside air, some of the NO is oxidized in reactions with other contaminants, principally ground-level ozone (O_3), to produce NO_2. This is important to the cumulative effects assessment, as the criteria used in this assessment apply only to NO_2, which has a much greater toxicity than NO.

The Ozone Limiting Method (OLM) was used in the cumulative effects assessment to estimate the maximum short-term NO_2 concentrations resulting from emissions of NO_X. The OLM assumes that the conversion of NO to NO_2 is limited only by the amount of O_3 present in the outside air. If the concentration of available O_3 (ppb) is less than that of the NO contributed by the modelled roadway emissions, then the portion of NO that is converted to NO_2 equals the available O_3. If the concentration of available O_3 exceeds that of the NO contributed by the modelled roadway, then all NO is converted to NO_2.

This calculation is performed in the AERMOD dispersion model. A simplified version of the OLM was used to estimate the short-term concentration of NO_2 resulting from emissions of NOX. Concentrations of NO_X predicted by AERMOD are converted to NO_2 based on the background ozone concentration. To represent background ozone conditions, 99th percentile ozone concentrations by hour of day were derived from measurements recorded by the MECP at the Kitchener monitoring station.

13. RESULTS

The assessment results are shown in **Table 4** and **Table 5**, where receptor-by-receptor contaminant concentrations are provided for Scenarios 1 and 2.

To compare scenarios, **Table 1** summarizes the maximum predicted concentrations for each contaminant, along with the MPOI and averaging period. The table also shows the percentages of the applicable criteria for both facility contributions and cumulative concentrations.

The annual $PM_{2.5}$ criterion is close to exceeding; however, this result is driven by background concentrations rather than emissions from the proposed facility. With the recommended mitigation measures in place, the modelling results indicate that the extension is not expected to result in significant air quality impacts.

Table 4: Scenario 1 Results Summary

Receptor		UTM Coordinates		Contaminant	Averaging Period	Recommended Criteria for Cumulative Effects Analysis	Facility		Cumulative	
ID	Type	X (m)	Y (m)		(hours)	(µg/m³)	Predicted Concentration (µg/m³)	Percentage of Relevant Criteria (%)	Predicted Concentration (µg/m³)	Percentage of Relevant Criteria (%)
R01	Residence	546,270	4,793,068	TSP	24	120	40.8	34%	92.8	77%
					Annual	60	5.1	8%	31.1	52%
				PM10	24	50	6.1	12%	35.1	70%
				PM2.5	24	27	3.7	14%	19.7	73%
					Annual	8.8	0.8	9%	8.8	**100%**
				Silica (<10µm)	24	5	1.9	38%	3.9	78%
				NOx	1	400	146.6	37%	199.6	50%
					24	200	15.0	7%	34.0	17%
R02	Residence	545,549	4,792,880	TSP	24	120	21.6	18%	73.6	61%
					Annual	60	1.2	2%	27.2	45%
				PM10	24	50	3.3	7%	32.3	65%
				PM2.5	24	27	1.4	5%	17.4	65%
					Annual	8.8	0.2	2%	8.2	93%
				Silica (<10µm)	24	5	1.0	19%	3.0	59%
				NOx	1	400	110.4	28%	163.4	41%
					24	200	8.4	4%	27.4	14%
R03	Residence	545,440	4,792,865	TSP	24	120	19.4	16%	71.4	59%
					Annual	60	1.0	2%	27.0	45%
				PM10	24	50	2.7	5%	31.7	63%
				PM2.5	24	27	1.2	4%	17.2	64%
					Annual	8.8	0.2	2%	8.2	93%
				Silica (<10µm)	24	5	0.7	14%	2.7	54%
				NOx	1	400	83.9	21%	136.9	34%
					24	200	6.4	3%	25.4	13%
R04	Residence	545,278	4,793,346	TSP	24	120	28.1	23%	80.1	67%
					Annual	60	1.4	2%	27.4	46%
				PM10	24	50	4.2	8%	33.2	66%
				PM2.5	24	27	1.4	5%	17.4	65%
					Annual	8.8	0.2	3%	8.2	93%
				Silica (<10µm)	24	5	1.1	22%	3.1	62%

Receptor		UTM Coordinates		Contaminant	Averaging Period	Recommended Criteria for Cumulative Effects Analysis	Facility		Cumulative	
ID	Type	X (m)	Y (m)		(hours)	(µg/m³)	Predicted Concentration (µg/m³)	Percentage of Relevant Criteria (%)	Predicted Concentration (µg/m³)	Percentage of Relevant Criteria (%)
				NOx	1	400	94.7	24%	147.7	37%
					24	200	10.4	5%	29.4	15%
R05	Residence	545,523	4,792,986	TSP	24	120	28.7	24%	80.7	67%
					Annual	60	1.7	3%	27.7	46%
				PM10	24	50	4.1	8%	33.1	66%
				PM2.5	24	27	1.7	6%	17.7	66%
					Annual	8.8	0.3	3%	8.3	94%
				Silica (<10µm)	24	5	1.0	21%	3.0	61%
				NOx	1	400	101.1	25%	154.1	39%
					24	200	9.6	5%	28.6	14%
R06	Residence	545,505	4,793,060	TSP	24	120	36.1	30%	88.1	73%
					Annual	60	2.2	4%	28.2	47%
				PM10	24	50	5.2	10%	34.2	68%
				PM2.5	24	27	2.1	8%	18.1	67%
					Annual	8.8	0.3	4%	8.3	95%
				Silica (<10µm)	24	5	1.3	26%	3.3	66%
				NOx	1	400	106.5	27%	159.5	40%
					24	200	12.1	6%	31.1	16%
R07	Residence	545,485	4,793,126	TSP	24	120	38.9	32%	90.9	76%
					Annual	60	2.7	5%	28.7	48%
				PM10	24	50	5.9	12%	34.9	70%
				PM2.5	24	27	2.7	10%	18.7	69%
					Annual	8.8	0.4	5%	8.4	96%
				Silica (<10µm)	24	5	1.6	33%	3.6	73%
				NOx	1	400	174.4	44%	227.4	57%
					24	200	14.0	7%	33.0	17%
R08	Residence	545,465	4,793,205	TSP	24	120	57.0	47%	109.0	91%
					Annual	60	3.8	6%	29.8	50%
				PM10	24	50	8.4	17%	37.4	75%
				PM2.5	24	27	3.5	13%	19.5	72%
					Annual	8.8	0.6	6%	8.6	97%

Receptor		UTM Coordinates		Contaminant	Averaging Period	Recommended Criteria for Cumulative Effects Analysis	Facility		Cumulative	
ID	Type	X (m)	Y (m)		(hours)	(µg/m³)	Predicted Concentration (µg/m³)	Percentage of Relevant Criteria (%)	Predicted Concentration (µg/m³)	Percentage of Relevant Criteria (%)
				Silica (<10µm)	24	5	2.2	44%	4.2	84%
				NOx	1	400	190.4	48%	243.4	61%
					24	200	14.4	7%	33.4	17%
R09	Residence	545,401	4,793,135	TSP	24	120	37.3	31%	89.3	74%
					Annual	60	1.9	3%	27.9	47%
				PM10	24	50	5.6	11%	34.6	69%
				PM2.5	24	27	2.3	8%	18.3	68%
					Annual	8.8	0.3	3%	8.3	94%
				Silica (<10µm)	24	5	1.5	29%	3.5	69%
				NOx	1	400	182.0	46%	235.0	59%
					24	200	11.8	6%	30.8	15%

Table 5: Scenario 2 Results Summary

Receptor		UTM Coordinates		Contaminant	Averaging Period	Recommended Criteria for Cumulative Effects Analysis	Facility		Cumulative	
ID	Type	X (m)	Y (m)		(hours)	(µg/m³)	Predicted Concentration (µg/m³)	Percentage of Relevant Criteria (%)	Predicted Concentration (µg/m³)	Percentage of Relevant Criteria (%)
R01	Residence	546,270	4,793,068	TSP	24	120	35.5	30%	60.5	50%
					Annual	60	4.6	8%	27.6	46%
				PM10	24	50	5.3	11%	19.3	39%
				PM2.5	24	27	3.3	12%	11.3	42%
					Annual	8.8	0.7	8%	7.7	88%
				Silica (<10µm)	24	5	1.3	27%	2.1	43%
				NOx	1	400	141.6	35%	167.6	42%
					24	200	12.2	6%	32.2	16%
R02	Residence	545,549	4,792,880	TSP	24	120	37.5	31%	62.5	52%
					Annual	60	1.5	2%	24.5	41%
				PM10	24	50	6.0	12%	20.0	40%
				PM2.5	24	27	2.2	8%	10.2	38%
					Annual	8.8	0.2	3%	7.2	82%
				Silica (<10µm)	24	5	1.7	34%	2.5	50%
				NOx	1	400	212.0	53%	238.0	60%
					24	200	16.3	8%	36.3	18%
R03	Residence	545,440	4,792,865	TSP	24	120	23.1	19%	48.1	40%
					Annual	60	1.3	2%	24.3	40%
				PM10	24	50	3.7	7%	17.7	35%
				PM2.5	24	27	2.2	8%	10.2	38%
					Annual	8.8	0.2	2%	7.2	82%
				Silica (<10µm)	24	5	1.1	21%	1.9	37%
				NOx	1	400	179.2	45%	205.2	51%
					24	200	10.0	5%	30.0	15%
R04	Residence	545,278	4,793,346	TSP	24	120	27.1	23%	52.1	43%
				TSP	Annual	60	1.5	2%	24.5	41%
				PM10	24	50	4.4	9%	18.4	37%
				PM2.5	24	27	1.7	6%	9.7	36%
					Annual	8.8	0.2	3%	7.2	82%

Receptor		UTM Coordinates		Contaminant	Averaging Period	Recommended Criteria for Cumulative Effects Analysis	Facility		Cumulative	
ID	Type	X (m)	Y (m)		(hours)	(µg/m³)	Predicted Concentration (µg/m³)	Percentage of Relevant Criteria (%)	Predicted Concentration (µg/m³)	Percentage of Relevant Criteria (%)
				Silica (<10µm)	24	5	1.2	25%	2.0	41%
				NOx	1	400	144.8	36%	170.8	43%
					24	200	11.3	6%	31.3	16%
R05	Residence	545,523	4,792,986	TSP	24	120	34.6	29%	59.6	50%
					Annual	60	2.1	4%	25.1	42%
				PM10	24	50	5.5	11%	19.5	39%
				PM2.5	24	27	2.8	10%	10.8	40%
					Annual	9	0.4	4%	7.4	84%
				Silica (<10µm)	24	5	1.8	37%	2.6	53%
				NOx	1	400	207.3	52%	233.3	58%
					24	200	15.5	8%	35.5	18%
R06	Residence	545,505	4,793,060	TSP	24	120	48.9	41%	73.9	62%
				TSP	Annual	60	2.8	5%	25.8	43%
				PM10	24	50	7.8	16%	21.8	44%
				PM2.5	24	27	3.4	13%	11.4	42%
					Annual	8.8	0.5	5%	7.5	85%
				Silica (<10µm)	24	5	2.3	46%	3.1	62%
				NOx	1	400	217.1	54%	243.1	61%
					24	200	21.4	11%	41.4	21%
R07	Residence	545,485	4,793,126	TSP	24	120	47.1	39%	72.1	60%
					Annual	60	3.3	5%	26.3	44%
				PM10	24	50	7.4	15%	21.4	43%
				PM2.5	24	27	3.7	14%	11.7	43%
					Annual	8.8	0.5	6%	7.5	86%
				Silica (<10µm)	24	5	2.0	40%	2.8	56%
				NOx	1	400	226.8	57%	252.8	63%
					24	200	18.3	9%	38.3	19%
R08	Residence	545,465	4,793,205	TSP	24	120	44.9	37%	69.9	58%
					Annual	60	3.1	5%	26.1	43%
				PM10	24	50	7.2	14%	21.2	42%
				PM2.5	24	27	3.3	12%	11.3	42%

Receptor		UTM Coordinates		Contaminant	Averaging Period	Recommended Criteria for Cumulative Effects Analysis	Facility		Cumulative	
ID	Type	X (m)	Y (m)		(hours)	(µg/m³)	Predicted Concentration (µg/m³)	Percentage of Relevant Criteria (%)	Predicted Concentration (µg/m³)	Percentage of Relevant Criteria (%)
					Annual	8.8	0.5	6%	7.5	85%
				Silica (<10µm)	24	5	1.8	37%	2.6	53%
				NOx	1	400	163.8	41%	189.8	47%
					24	200	18.8	9%	38.8	19%
R09	Residence	545,401	4,793,135	TSP	24	120	33.3	28%	58.3	49%
					Annual	60	2.1	4%	25.1	42%
				PM10	24	50	5.2	10%	19.2	38%
				PM2.5	24	27	2.6	9%	10.6	39%
					Annual	8.8	0.4	4%	7.4	84%
				Silica (<10µm)	24	5	1.4	28%	2.2	44%
				NOx	1	400	162.9	41%	188.9	47%
					24	200	14.5	7%	34.5	17%

14. RECOMMENDATIONS

The Jedburgh Plains facility must operate in accordance with the operating standards pertaining to dust outlined in section 0.12 (2) Ontario Regulation 244/97, which include:

- The licensee or permittee shall apply water or another provincially approved dust suppressant to internal haul roads and processing areas, as necessary to mitigate dust, if the pit or quarry is located within 1,000 metres of a sensitive receptor.
- The licensee or permittee shall equip any processing equipment that creates dust with dust suppressing or collection devices if it is located within 300 metres of a sensitive receptor.
- The licensee or permittee shall obtain Environmental Compliance Approval under the Environmental Protection Act where required to carry out operations at the pit or quarry.

Furthermore, this assessment is based on the following recommendation, which is to be included in the Site Plans:

- The site will operate in accordance with the Best Management Practices Plan for Fugitive Dust, dated September 2025, which may be amended from time to time, considering actual impacts and operational considerations. The recommendations in the Best Management Practices Plan are based on the maximum daily production rates. At lower production rates, the control measures specified in the Best Management Practices Plan can be reduced accordingly, provided dust remains mitigated on site.

15. RECOMMENDED MANAGEMENT PRACTICES

A copy of the BMPP is provided in **Appendix F**. The BMPP provides a full listing of the recommended dust mitigation measures to be implemented at the Site.

16. CONCLUSIONS

The modelling results in **Tables 4, and 5** indicate that future operations at the extended pit will not result in exceedances of the Ambient Air Quality Criteria (AAQC) or the Canadian Ambient Ai Quality Standards (CAAQS).

In addition, the predicted concentrations remain within the applicable criteria, confirming that the proposed operations will not result in significant impacts on the nearby receptors, provided that appropriate mitigations measures remain in place.

17. STATEMENT OF LIMITATIONS

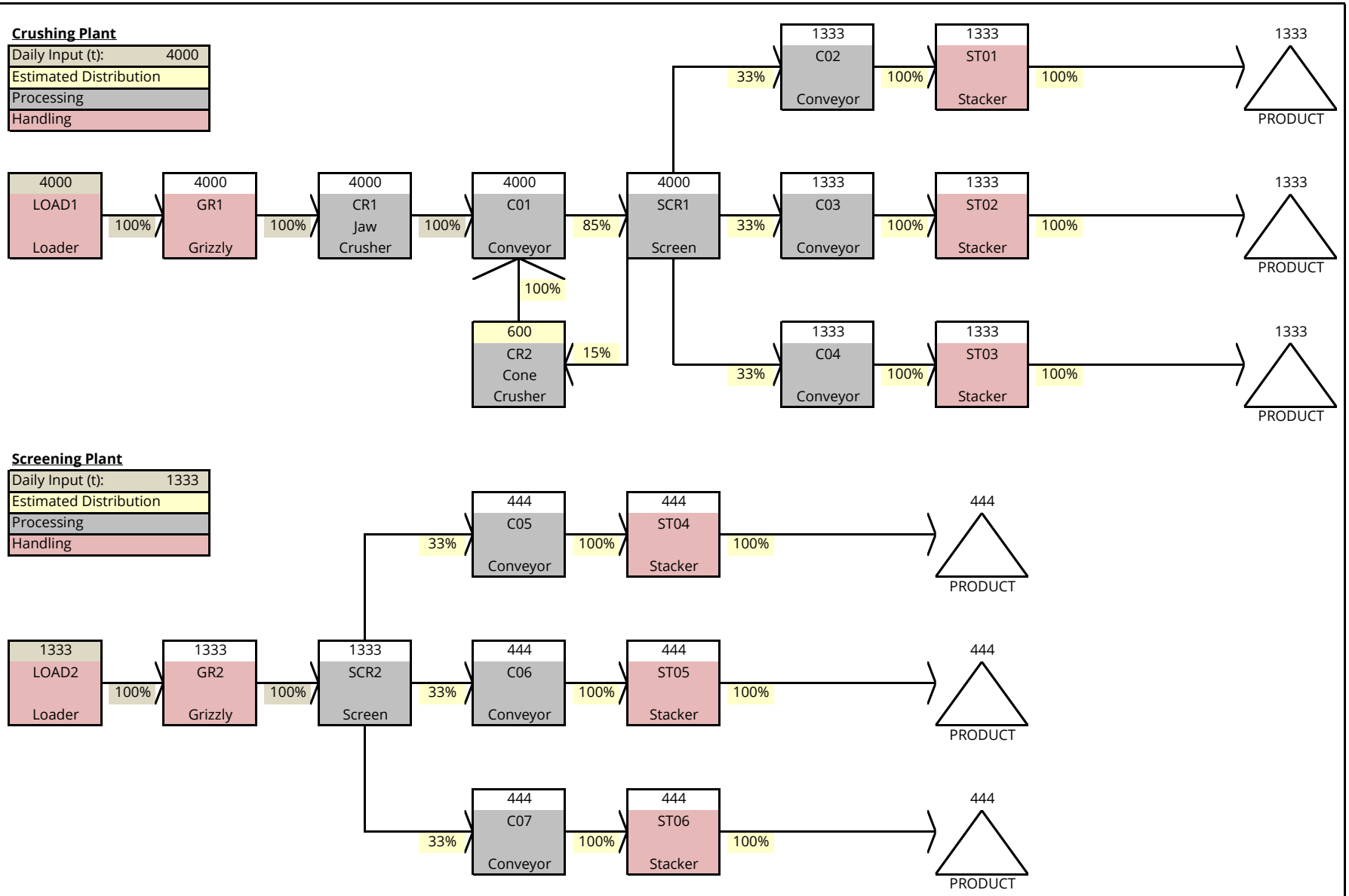
This report entitled J-AAR Materials Limited Jedburgh Plains Air Quality Assessment was prepared by RWDI AIR Inc. ("RWDI") for Wrigley Developments Ltd. c/o Orange Rock Developments, ("Client"). The findings and conclusions presented in this report have been prepared for the Client and are specific to the project described herein ("Project"). The conclusions and recommendations contained in this report are based on the information available to RWDI when this report was prepared. Because the contents of this report may not reflect the final design of the Project or subsequent changes made after the date of this report, RWDI recommends that it be retained by Client during the final stages of the project to verify that the results and recommendations provided in this report have been correctly interpreted in the final design of the Project.

The conclusions and recommendations contained in this report have also been made for the specific purpose(s) set out herein. Should the Client or any other third party utilize the report and/or implement the conclusions and recommendations contained therein for any other purpose or project without the involvement of RWDI, the Client or such third party assumes any and all risk of any and all consequences arising from such use and RWDI accepts no responsibility for any liability, loss, or damage of any kind suffered by Client or any other third party arising therefrom.

Finally, it is imperative that the Client and/or any party relying on the conclusions and recommendations in this report carefully review the stated assumptions contained herein and to understand the different factors which may impact the conclusions and recommendations provided.

RWDI aims to accommodate. If you require this document in a different format in order to aid accessibility, please contact the sender of this document, email solutions@rwdi.com or call +1.519.823.1311

FIGURES

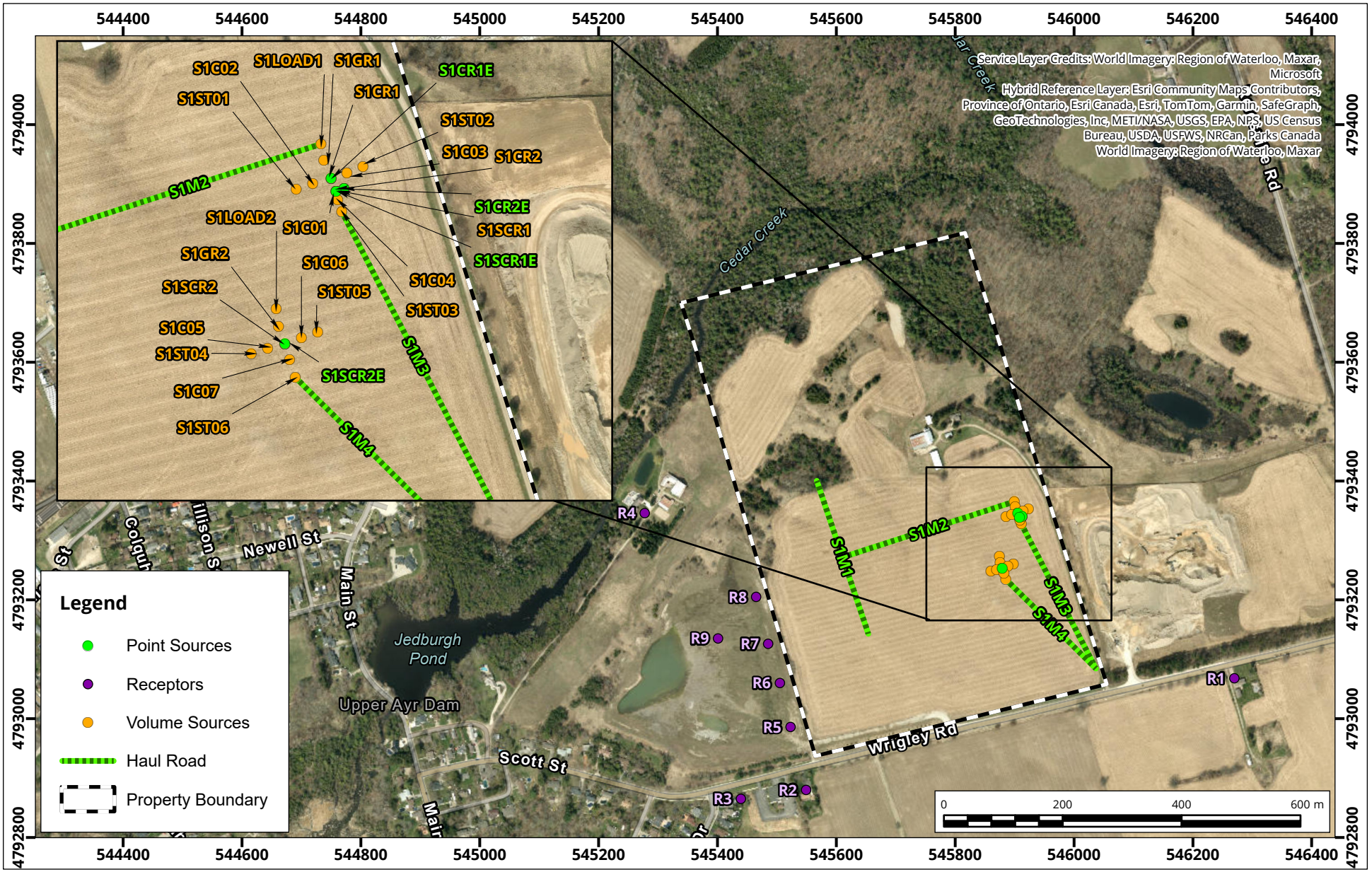


Daily throughout is based on the maximum annual extraction limit of 1,000,000 tonnes; an operating schedule of 6 day a week; and assuming the material input to the screening plant is a product of the crushing plant.

Process Flow Diagrams
Crushing Plant and Screening Plant

Jedburgh Plains, Ayr, Ontario

Drawn by: PAD	Figure: 1
Approx. Scale: not to scale	
Date Revised: Apr 21, 2025	



Map Document: C:\Users\LJN\OneDrive - ROWAN WILLIAMS DAVIES & IRWIN INC\Desktop\GIS\Jedburgh Plains\Jedburgh Plains.aprx

Site Plan Showing Significant Sources, Buildings, and Property Boundary

Scenario 1

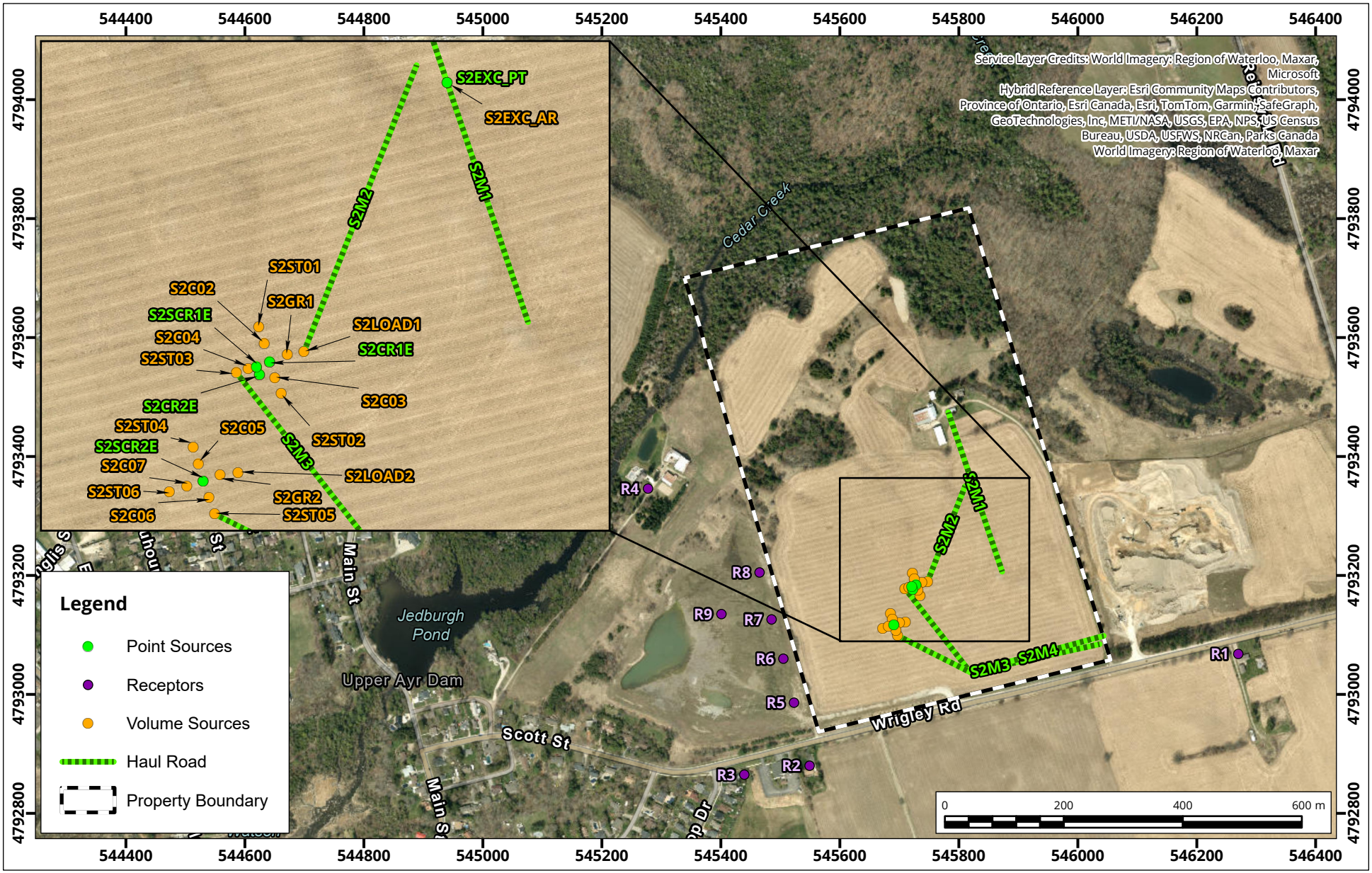
Map Projection: NAD 1983 UTM Zone 17N

Jedburgh Plains - Ayr, ON

True North

Project #: 2508601

Drawn by: LJN	Figure: 2
Approx. Scale:	1:9,000
Date Revised:	Sep 18, 2025



Site Plan Showing Significant Sources and Property Boundary

Scenario 2

Map Projection: NAD 1983 UTM Zone 17N

Jedburgh Plains - Ayr, ON

True North

Project #: 2508601

Drawn by: LJN	Figure: 3
Approx. Scale:	1:9,000
Date Revised: Sep 18, 2025	

Map Document: C:\Users\LJN\OneDrive - ROWAN WILLIAMS DAVIES & IRWIN INC\Desktop\GIS\JedburghPlains\JedburghPlains.aprx

Jedburgh Plains Property Boundary and External Facilities

True North

Drawn by: LJN	Figure: 4
Approx. Scale:	1:35,000
Date Revised: Sep 30, 2025	

Map Projection: NAD 1983 UTM Zone 17N

Jedburgh Plains - Ayr, ON

Project #: 2508601

Map Document: \\por-nsf-fi03\volam-jobs-df$\jobs\2025\2508601\03WorkItems\GIS\JedburghPlains.aprx

APPENDIX A

Appendix A: Bulk Material Handling Emissions Spreadsheet

Project #2508601

Jedburgh Plains

Material handling emissions: $E = 0.0016\ k\ (U / 2.2)^{1.3} / (M / 2)^{1.4}$

E emission factor
k particle size multiplier (0.8, 0.35 and 0.053 for TSP, PM_{10} and $PM_{2.5}$) [3]
U mean wind speed, meters per second (m/s)
M material moisture content (%)

AGGREGATE HANDLING AND STORAGE PILES - AP-42 Section 13.2.4

Average recorded hourly wind speed (m/s): 3.765
(used for sample calculations & factor validation)

Source ID [1]	Description	INDEX	Processing Rate Hourly (Mg/h)	Processing Rate Daily (Mg/d)	Site Data: Site Specific Data? (y/n)	Site Data: Silt Content (%)	Site Data: Moisture Content (%)	Site Data: Source Conditions Valid [2]	Base AP-42 Emission Factor TSP (kg/Mg)	Base AP-42 Emission Factor PM_{10} (kg/Mg)	Base AP-42 Emission Factor $PM_{2.5}$ (kg/Mg)	Base AP-42 Emission Factor Silica (kg/Mg)	Base Emission Rate TSP (g/s)	Base Emission Rate PM_{10} (g/s)	Base Emission Rate $PM_{2.5}$ (g/s)	Base Emission Rate Silica (g/s)	Additional Control Efficiency Applied (%)	Final Controlled Emission Rate at 3.765 m/s: TSP (g/s)	TSP Data Quality Rating	PM_{10} (g/s)	PM_{10} Data Quality Rating	$PM_{2.5}$ (g/s)	$PM_{2.5}$ Data Quality Rating	Silica (g/s)	Silica Data Quality Rating
LOAD1H	Front-End Loader at Crushing Plant	1	267	3205	n	1.6%	1.5%	valid	3.9E-03	1.7E-03	5.6E-04	1.2E-04	2.9E-01	1.2E-01	4.1E-02	9.3E-03		2.9E-01	B	1.2E-01	B	4.1E-02	B	9.3E-03	B
LOAD2H	Front-End Loader at Screeing Plant	2	111	1333	n	1.6%	1.5%	valid	3.9E-03	1.7E-03	5.6E-04	3.1E-04	1.2E-01	5.2E-02	1.7E-02	9.7E-03		1.2E-01	B	5.2E-02	B	1.7E-02	B	9.7E-03	B
GR1	Truck / Loader Drop to Grizzly	3	333	4000	n	1.6%	1.5%	valid	3.9E-03	1.7E-03	5.6E-04	1.2E-04	3.6E-01	1.6E-01	5.2E-02	1.2E-02		3.6E-01	B	1.6E-01	B	5.2E-02	B	1.2E-02	B
GR2	Truck / Loader Drop to Grizzly	4	111	1333	n	1.6%	1.5%	valid	3.9E-03	1.7E-03	5.6E-04	3.1E-04	1.2E-01	5.2E-02	1.7E-02	9.7E-03		1.2E-01	B	5.2E-02	B	1.7E-02	B	9.7E-03	B
ST01	Stacker 1	5	111	1333	n	1.6%	1.5%	valid	3.9E-03	1.7E-03	5.6E-04	1.2E-04	1.2E-01	5.2E-02	1.7E-02	3.9E-03		1.2E-01	B	5.2E-02	B	1.7E-02	B	3.9E-03	B
ST02	Stacker 2	6	111	1333	n	1.6%	1.5%	valid	3.9E-03	1.7E-03	5.6E-04	1.2E-04	1.2E-01	5.2E-02	1.7E-02	3.9E-03		1.2E-01	B	5.2E-02	B	1.7E-02	B	3.9E-03	B
ST03	Stacker 3	7	111	1333	n	1.6%	1.5%	valid	3.9E-03	1.7E-03	5.6E-04	1.2E-04	1.2E-01	5.2E-02	1.7E-02	3.9E-03		1.2E-01	B	5.2E-02	B	1.7E-02	B	3.9E-03	B
ST04	Stacker 4	8	37	444	n	1.6%	1.5%	valid	3.9E-03	1.7E-03	5.6E-04	3.1E-04	4.0E-02	1.7E-02	5.7E-03	3.2E-03		4.0E-02	B	1.7E-02	B	5.7E-03	B	3.2E-03	B
ST05	Stacker 5	9	37	444	n	1.6%	1.5%	valid	3.9E-03	1.7E-03	5.6E-04	3.1E-04	4.0E-02	1.7E-02	5.7E-03	3.2E-03		4.0E-02	B	1.7E-02	B	5.7E-03	B	3.2E-03	B
ST06	Stacker 6	10	37	444	n	1.6%	1.5%	valid	3.9E-03	1.7E-03	5.6E-04	3.1E-04	4.0E-02	1.7E-02	5.7E-03	3.2E-03		4.0E-02	B	1.7E-02	B	5.7E-03	B	3.2E-03	B
EXC_AR	Extraction Area	11	333	4000	n	1.6%	1.5%	valid	3.9E-03	1.7E-03	5.6E-04	1.2E-04	3.6E-01	1.6E-01	5.2E-02	1.2E-02		3.6E-01	B	1.6E-01	B	5.2E-02	B	1.2E-02	B

Sample calculation for uncontrolled TSP emission factor for Source LOAD1H: Front-End Loader at Crushing Plant, at a sample wind speed of 3.765 m/s

EF = 0.0016 x (0.8) x ((3.765 m/s) / 2.2) ^ 1.3 / ((1.5%) / 2) ^ 1.4 = 3.9E-03 kg TSP / Mg handled

Sample calculation for TSP emission rate for Source LOAD1H: Front-End Loader at Crushing Plant, at a sample wind speed of 3.765 m/s

$$\frac{267\ Mg_{handled}}{1\ h} \times \frac{3.9E\text{-}03\ kg_{TSP}}{1\ Mg_{handled}} \times \frac{1\ h}{3600\ s} \times \frac{1000\ g_{TSP}}{1\ kg_{TSP}} \times \frac{1\ g_{TSP\ uncontrolled}}{1\ g_{TSP}} = 2.9E\text{-}01\ g_{TSP} / s$$

Comments

k-factor for TSP (PM44) scaled up logarithmically to 0.8 from published k-factor of 0.74 which refers to PM30.
Source condition validity used to determine the data quality rating, in accordance with AP-42.
Silt values reflect on-site sampling conducted by MTE. (Dec. 22, 2023)
Moisture content based on AP-42 13.2.4 and MTE Preliminary Geotechnical Investigation (December 22, 2023). Damp conditions noted from the borehole samples, so the upper limit from AP-42 used.
Silica emissions based on "PM4 Crystalline Silica and PM10 Particulate Matter Emission Factors for Aggregate Producing Sources".
Silica emission rate is equivalent to 7.41% of PM10 emissions, based on the OAPC Central/Southwestern silica content for mixed stone and grave
Hourly processing rate based on 12 hours of operation for handling sources (07:00 - 19:00).

APPENDIX B

Appendix B: Processing Emissions Spreadsheet

Jedburgh Plains

Project #2508601

Soource ID [1]	Source Description / Process Decription INDEX		AP-42 Process Description [1]	Process Code	AP-42 Chapter	Processing Rate		Base AP-42 Emission Factor				Base Emission Rate				Additional Control Efficiency Applied (%)	Final Controlled Emission Rate							
						Hourly (Mg/h)	Daily (Mg/d)	TSP [3] (kg/Mg)	PM_{10} (kg/Mg)	$PM_{2.5}$ (kg/Mg)	Silica (kg/Mg)	TSP (g/s)	PM_{10} (g/s)	$PM_{2.5}$ (g/s)	Silica (g/s)		TSP (g/s)	Data Quality Rating	PM_{10} (g/s)	Data Quality Rating	$PM_{2.5}$ (g/s)	Data Quality Rating	Silica (g/s)	Data Quality Rating
CR1	Primary Crusher	12	Primary crushing (controlled)	6	11.19.2-1	333	4000	3.4E-04	2.7E-04	5.0E-05	2.0E-05	3.1E-02	2.5E-02	4.6E-03	1.9E-03		3.1E-02	E	2.5E-02	E	4.6E-03	E	1.9E-03	E
SCR1	Triple Deck Screen	13	Conveyor transfer point (controlled)	14	11.19.2-1	333	4000	3.7E-05	2.3E-05	6.5E-06	1.7E-06	3.4E-03	2.1E-03	6.0E-04	1.6E-04		3.4E-03	E	2.1E-03	D	6.0E-04	E	1.6E-04	E
CR2	Secondary Crusher	14	Screening (controlled)	2	11.19.2-1	50	600	5.6E-04	3.7E-04	2.5E-05	6.9E-05	7.8E-03	5.1E-03	3.5E-04	9.6E-04		7.8E-03	E	5.1E-03	C	3.5E-04	E	9.6E-04	E
SCR2	Triple Deck Screen	15	Secondary crushing (controlled)	7	11.19.2-1	111	1333	3.4E-04	2.7E-04	5.0E-05	5.0E-05	1.0E-02	8.3E-03	1.5E-03	1.6E-03		1.0E-02	E	8.3E-03	E	1.5E-03	E	1.6E-03	E
C01	Conveyor from SCR1 to ST01	16	Conveyor transfer point (controlled)	14	11.19.2-1	333	4000	3.7E-05	2.3E-05	6.5E-06	1.7E-06	3.4E-03	2.1E-03	6.0E-04	1.6E-04		3.4E-03	E	2.1E-03	D	6.0E-04	E	1.6E-04	E
C02	Conveyor from SCR1 to ST02	17	Conveyor transfer point (controlled)	14	11.19.2-1	111	1333	3.7E-05	2.3E-05	6.5E-06	1.7E-06	1.1E-03	7.1E-04	2.0E-04	5.3E-05		1.1E-03	E	7.1E-04	D	2.0E-04	E	5.3E-05	E
C03	Conveyor from SCR1 to ST03	18	Conveyor transfer point (controlled)	14	11.19.2-1	111	1333	3.7E-05	2.3E-05	6.5E-06	1.7E-06	1.1E-03	7.1E-04	2.0E-04	5.3E-05		1.1E-03	E	7.1E-04	D	2.0E-04	E	5.3E-05	E
C04	Conveyor from CR1 to SCR1	19	Conveyor transfer point (controlled)	14	11.19.2-1	111	1333	3.7E-05	2.3E-05	6.5E-06	1.7E-06	1.1E-03	7.1E-04	2.0E-04	5.3E-05		1.1E-03	E	7.1E-04	D	2.0E-04	E	5.3E-05	E
C05	Conveyor from SCR2 to ST05	20	Conveyor transfer point (controlled)	14	11.19.2-1	37	444	3.7E-05	2.3E-05	6.5E-06	4.3E-06	3.8E-04	2.4E-04	6.7E-05	4.4E-05		3.8E-04	E	2.4E-04	D	6.7E-05	E	4.4E-05	E
C06	Conveyor from SCR2 to ST06	21	Conveyor transfer point (controlled)	14	11.19.2-1	37	444	3.7E-05	2.3E-05	6.5E-06	4.3E-06	3.8E-04	2.4E-04	6.7E-05	4.4E-05		3.8E-04	E	2.4E-04	D	6.7E-05	E	4.4E-05	E
C07	Conveyor from SCR2 to ST07	22	Conveyor transfer point (controlled)	14	11.19.2-1	37	444	3.7E-05	2.3E-05	6.5E-06	4.3E-06	3.8E-04	2.4E-04	6.7E-05	4.4E-05		3.8E-04	E	2.4E-04	D	6.7E-05	E	4.4E-05	E

Sample calculation for TSP emissions from Source CR2: Secondary Crusher

$$\frac{50\ Mg_{processed}}{1\ h} \times \frac{5.6E\text{-}04\ kg_{TSP}}{1\ Mg_{processed}} \times \frac{1\ h}{3600\ s} \times \frac{1000\ g_{TSP}}{1\ kg_{TSP}} \times \frac{1\ g_{TSP\ uncontrolled}}{1\ g_{TSP}} = 7.8E\text{-}03\ g_{TSP}/s$$

Comments

Silica emissions based on "PM4 Crystalline Silica and PM10 Particulate Matter Emission Factors for Aggregate 'Producing Sources", Silica emission rate is equivalent to 7.41% of PM10 emissions, based on the OAPC Central/Southwestern silica content for mixed stone and gravel which is supported by measurements of silica content in airborne particulate at a nearby site, which indicated 7.2% silica.

AP-42 process listed as "controlled" reflects between 70-90% control due to high moisture / water sprays (AP-42 11.19.2).

AP-42 Emission Factor is based on PM100. The values have been corrected to reflect PM44.

Hourly passes for shipping loader and trucks based on 13 hours of operation for processing sources (07:00 - 19:00)

Estimated Monthly Processing Breakdown

Month	Processing
January	10%
February	10%
March	50%
April	100%
May	100%
June	85%
July	85%
August	85%
September	85%
October	100%
November	100%
December	10%

APPENDIX C

Appendix C: On-Site Mobile Equipment Emissions Spreadsheet - Fugitive Dust

Project #2508601

Jedburgh Plains

UNPAVED ROAD SECTIONS - AP-42 Section 13.2.2
PAVED ROAD SECTIONS - AP-42 Section 13.2.1

Paved Roads: $E = k\,(sL)^{0.91}\,(W)^{1.02}$
Unpaved Roads - Industrial: $E = 281.9\,k\,(s/12)^{a}\,(W/3)^{c}$
Unpaved Roads - Public: $E = 281.9\,k\,(s/12)^{a}\,(S/30)^{d}\,/\,(M/0.5)^{c} - C$

E particulate emission factor (g/VKT)
k particle size multiplier (see below)
sL road surface silt loading (g/m^2)
W average weight of the vehicles traveling the road (US short tons)
s surface material silt content (%)
C emission factor for 1980's vehicle fleet exhaust, brake wear and tire wear
M surface material moisture content (%)
S mean vehicle speed (mph)
a,b,c,d constants (see below)

Route ID [1]	Route Description	INDEX	Traffic Passes Hourly (#/h)	Traffic Passes Daily (#/d)	Segment Length (m)	Road Surface	Roadway Type	Mean Vehicle Speed (km/h)	Mean Vehicle Speed (mph)	Average Vehicle Weight (tons)	Surface Material Moisture Content (%)	Surface Silt Content (%)	Base AP-42 Emission Factor TSP (g/VKT)	Base AP-42 Emission Factor PM_{10} (g/VKT)	Base AP-42 Emission Factor $PM_{2.5}$ (g/VKT)	Base AP-42 Emission Factor Silica (g/VKT)	Base Emission Rate TSP (g/s)	Base Emission Rate PM_{10} (g/s)	Base Emission Rate $PM_{2.5}$ (g/s)	Base Emission Rate Silica (g/s)	Additional Control Efficiency Applied (%)	Final Controlled Emission Rate TSP (g/s)	TSP Data Quality Rating	Final Controlled Emission Rate PM_{10} (g/s)	PM_{10} Data Quality Rating	Final Controlled Emission Rate $PM_{2.5}$ (g/s)	$PM_{2.5}$ Data Quality Rating	Final Controlled Emission Rate Silica (g/s)	Silica Data Quality Rating
LOAD1M	Crushing Plant Loader	23	36	427	20	Unpaved	Industrial	20	12	63.8	1.5%	1.6%	2.4E+03	2.7E+02	2.7E+01	2.0E+01	4.9E-01	5.5E-02	5.5E-03	4.0E-03	95%	2.4E-02	C	2.7E-03	B	2.7E-04	C	2.0E-04	C
LOAD2M	Screening Plant Loader	24	12	142	20	Unpaved	Industrial	20	12	63.8	1.5%	1.6%	2.4E+03	2.7E+02	2.7E+01	2.0E+01	1.6E-01	1.8E-02	1.8E-03	1.3E-03	95%	8.1E-03	C	9.1E-04	B	9.1E-05	C	6.7E-05	C
MOVE1S1	Extraction Area Movements	25	18	214	272	Unpaved	Industrial	20	12	10.2	1.5%	1.6%	1.1E+03	1.2E+02	1.2E+01	8.9E+00	1.5E+00	1.6E-01	1.6E-02	1.2E-02	95%	7.3E-02	C	8.1E-03	B	8.1E-04	C	6.0E-04	C
MOVE1S2	Extraction Area Movements	25	18	214	283	Unpaved	Industrial	20	12	10.2	1.5%	1.6%	1.1E+03	1.2E+02	1.2E+01	8.9E+00	1.5E+00	1.7E-01	1.7E-02	1.3E-02	95%	7.6E-02	C	8.5E-03	B	8.5E-04	C	6.3E-04	C
MOVE2S1	Unpaved road - Extraction Area to Crushing Plant	26	15	180	304	Unpaved	Industrial	20	12	10.2	1.5%	1.6%	1.1E+03	1.2E+02	1.2E+01	8.9E+00	1.4E+00	1.5E-01	1.5E-02	1.1E-02	95%	6.8E-02	C	7.6E-03	B	7.6E-04	C	5.6E-04	C
MOVE2S2	Unpaved road - Extraction Area to Crushing Plant	26	15	180	171	Unpaved	Industrial	20	12	10.2	1.5%	1.6%	1.1E+03	1.2E+02	1.2E+01	8.9E+00	7.6E-01	8.5E-02	8.5E-03	6.3E-03	95%	3.8E-02	C	4.3E-03	B	4.3E-04	C	3.2E-04	C
MOVE3S1	Unpaved road (Crushing Plant to Entrance/Exit)	27	15	180	274	Unpaved	Industrial	20	12	10.2	1.5%	1.6%	1.1E+03	1.2E+02	1.2E+01	8.9E+00	1.2E+00	1.4E-01	1.4E-02	1.0E-02	95%	6.1E-02	C	6.8E-03	B	6.8E-04	C	5.1E-04	C
MOVE3S2	Unpaved road (Crushing Plant to Entrance/Exit)	27	15	180	401	Unpaved	Industrial	20	12	10.2	1.5%	1.6%	1.1E+03	1.2E+02	1.2E+01	8.9E+00	1.8E+00	2.0E-01	2.0E-02	1.5E-02	95%	8.9E-02	C	1.0E-02	B	1.0E-03	C	7.4E-04	C
MOVE4S1	Unpaved road (Screening Plant to Entrance/Exit)	28	5	60	213	Unpaved	Industrial	20	12	10.2	1.5%	1.6%	1.1E+03	1.2E+02	1.2E+01	8.9E+00	3.2E-01	3.5E-02	3.5E-03	2.6E-03	95%	1.6E-02	C	1.8E-03	B	1.8E-04	C	1.3E-04	C
MOVE4S2	Unpaved road (Screening Plant to Entrance/Exit)	28	5	60	359	Unpaved	Industrial	20	12	10.2	1.5%	1.6%	1.1E+03	1.2E+02	1.2E+01	8.9E+00	5.3E-01	6.0E-02	6.0E-03	4.4E-03	95%	2.7E-02	C	3.0E-03	B	3.0E-04	C	2.2E-04	C

Constants for Mobile Emission Equations

Roadway Type	Contaminant	k	a	b	c	d	Quality
Paved Roads:	$PM_{2.5}$	0.15	-	-	-	-	-
	PM_{10}	0.62	-	-	-	-	-
	PM_{30}	3.23	-	-	-	-	-
	TSP	4.79	-	-	-	-	-
Unpaved Roads - Industrial:	$PM_{2.5}$	0.15	0.9	0.45	-	-	C
	PM_{10}	1.5	0.9	0.45	-	-	B
	PM_{30}	4.9	0.7	0.45	-	-	B
	TSP	7.32	0.6	0.45	-	-	C
Unpaved Roads - Public:	$PM_{2.5}$	0.18	1	-	0.2	0.5	C
	PM_{10}	1.8	1	-	0.2	0.1	B
	PM_{30}	6	1	-	0.3	0.3	B
	TSP	8.96	1	-	0.49	0.2	C

Comments

Hourly shipping traffic based on a peak of 15 trips per hour, to ensure consistency with the HGC Noise Feasilbility Study (March 28, 2025).
95% control applied to unpaved roads based on watering as per the recommendations in the "Best Management PracticesPlan" report (hourly watering under dry conditions)
Silt values for unpaved roads reflect mean values from AP-42.
Silica emissions based on "PM4 Crystalline Silica and PM10 Particulate Matter Emission Factors for Aggregate Producing Sources", 'Richards and Brozell, Air Control Techniques, July 31, 2007. Silica emission rate is equivalent to 7.41% of PM10 emissions, based on the OAPC Central/Southwestern silica content for mixed stone and gravel.
Trips from the extraction face, as well as loader trips, are based on daily production rate and assumed haul truck capacity of 15 tonnes.
Hourly passes for shipping loader and trucks based on 12 hours of operation for shipping and handling sources (07:00 - 19:00)

Sample calculation for TSP emission rate for Source MOVE1S1: Extraction Area Movements

$$\frac{18\ \text{vehicles}}{1\ \text{h}} \times \frac{272\ \text{m}}{1\ \text{km}} \times \frac{1\ \text{km}}{1000\ \text{m}} \times \frac{1068\ g_{TSP}}{1\ \text{vehicle km}} \times \frac{1\ \text{h}}{3600\ \text{s}} \times \frac{0.05\ g_{TSP\ \text{uncontrolled}}}{1\ g_{TSP}} = 7.3\text{E-}02\ g_{TSP}/\text{s}$$

APPENDIX D

Appendix D: Summary of Combustion Exhaust Emissions (Mobile and Stationary Sources)

Project #2508601

Jedburgh Plains

Source ID	Description		Gross Power Rating (kW)	Number Of Units	Traffic Passes		Segment Length	Mean Vehicle Speed	Load Factor [5]	Tailpipe Emission Factor								Tailpipe Emission Rate				Tailpipe + Fugitive Emission Rate [6]			
					Hourly	Daily				TSP		PM10		PM2.5		NOx		TSP	PM10	PM2.5	NOx	TSP	PM10	PM2.5	NOx
					(#/h)	(#/d)	(m)	(km/h)	(%)	(g/vkt)	(g/kW-h)	(g/vkt)	(g/kW-h)	(g/vkt)	(g/kW-h)	(g/vkt)	(g/kW-h)	(g/s)	(g/s)	(g/s)	(g/s)	(g/s)	(g/s)	(g/s)	(g/s)
On-Site Mobile Equipment [1] [2]																									
LOAD1	Chrushing Plant Loade	22	303	1	n/a	n/a	n/a	n/a	48%	--	0.2	--	0.2	--	0.2	--	4	8.1E-03	8.1E-03	8.1E-03	1.6E-01	3.2E-01	1.4E-01	5.0E-02	1.6E-01
LOAD2	Screening Plant Loader	23	303	1	n/a	n/a	n/a	n/a	48%	--	0.2	--	0.2	--	0.2	--	4	8.1E-03	8.1E-03	8.1E-03	1.6E-01	1.6E-02	9.0E-03	8.2E-03	1.6E-01
MOVE1S1	Two-way Unpaved Hau	25	n/a	n/a	18	214	272	15	59%	0.95	--	0.95	--	0.95	--	11.4	--	1.3E-03	1.3E-03	1.3E-03	1.5E-02	7.4E-02	9.4E-03	2.1E-03	1.5E-02
MOVE1S2	Two-way Unpaved Hau	25	n/a	n/a	18	214	283	15	59%	0.95	--	1.95	--	1.95	--	12.4	--	1.3E-03	2.8E-03	2.8E-03	1.8E-02	7.7E-02	1.1E-02	3.6E-03	1.8E-02
MOVE2S1	Two-way Unpaved Hau	26	n/a	n/a	15	180	304	15	59%	0.95	--	2.95	--	2.95	--	13.4	--	1.2E-03	3.7E-03	3.7E-03	1.7E-02	6.9E-02	1.1E-02	4.5E-03	1.7E-02
MOVE2S2	Two-way Unpaved Hau	26	n/a	n/a	15	180	171	15	59%	0.95	--	3.95	--	3.95	--	14.4	--	6.8E-04	2.8E-03	2.8E-03	1.0E-02	3.9E-02	7.1E-03	3.2E-03	1.0E-02
MOVE3S1	Two-way Unpaved Hau	27	n/a	n/a	15	180	268	15	59%	0.95	--	4.95	--	4.95	--	15.4	--	1.1E-03	5.5E-03	5.5E-03	1.7E-02	6.2E-02	1.2E-02	6.2E-03	1.7E-02
MOVE3S2	Two-way Unpaved Hau	27	n/a	n/a	15	180	408	15	59%	0.95	--	5.95	--	5.95	--	16.4	--	1.6E-03	1.0E-02	1.0E-02	2.8E-02	9.1E-02	2.0E-02	1.1E-02	2.8E-02
MOVE4S1	Two-way Unpaved Hau	28	n/a	n/a	5	60	211	15	59%	0.95	--	6.95	--	6.95	--	17.4	--	2.8E-04	2.0E-03	2.0E-03	5.1E-03	1.6E-02	3.8E-03	2.2E-03	5.1E-03
MOVE4S2	Two-way Unpaved Hau	28	n/a	n/a	5	60	395	15	59%	0.95	--	7.95	--	7.95	--	18.4	--	5.2E-04	4.4E-03	4.4E-03	1.0E-02	2.7E-02	7.3E-03	4.7E-03	1.0E-02
EXC_PT	Excavator at Extraction	29	130	1	n/a	n/a	n/a	n/a	53%	--	0.3	--	0.3	--	0.3	--	4	5.7E-03	5.7E-03	5.7E-03	7.7E-02	5.7E-03	5.7E-03	5.7E-03	7.7E-02
Stationary Combustion Equipment [3] [4]																									
CR1E	Primary Crusher Engin	30	100	1	n/a	n/a	n/a	n/a	100%	--	0.3	--	0.3	--	0.3	--	4	8.3E-03	8.3E-03	8.3E-03	1.1E-01	8.3E-03	8.3E-03	8.3E-03	1.1E-01
CR2E	Secondary Crusher Eng	31	100	1	n/a	n/a	n/a	n/a	100%	--	0.3	--	0.3	--	0.3	--	4	8.3E-03	8.3E-03	8.3E-03	1.1E-01	8.3E-03	8.3E-03	8.3E-03	1.1E-01
SCR1E	Screening Plant Engine	32	100	1	n/a	n/a	n/a	n/a	100%	--	0.3	--	0.3	--	0.3	--	4	8.3E-03	8.3E-03	8.3E-03	1.1E-01	8.3E-03	8.3E-03	8.3E-03	1.1E-01
SCR2E	Screening Plant Engine	33	100	1	n/a	n/a	n/a	n/a	100%	--	0.3	--	0.3	--	0.3	--	4	8.3E-03	8.3E-03	8.3E-03	1.1E-01	8.3E-03	8.3E-03	8.3E-03	1.1E-01

Sample Calculations

Excavator Exhaust TSP Emissions:

$$\frac{130\ \text{kW} \times 0.2\ \text{g} \times 53\%\ \text{Load} \times 1\ \text{h}}{1\ \text{kW h} \times 3600\ \text{s}} = 4.0\text{E-}03\ g_{TSP}/\text{s}$$

Two-way Unpaved Haul Route TSP Emissions:

$$\frac{18\ \text{Vehicles} \times 272\ \text{m} \times 0.95\ \text{g} \times 1\ \text{km} \times 1\ \text{h}}{1\ \text{h} \times 1\ \text{Veh. Km} \times 1000\ \text{m} \times 3600\ \text{s}} = 1.3\text{E-}03\ g_{TSP}/\text{s}$$

Comments

[1] Excavator assumed to be CAT 325 or similar.

[2] Loaders assumed to be CAT 982 or similar.

[3] Crushing and Screening Plant engines assumed to be 100 kW (typical)

[4] Excavator, Crushing Plant, and Screening Plant engine emissions based on Tier 3 emission limits.

[5] Load Factors from "Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling", EPA-420-B-16-022 March 2016

[6] Exhaust parameters for mobile and stationary combustion engines based on typical diesel equipment parameters

Flow	745 cfm	=	0.35 m³/s
Temp	1010 °F	=	816 K
Diameter	0.1 m		
Velocity	45 m/s		

APPENDIX E

Appendix E: Summary of Scaled Emissions From Nearby Pit/Quarries

Jedburgh Plains

RWDI Project #2506757

Source Information							Expected Contaminants				
Quarry Description				Approximate Location		Distance to Site (km)	TSP (g/s)	PM_{10} (g/s)	$PM_{2.5}$ (g/s)	Silica (g/s)	NO_X (g/s)
Quarry Name	Quarry Size (ha)	Quarry General Direction to Jedburgh	Max Annual Tonnage t/y	X	Y						
Jedburgh Plains Pit	27.1	NA	1,000,000	545698	4793376	NA	2.60E+00	1.06E+00	3.91E-01	1.01E-01	9.65E-01
Cambridge Aggregates Ayr Pit	14.8	East	500,000	546251	4793277	0.6	1.30E+00	5.30E-01	1.96E-01	5.04E-02	4.82E-01

Comments
Data on nearby quarries identified using the Ministry of Natural Resources and Forestry (MNRF) Pits and Quarries Online
The total calculated contaminants for Jedburgh Plains Pit were scaled by max annual tonnage for each pit.
For modelling purposes, the other pits were modelled as volume sources at the respective site's centroid.

Sample Calculations

Cambridge Aggregates Ayr Pit $gTSP$ / $\frac{2.60E+00 \text{ g/s}}{\frac{500000.00 \text{ t/y}}{1{,}000{,}000 \text{ t/y}}}$ = 1.3E+00 g_{TSP} / s

APPENDIX F

FINAL REPORT

J-AAR MATERIALS LIMITED JEDBURGH PLAINS

NORTH DUMFRIES, ONTARIO

BEST MANAGEMENT PRACTICES PLAN FOR DUST
RWDI #2508601
October 28, 2025

SUBMITTED TO

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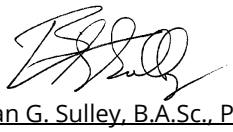
VERSION HISTORY

Index	Date	Pages	Author
1	September 30, 2025	All	Brian G. Sulley
2	October 28, 2025	All	Brian G. Sulley

REPORT SIGNATURES



Brian G. Sulley, B.A.Sc., P.Eng.
Technical Director, Principal

1 INTRODUCTION

1.1 Overview

This Best Management Practice Plan ("BMPP") for dust was prepared for J-AAR Material Limited (the "Company") for implementation at the Jedburgh Plains Pit (the "Site") in Ayr, Ontario. This plan includes dust control measures that meet and/or exceed the current industry standards. Implementation of these measures will ensure that dust is effectively controlled and impacts to neighbouring residents are minimized.

A BMPP is meant to be a living document, reflecting operational experience at the site, and shall be reviewed periodically to ensure that mitigation measures are effective. Furthermore, if the site is operating at levels below maximum capacity, the mitigation measures may be adjusted accordingly.

1.2 Components of A Best Management Practices Plan

A BMPP is a detailed document that outlines the fugitive dust sources at a given site and describes the measures that shall be used to control emissions from these sources. The BMPP is used to manage fugitive dust emissions from sources such as on-site haul routes, material processing, material handling, and wind erosion. The Ontario Ministry of the Environment, Conservation and Parks ("MECP") recommends that the BMPP be based on a process of "Plan | Do | Check | Act", as described in the Technical Bulletin: Management Approaches for Industrial Fugitive Dust Sources[1]. This BMPP is designed to meet the recommendations of the MECP in a form that provides clear and concise procedures for site personnel.

1.3 Size and Composition of Fugitive Dust at Aggregate Sites

Typically, the dust at a sand and gravel operation has the following characteristics:

- Primarily composed of calcium carbonate, oxides of iron, magnesium and aluminum and/or silicon;
- Fraction of dust smaller than 10 micrometres (PM10), 19-55%[2];
- Fraction of dust smaller than 2.5 micrometres (PM2.5), 3-14%[2]; and,
- Crystalline silica content of onsite material, estimated at less than 20%.

1.4 Overview of the Best Management Practices Plan

This document provides a separate section for fugitive dust sources at the Site, including a description of each source, complete with control measures applicable to each particular source.

[1] Standards Development Branch, Local Air Quality Section, Ontario Ministry of the Environment and Climate Change (MOECC)
[2] Based on data from the AP-42 Compilation of Air Pollutant Emission Factors, published by the United States Environmental Protection Agency.

2 DEFINITIONS

2.1 Dry Conditions

Where the BMPP refers to ”dry conditions”, this is defined as a period before which there have been more than 2 consecutive days without total rainfall over 1 mm.

2.2 Precipitation

Where the BMPP refers to ”sufficient precipitation”, this is defined as:

- Greater than 1 hour of rain; and,
- Greater than 2 hours of drizzle.

This does not include:

- Periods of rain or drizzle less than 1 hour per day; and,
- Periods of fog.

2.3 Fugitive Dust

Where the BMPP refers to observations of “fugitive dust”, it refers to the MECP definition of fugitive dust:

> “‘Fugitive dust’ means any solid particulate matter that becomes airborne, other than that emitted from an exhaust stack, directly or indirectly as a result of the activities of any person.”

3 SITE PREPARATION & REHABILITATION

3.1 Activities Included

- Overburden removal using excavators, loaders and haul trucks.
- Berm construction using loaders, haul trucks and bulldozers.
- Rehabilitation using loaders, haul trucks, bulldozers and other equipment as required.

3.2 Controls

- Avoid overburden removal, berm construction and rehabilitation operations, if possible, during drier months, such as July, August, and September and during peak periods of extraction and processing of aggregates. Should these activities occur during this period, the measures identified below for dry conditions will be implemented, regardless of location and wind direction.
- During stripping, berm construction and rehabilitation, personnel shall monitor operations to ensure that visible fugitive dust does not leave the property when the following criteria are met:
    - Dry conditions are anticipated;

  - Excavation and loading activities are within 150 m of a residence; and,
  - Winds are anticipated to be blowing towards the nearby residences.
- If visible fugitive dust is observed under these conditions, these operations shall be reduced, or additional mitigation measures shall be undertaken, such that visible fugitive dust is prevented from leaving the site. These additional mitigation measures could include, but are not limited to:
  - Application of water using a spray cannon mounted on the water truck; and,
  - If operations allow it, shifting operations to another area of the Site to reduce the potential for dust to migrate to the nearby residences.

4 AGGREGATE EXTRACTION

4.1 Activities Included

- Excavation of sand and gravel at the pit face.
- Transfer of sand and gravel to haul trucks by front-end loader or excavator.
- Stockpiling of excavated material.
- Maintenance of haul roads and working areas.

4.2 Controls

- Personnel shall monitor extraction and loading activities to ensure that visible fugitive dust does not leave the property when the following criteria are met:
  - Extraction or loading haul trucks is occurring within 150 meters of a residence;
  - Winds are blowing from the operations towards nearby residences; and,
  - Dry conditions are anticipated (operations can proceed at full production under rainy conditions).
- If visible fugitive dust is observed blowing towards nearby residences, the following measures shall be implemented:
  - Water should be applied to the working face and haul roads using a spray cannon or water truck as quickly as possible;
  - Activities may need to be reduced or stopped completely if the dust cannot be mitigated;
  - If operations allow it, shifting activities to another area of the Site to reduce the potential for dust to migrate to the nearby residences.

5 AGGREGATE PROCESSING

5.1 Activities Included

- Aggregate crushing, screening, and stockpiling at the processing plants.
- Aggregate stockpile area and loading of trucks around the stockpiles.

5.2 Controls

- The processing (crushing and screening) plants shall be equipped with a water spray system.
- The total processing rate for the site shall not exceed 4,000 tonnes/day.
- The watering rate shall be set as needed to suppress visible dust.
- If the natural moisture content of the virgin aggregate is sufficiently high, watering may not be required.
- If sufficient precipitation is occurring, watering may not be required.
- For screenings and other high-fine materials, stackers will be kept as close to the tops of stockpiles as is feasible to achieve a drop height of approximately 1m or less.

6 UNPAVED HAUL ROUTES

6.1 Activities Included

- Traffic on unpaved haul routes for loader traffic from working face to the processing plants.
- Traffic on unpaved haul routes for shipping traffic from the stockpiles to paved portion of haul route.

6.2 Controls

- A speed limit of 20 km/h shall be posted near the site entrance. Heavy equipment and truck operators will be directed to observe the speed limit.
- Unpaved roads are watered using a water truck. The application of water to the unpaved roads will be dependent on weather conditions and the amount of traffic.
- Water shall not be applied to the roads when temperatures are below, or predicted to fall below, 4°C.
- The watering system shall be designed to deliver the water evenly over the haul route surface and shall have the capacity to deploy water on all active haul routes at a rate of at least 1.5 L/m²/hour.
- Site staff will conduct visual inspections of the unpaved roads for dust emissions and the opacity of the dust emissions on a daily basis. If there is a significant amount of dust being emitted and/or the dust being emitted is of a high opacity, the water truck will be implemented.

7 PAVED HAUL ROUTES

7.1 Activities Included

- Paved haul routes for shipping traffic near the site entrances.

7.2 Controls

- A speed limit of 20 km/h shall be posted near the site entrance. Heavy equipment and truck operators will be directed to observe the speed limit.
- The facility shall have the capability to sweep or flush the on-site paved surface, as well as the portion of Burnside Line near the site entrance where visible track-out of material from the Site is observed.

- Sweeping or flushing shall occur if silt is visible on the final 100 metres of the paved road surface at the site entrances.
- In dry conditions, the paved entrance area and the portion of Burnside Line near the site entrance shall be inspected at the end of each day's shift and be swept or flushed, if necessary, to provide a clean entrance for the start of the next day's operations.
- The frequency of sweeping shall vary, depending on surface moisture conditions and traffic levels, and shall be triggered, as soon as practical, whenever routine inspections indicate that there is visible track-out on the pavement (may need to be swept once or twice per day, during peak operating periods).
- Water shall not be applied to the roads when temperatures are below, or predicted to fall below, 4ºC.

8 WIND EROSION

8.1 Activities Included

- Wind erosion may occur at disturbed areas, or at stockpiles that have relatively high silt contents, such as screenings or granular aggregate.
- Disturbed areas include the working face, areas that have been stripped but not yet extracted, and areas that have been extracted but not yet rehabilitated.
- Wind erosion of these piles will only occur when winds exceed a threshold wind speed level, which is typically on the order of 5-7 metres per second (18-25 km/h).

8.2 Controls

- The amount of disturbed area will be kept to the minimum necessary for extraction to proceed in an efficient manner. Progressive rehabilitation will be used to reduce erosion from previously extracted areas, in accordance with recommendations in Section 3.
- Stockpiles of finer-grained material will be located on the eastern side of the plant area so as to be sheltered from prevailing winds by other piles.
- If visible fugitive dust associated with wind erosion of stockpiles or exposed areas is observed blowing towards nearby residences, water should be applied to the stockpiles and / or working face using a spray cannon mounted on the water truck, as quickly as possible.

9 EQUIPMENT SPECIFICATIONS

9.1 Activities Included

- These controls pertain to all diesel-fired off-road and stationary equipment at the site, including:
  - Front-end loaders used for extraction and loading;
  - Haul trucks used for moving aggregate to and from the active face to the processing plant; and,
  - Excavators, loaders, and haul trucks used for site preparation and rehabilitation.

9.2 Controls

- At a minimum, all equipment shall meet the Tier 3 or 4 emission limits, as applicable to each size of engine, as established under the Canadian Off-Road Compression-Ignition Engine Emission Regulations.
- Should all equipment used at the site in the future be Tier 4 compliant, this will only serve to further reduce potential impacts.

10 OPERATIONAL WATERING FORECASTING

10.1 Activities Included

- The decision of when to conduct watering of haul routes and stockpiles requires the operator to use observations of meteorological conditions to ensure that dust is mitigated.

10.2 Conditions Under Which Watering is Required

- The site operator should monitor local weather conditions using local weather forecasts.
- The following table provides guidance on optimal frequency at which water should be applied:

Temperature	Relative Humidity	Hours Between Watering @ 1.5 L/m²
Below 4°C	Any	Watering not recommended
4°C - 10°C	75% or less	3
	75-90%	7
	90-100%	15
	Wet Weather (e.g., rain, drizzle)	Not required
10°C – 20°C	75% or less	1.5
	75-90%	3
	90-100%	7
	Wet Weather (e.g., rain, drizzle)	Not required
Above 20°C	75% or less	1
	75-90%	1.5
	90-100%	3
	Wet Weather (e.g., rain, drizzle)	Not required

- Regardless of the criteria above, watering shall be implemented immediately if dust is observed to be blowing toward nearby residences.
- When the temperature is below 4°C, watering is not recommended for safety reasons. Under these conditions, operations may need to be reduced, or other mitigation measures implemented.

11 ADMINISTRATION

11.1 Implementation Schedule

- All control measures should be in a state of readiness before operation of the Site commences.

11.2 Implementation Plan

- Formal training on new and existing operating procedures shall be provided to relevant new and existing staff at a minimum of once every 3 years, and in the event of changes to the BMPP.
- The company's management shall communicate the BMPP to responsible supervisors, who shall ensure personnel are following operating procedures defined in the BMPP.
- The Site Manager shall be responsible for ensuring the BMPP is followed.
- Management shall ensure the controls described in the BMPP are reviewed annually to maintain the levels of control outlined in the Air Quality Assessment, and to ensure operations will not have a negative environmental impact on the surrounding area.
- The BMPP shall be kept on file at the onsite scale house (or with other health and safety information and procedures on site).

12 INSPECTION & MONITORING

12.1 Inspection and Maintenance

- Any dust suppressing or collection systems, such as spray bars, water trucks, or other such equipment should be inspected weekly.
- The paved and unpaved haul routes shall be inspected weekly, and maintenance shall be performed as soon as practicable.

12.2 Monitoring

- Weather forecasts shall be checked daily, to plan for current and next-day watering needs according to the Operation Weather Forecasting procedure described in **Section 10**.
- Throughout the operating day, on-site personnel shall report to the Site Manager any observations of visible fugitive dust blowing towards nearby residences.
- The Site Manager or their delegate will be responsible for monitoring current conditions and weather forecasts from Environment & Climate Change Canada, to subsequently help plan for current and next day dust management measures.

12.3 Record Keeping

- Records shall be kept of when and how dust control measures are implemented and when complaints are received, if any.

- In addition, records shall also be kept of the results of all Inspection, Maintenance and Monitoring activities.

13 COMPLAINT RESOLUTION

13.1 Complaint Tracking

A sign posted at the site entrance shall include a phone number for neighbours to call if they have concerns.

The Company shall request that the local MECP office and the Township of Severn notify them immediately if they receive a complaint, to allow for prompt response and follow-up.

Complainants should be requested to identify the location of the incident as well as the time of day that it was detected and any other information that they feel is relevant.

13.2 Complaint Resolution

When a complaint is received, the Site Manager shall ensure the following steps are undertaken:

1. Inspect the site and surrounding area to identify possible sources of visible dust;
2. Obtain weather data for the time of the event;
3. Note all on-site activities at the time that the complaint was made;
4. If the information indicates that the facility is not the source of the dust complaint, the complainant shall be notified of this finding; and,
5. If it is determined that the complaint may, in fact, have been related to the facility operations, the following response procedures shall be followed, in the order provided below:
    - **Level 1** - Correction of operations as soon as practical. The Site Manager shall ensure that all elements of the BMPP are being followed. Control measures shall be stepped up or operations may be curtailed, as required.
    - **Level 2** – Review of Best Management Practice Plan. If the Level 1 response does not adequately resolve the problem, the BMPP shall be reviewed to look for additional control measures to address the source of the dust complaint.
    - **Level 3** – Operational modifications. If the Level 2 response does not adequately resolve the problem, the operator shall commit to making physical changes to the facility to address the source of the dust complaint, such as additional enclosures, relocation of equipment, or additional paving.