REPORT

Emission Summary and Dispersion Modelling Report, v.2.0

Lehigh Hanson Materials Limited - Picton Cement Plant

Submitted to:

Lehigh Hanson Materials Limited
1370 Highway 49
Picton, ON
K0K 2T0

Submitted by:

Golder Associates Ltd.
1931 Robertson Road, Ottawa, Ontario, K2H 5B7, Canada

+1 613 592 9600

2148080301

November 2022

Distribution List

1 e-copy - Lehigh Hanson Materials Limited

1 e-copy - Golder Associates Ltd., Ottawa

Document Version Control

This Emission Summary and Dispersion Modelling (ESDM) Report documents the operations at the Lehigh Picton Cement Facility, Lehigh Hanson Materials Limited in Picton, Ontario (the Facility) and has been prepared in accordance with s.26 of Ontario Regulation 419/05 (O. Reg. 419/05) to document compliance with s. 20 of O. Reg. 419/05. The Report is a living document and should be kept up-to-date at all times. Therefore, it is necessary to have appropriate version control. This version control will allow facility personnel, compliance auditors, or the Ontario Ministry of the Environment, Conservation and Parks (the Ministry) to track and monitor ESDM Report changes over time.

As facility operations change and sources are added to or removed from the Facility, this ESDM Report will need to be updated as required. These changes are to be documented in a Modification Log. The Modification Log is included in Appendix A. For future versions, changes listed in the Modification Log will have been incorporated into the ESDM Report. When the ESDM Report is updated, the version number will be changed to correspond with the information in the Modification Log.

Version	Date	Revision Description	Prepared By	Reviewed By (Facility Contact)
1.0	October 2017	Original ESDM Report to support the ECA Application	Golder Associates Ltd.	Nick Papanicolaou
1.1	November 2019	This ESDM includes the following changes since the ESDM Report version 1.0 was last prepared: Refined emission inventory at the request of the Ministry to use AP-42 emission factors from the Kilns, raw mills and primary and secondary crusher and CEMS data where applicable; accurate as of December 2018. Updated AERMOD model to v.16216R and with site-specific meteorology; accurate as of December 2018 Included an assessment of transitional operating conditions; accurate as of March 2019	Golder Associates Ltd.	Nick Papanicolaou
1.2	August 2020	Revised TOC assessment to include update 2019 CEMS data	Golder Associates Ltd.	Nick Papanicolaou

Version	Date	Revision Description	Prepared By	Reviewed By (Facility Contact)
1.3	June 2021	Updated AERMOD model to v.19191 with site-specific meteorology accurate as of December 2020. Revised TOC assessment to include update of 2020 CEMS data for nitrogen oxides and sulphur dioxide. Updated source testing emission rates, where applicable on Kiln 4 and Kiln 4 Bypass Refined PM10 and crystalline silica emissions from QUARRY5, VFUG4 and VFUG4A, COALSHIP and COALGYP, COALTD and GYPTD, MISCDROP, CKD and VFUG5. Removed the following compounds from Kiln 3 as it did not operate in 2020: Ammonium, Chloride, Nitrate, Potassium, Sodium and Sulfate. Lime injection was trialed on Kiln 4 but this did not change the emission estimating methods or the modelling directly.	Golder Associates Ltd.	Nick Papanicolaou
1.4	June 2022	Revised TOC assessment to include update of 2021 CEMS data for carbon monoxide, nitrogen oxides and sulphur dioxide. Updated source testing emission rates, where applicable on Kiln 4 and Kiln 4 Bypass Added phosphorus and tin as contaminants from the updated source testing on Kiln 4 and Kiln 4 bypass Removed sources 5-24,25,29,30 (SRCID 30,32,37,38) that were decommissioned in 2021. Added ammonia injection control on Kiln 4 including emissions of ammonia slip.	Golder Associates Ltd.	Nick Papanicolaou
2.0	November 2022	Assessed the use of alternative low-carbon fuels (ALCFs) to fuel the process kiln Added magnesium and tungsten as contaminants from ALCFs Removed sources associated with Kiln 3 Added dust collector associated with cement dome conversion	Golder Associates Ltd.	Nick Papanicolaou

Executive Summary

This Emission Summary and Dispersion Modelling (ESDM) Report was prepared to support an application for an amendment to Environmental Compliance Approval (ECA) with Limited Operational Flexibility (LOF) for air and noise under Part II.1 of the *Ontario Environmental Protection Act* (EPA) for Lehigh Hanson Materials Limited (Lehigh) cement manufacturing facility located at 1370 Highway 49, Picton, Ontario (the Facility). Lehigh is undertaking efforts to use Alternative Low Carbon Fuels (ALCFs) to supplement the energy required to make Portland Cement at their Facility. ALCFs are in use in many cement plants all over the world and represent a proven technology to reduce greenhouse gas emissions. The Facility currently operates under ECA Number 0073-BHGQHC, issued October 31, 2019.

Lehigh has prepared an application under Part II.1 of the Ontario Environmental Protection Act (EPA) to amend the existing ECA, to allow for a Non-Demonstration (Permanent) Project to use ALCFs at the Site, satisfying Ontario Regulation (O. Reg.) 79/15 (as amended by O. Reg. 54/21 and 824/21) (the ECA Amendment Application).

As part of the ECA Amendment Application, Lehigh is requesting approval to for the following:

- An ALCF daily throughput of up to 200 tonnes per day, which may include the following materials:
  - Construction & Demolition (C&D) Materials; including but not limited to primarily wood material with minor amounts of non-recyclable paper and plastic.
  - Industrial, Commercial, and Institutional (IC&I) Materials; including but not limited to primarily non-recyclable paper, plastic and textiles wood material, and tire fibre and fluff.
  - The combustible fraction of non-recyclable household waste (commonly referred to as Refuse Derived Fuel [RDF]).
  - Discarded treated seed.
- Installation of new conveyance and storage equipment for ALCFs at the site using enclosed containers and buildings.
- Renew the LOF condition 2.1 of ECA Number 0073-BHGQHC, which expires on July 1, 2023.

The contents of this ESDM Report satisfy the requirements of s.26 of Ontario Regulation 419/05 (O. Reg. 419/05). In addition, guidance in the Ontario Ministry of the Environment, Conservation and Parks (the Ministry) "*Guideline A-10: Procedure for Preparing an Emission Summary and Dispersion Modelling (ESDM) Report, Version 4.1"*, dated March 2018 (ESDM Procedure Document) PIBS 3614e04.1 was followed, as appropriate.

The Facility includes quarry operations comprising of blasting and drilling, limestone crushing, a process kiln with a pre-heater equipped with an ESP that is currently fueled with a mixture of low sulphur coal (LSC) and petroleum coke (petcoke), and eight mills equipped with baghouses. It can operate up to 24 hours per day, seven days per week, 52 weeks per year and has a proposed maximum production limit of 1.4 million metric tonnes of clinker manufactured per year using a maximum of 200 metric tonnes of ALCFs per day to fuel the process kiln.
The Facility is expected to emit suspended particulate matter (SPM), metals, crystalline silica and products of combustion.

The North American Industry Classification System (NAICS) code that best applies to the Facility is 327310 (Cement manufacturing).

The maximum emission rates for each significant contaminant emitted from the significant sources were calculated in accordance with s.11 of O. Reg. 419/05 and the data quality assessment follows the classification system outlined in the ESDM Procedure Document. Some of the sources were considered negligible in accordance with s.8 of O. Reg. 419/05.

The modelling scenario, for the relevant averaging period, assumed operating conditions for the Facility that result in the highest concentration of each significant contaminant at a Point of Impingement (POI). A POI concentration for each significant contaminant emitted from the Facility was calculated based on the emission rate estimates and the output from the dispersion model; the results are presented in the Emission Summary Table (Table I) in accordance with s.26 of O. Reg. 419/05.

The POI concentrations in the Emission Summary Table were compared against the applicable s.20 standards and guidelines listed as Benchmark 1 in the *Air Contaminants Benchmark (ACB) List*, dated April 2018 (List of Ministry POI Limits).

For normal operations, at 48% crystalline silica is the highest predicted concentration relative to the corresponding Ministry Limit.

At 68%, nitrogen oxides under the Transitional Operating Conditions (Table II) has the highest predicted POI concentration relative to the corresponding 1-hour Ministry POI Limit.

Contaminants released by the Facility that do not have Benchmark 1 standards or guidelines in the ACB List are considered to be ‘Contaminants with No Ministry POI Limits’. Where applicable, predicted POI concentrations of Contaminants with No Ministry POI Limits were screened against the Benchmark 2 screening levels in the ACB List or the *de minimus* limit. For Contaminants with No Ministry POI Limits whose predicted POI concentrations were found to be above the Benchmark 2 screening level or the *de minimus* limit, a “*Supporting Information for a Maximum Ground Level Concentration Acceptability Request for Compounds with no Ministry POI Limit Supplement to Application for Approval, EPA s.9*” Form was submitted to the Ministry as part of the ECA application in February 2018.

This ESDM Report demonstrates that the Facility can operate in compliance with s.20 of O. Reg. 419/05.

Table I: Emission Summary Table – Normal Operating Conditions

Contaminant	CAS No.	Total Facility Emission Rate [g/s]	Air Dispersion Model Used (1)	Maximum POI Concentration [µg/m³]	Averaging Period	Ministry POI Limit [µg/m³]	Limiting Effect	Schedule	Source	Benchmark	Percentage of Ministry Limit [%]	Model Run Name	Notes	Version of ACB List (2)
Acenaphthylene	208-96-8	2.67E-03	AERMOD	8.54E-04	24	0.1	—	—	De Minimus	—	Below De Minimus	Unit Run		
Aluminum	7429-90-5	5.89E-01	AERMOD	1.09E+00	24	12	Health	Sch. 3	SL-JSL	B2	Below B2	Unit Run		v2
Ammonia	7664-41-7	7.19E+00	AERMOD	2.30E+00	24	100	Health	Sch. 3	Standard	B1	2%	Unit Run	ACB List (URT - Note 4, Table 4)	v2
Ammonium	14798-03-9	4.89E+00	AERMOD	9.05E+00	24	14.5	—	—	Previously Approved MAXGLC	—	Below Previously Approved MaxGLC	Unit Run		
Arsenic	7440-38-2	3.84E-04	AERMOD	3.98E-04	24	0.3	Health	Sch. 3	Guideline	B1	<1%	Unit Run		v2
Barium	7440-39-3	2.82E-02	AERMOD	7.06E-02	24	10	Health	Sch. 3	Guideline	B1	<1%	Unit Run		v2
Benzaldehyde	100-52-7	1.09E-03	AERMOD	2.01E-03	24	2	Health	Sch. 3	SL-JSL	B2	Below B2	Unit Run		v2
Benzene	71-43-2	7.26E-02	AERMOD	2.54E-03	Annual	0.45	Health	Sch. 3	Standard	B1	<1%	Unit Run	ACB List (Note 19, Table 2, 3, URT - Note 4, Table 4)	v2
Benzene	71-43-2	7.26E-02	AERMOD	2.36E-02	24	100	—	Sch. 6	DAV	—	Below DAV	Unit Run		
Benzene	71-43-2	7.26E-02	AERMOD	2.54E-03	Annual	4.5	—	—	AAV	—	Below AAV	Unit Run		
Benzo(a)pyrene	50-32-8	2.97E-06	AERMOD	1.08E-07	Annual	0.00001	Health	Sch. 3	Standard	B1	1%	Unit Run	ACB List (Note 7, 19, Table 2, 3, URT - Note 4, Table 4)	v2
Benzo(a)pyrene	50-32-8	2.97E-06	AERMOD	1.02E-06	24	0.005	—	Sch. 6	DAV	—	Below DAV	Unit Run		
Benzo(a)pyrene	50-32-8	2.97E-06	AERMOD	1.08E-07	Annual	0.0001	—	—	AAV	—	Below AAV	Unit Run		
Beryllium	7440-41-7	1.60E-05	AERMOD	8.19E-06	24	0.01	Health	Sch. 3	Standard	B1	<1%	Unit Run		v2
Bismuth	7440-69-9	4.56E-01	AERMOD	1.54E+00	24	2.5	Health	Sch. 3	SL-JSL	B2	Below B2	Unit Run		v2
C3 benzenes	N/A-10	1.18E-04	AERMOD	2.18E-04	24	0.1	—	—	De Minimus	—	Below De Minimus	Unit Run		
C4 benzenes	N/A-11	2.72E-04	AERMOD	5.03E-04	24	0.1	—	—	De Minimus	—	Below De Minimus	Unit Run		
Cadmium	7440-43-9	6.49E-04	AERMOD	1.61E-03	24	0.025	Health	Sch. 3	Standard	B1	6%	Unit Run	ACB List (URT - Note 4, Table 4)	v2
Calcium Oxide	1305-78-8	5.51E+00	AERMOD	1.68E+00	24	10	Corrosion	Sch. 3	Standard	B1	17%	Calcium Oxide		
Carbon Dioxide	124-38-9	8.15E+04	AERMOD	1.26E+05	24	255800	Health	Sch. 3	SL-PA	B2	Below B2	Carbon Dioxide		v2
Carbon Monoxide	630-08-0	6.01E+01	AERMOD	3.44E+01	½	6000	Health	Sch. 3	Standard	B1	<1%	Carbon Monoxide	ACB List (Note 9)	v2
Chloride	N/A-5	1.54E+01	AERMOD	5.09E+00	24	5.176	—	—	Previously Approved MAXGLC	—	Below Previously Approved MaxGLC	Unit Run		
Chromium	7440-47-3	1.28E-03	AERMOD	3.80E-03	24	0.5	Health	Sch. 3	Standard	B1	<1%	Unit Run	ACB List (Note 11a, URT - Note 4, Table 4)	v2
Cobalt	7440-48-4	1.33E-02	AERMOD	7.12E-03	24	0.1	Health	Sch. 3	Guideline	B1	7%	Unit Run		v2
Copper	7440-50-8	1.21E-01	AERMOD	4.87E-02	24	50	Health	Sch. 3	Standard	B1	<1%	Unit Run		v2
Crystalline Silica	14808-60-7	1.91E+00	AERMOD	2.41E+00	24	5	Health	Sch. 3	Guideline	B1	48%	Crystalline Silica		v2
Dioxins and Furans (TEQ)	N/A	1.87E-09	AERMOD	5.90E-10	24	0.0000001	Health	Sch. 3	Standard	B1	<1%	Dioxins and Furans (TEQ)	ACB List (Note 8, 8a, Table 1, URT - Note 4, Table 4)	v2
Fluoranthene	206-44-0	1.99E-04	AERMOD	6.41E-05	24	0.1	—	—	De Minimus	—	Below De Minimus	Unit Run		

Contaminant	CAS No.	Total Facility Emission Rate [g/s]	Air Dispersion Model Used (1)	Maximum POI Concentration [µg/m³]	Averaging Period	Ministry POI Limit [µg/m³]	Limiting Effect	Schedule	Source	Benchmark	Percentage of Ministry Limit [%]	Model Run Name	Notes	Version of ACB List (2)
Fluorene	86-73-7	4.26E-04	AERMOD	1.37E-04	24	0.1	—	—	De Minimus	—	Below De Minimus	Unit Run		
Hydrogen chloride	7647-01-0	1.04E+01	AERMOD	3.22E+00	24	20	Health	Sch. 3	Standard	B1	16%	Hydrogen chloride	ACB List (URT - Note 4, Table 4)	v2
Hydrogen Fluoride	7664-39-3	2.28E-02	AERMOD	1.47E-02	24	1.72	Vegetation	Sch. 3	Standard	B1	<1%	Unit Run	ACB List (Note 2, 20)	v2
Hydrogen Fluoride	7664-39-3	2.28E-02	AERMOD	5.73E-03	30-day	0.69	Vegetation	Sch. 3	Standard	B1	<1%	Unit Run	ACB List (Note 2, 20)	v2
Iron	7439-89-6	8.41E-01	AERMOD	1.40E+00	24	4	Health	Sch. 3	Standard	B1	35%	Iron		v2
Lead	7439-92-1	1.90E-02	AERMOD	1.45E-02	24	0.5	Health	Sch. 3	Standard	B1	3%	Unit Run	ACB List (Note 2, URT - Note 4, Table 4)	v2
Lead	7439-92-1	1.90E-02	AERMOD	5.64E-03	30-day	0.2	Health	Sch. 3	Standard	B1	3%	Unit Run	ACB List (Note 2, URT - Note 4, Table 4)	v2
Magnesium	7439-95-4	4.56E-01	AERMOD	1.54E+00	24	72	Health	—	SL-MD	B2	Below B2	Unit Run		
Manganese	7439-96-5	2.24E-02	AERMOD	1.60E-02	24	0.4	Health	Sch. 3	Standard	B1	4%	Unit Run	ACB List (URT - Note 4, Table 4)	v2
Mercury	7439-97-6	4.48E-02	AERMOD	1.46E-02	24	2	Health	Sch. 3	Standard	B1	<1%	Unit Run		v2
Nickel	7440-02-0	5.27E-03	AERMOD	3.08E-04	Annual	0.04	Health	Sch. 3	Standard	B1	<1%	Unit Run	ACB List (Note 19, Table 2, 3, URT - Note 4, Table 4)	v2
Nickel	7440-02-0	5.27E-03	AERMOD	3.19E-03	24	2	—	Sch. 6	DAV	—	Below DAV	Unit Run		
Nickel	7440-02-0	5.27E-03	AERMOD	3.08E-04	Annual	0.4	—	—	AAV	—	Below AAV	Unit Run		
Nitrate	14797-55-8	2.08E-01	AERMOD	3.85E-01	24	0.62	—	—	Previously Approved MAXGLC	—	Below Previously Approved MaxGLC	Unit Run		
Nitrogen Oxides	10102-44-0	1.19E+02	AERMOD	3.36E+01	24	200	Health	Sch. 3	Standard	B1	17%	Nitrogen Oxides	ACB List (Notes 2, 17)	v2
Nitrogen Oxides	10102-44-0	1.19E+02	AERMOD	1.42E+02	1	400	Health	Sch. 3	Standard	B1	36%	Nitrogen Oxides	ACB List (Notes 2, 17)	v2
PCBs	1336-36-3	1.76E-04	AERMOD	5.68E-05	24	0.15	Health	Sch. 3	Guideline	B1	<1%	Unit Run	ACB List (Note 8a)	v2
Phenanthrene	85-01-8	9.06E-03	AERMOD	2.90E-03	24	0.1	—	—	De Minimus	—	Below De Minimus	Unit Run		
Phosphorus	7723-14-0	1.29E-01	AERMOD	6.86E-02	24	0.5	Health	Sch. 3	SL-MD	B2	Below B2	Unit Run		
Potassium	7440-09-7	8.15E-01	AERMOD	1.51E+00	24	2.42	Health	Sch. 3	Previously Approved MAXGLC	—	Below Previously Approved MaxGLC	Unit Run		v2
Pyrene	129-00-0	9.97E-05	AERMOD	3.22E-05	24	0.1	—	—	De Minimus	—	Below De Minimus	Unit Run		
Selenium	7782-49-2	7.92E-03	AERMOD	1.64E-02	24	10	Health	Sch. 3	Guideline	B1	<1%	Unit Run		v2
Silicon	7440-21-3	6.67E+00	AERMOD	3.53E+00	24	27	Health	Sch. 3	SL-PA	B2	Below B2	Unit Run		
Sodium	7440-23-5	1.36E+00	AERMOD	1.83E+00	24	5.39	—	—	Previously Approved MAXGLC	—	Below Previously Approved MaxGLC	Unit Run		
Sulfate	14808-79-8	4.69E+00	AERMOD	2.00E+00	24	2.36	—	—	Previously Approved MAXGLC	—	Below Previously Approved MaxGLC	Unit Run		
Sulfur trioxide	7446-11-9	2.23E+00	AERMOD	1.07E+00	24	5	Health	Sch. 3	SL-JSL	B2	Below B2	Sulfur trioxide		v2

Contaminant	CAS No.	Total Facility Emission Rate [g/s]	Air Dispersion Model Used (1)	Maximum POI Concentration [µg/m³]	Averaging Period	Ministry POI Limit [µg/m³]	Limiting Effect	Schedule	Source	Benchmark	Percentage of Ministry Limit [%]	Model Run Name	Notes	Version of ACB List (2)
Sulphur dioxide	7446-09-5	1.36E+01	AERMOD	3.84E+00	24	275	Health & Vegetation	Sch. 3	Standard	B1	1%	Sulphur dioxide	ACB List (Effective until July 1, 2023, Note 2, URT - Note 4, Table 4)	v2
Sulphur dioxide	7446-09-5	1.36E+01	AERMOD	1.61E+01	1	690	Health & Vegetation	Sch. 3	Standard	B1	2%	Sulphur dioxide	ACB List (Effective until July 1, 2023, Note 2, URT - Note 4, Table 4)	v2
SPM	N/A	2.01E+01	AERMOD	3.52E+01	24	120	Visibility	Sch. 3	Standard	B1	29%	SPM		v2
Tin	7440-31-5	1.29E-01	AERMOD	6.03E-02	24	10	Health	Sch. 3	Standard	B1	<1%	Unit Run		
Tungsten	7440-33-7	4.56E-01	AERMOD	1.54E+00	24	5	Health	—	SL-JSL	B2	Below B2	Unit Run		
Zinc	7440-66-6	4.68E-01	AERMOD	1.55E+00	24	120	Particulate	Sch. 3	Standard	B1	1%	Unit Run		

Notes:
1. AERMOD v.19191 was used for all contaminants
2. v2 = Version 2.0 - April 2018
3. "SL-JSL" = Screening Limit - Jurisdictional Screening Limit, "SL-MD" = Screening Limit - Ministry-derived,"SL-PA" = Screening Limit - Previously Accepted", "URT" = Upper Risk Threshold, "DAV" = Daily Assessment Value, "AAV" = Annual Assessment Value, "Previously Approved MAXGLC" = Previously Approved Limit using the Maximum Ground Level Concentration Assessment submitted with the ECA Amendment.

Table II: Emission Summary Table – Transitional Operating Conditions

Contaminant	CAS No.	Total Facility Emission Rate [g/s]	Air Dispersion Model Used (1)	Maximum POI Concentration [µg/m³]	Averaging Period	Ministry POI Limit [µg/m³]	Limiting Effect	Schedule	Source	Benchmark	Percentage of Ministry Limit [%]	Model Run Name	Notes	Version of ACB List (2)
Carbon Monoxide	630-08-0	1.79E+02	AERMOD	2.18E+02	½	6000	Health	Sch. 3	Standard	B1	4%	Carbon Monoxide	ACB List (Note 9)	v2
Nitrogen Oxides	10102-44-0	2.17E+02	AERMOD	6.61E+01	24	200	Health	Sch. 3	Standard	B1	33%	Nitrogen Oxides	ACB List (Notes 2, 17)	v2
Nitrogen Oxides	10102-44-0	2.17E+02	AERMOD	2.72E+02	1	400	Health	Sch. 3	Standard	B1	68%	Nitrogen Oxides	ACB List (Notes 2, 17)	v2
Sulphur dioxide	7446-09-5	1.79E+02	AERMOD	6.23E+01	24	275	Health & Vegetation	Sch. 3	Standard	B1	23%	Sulphur dioxide	ACB List (Effective until July 1, 2023, Note 2, URT - Note 4, Table 4)	v2
Sulphur dioxide	7446-09-5	1.79E+02	AERMOD	2.40E+02	1	690	Health & Vegetation	Sch. 3	Standard	B1	35%	Sulphur dioxide	ACB List (Effective until July 1, 2023, Note 2, URT - Note 4, Table 4)	v2
SPM	N/A	2.47E+01	AERMOD	3.52E+01	24	120	Visibility	Sch. 3	Standard	B1	29%	SPM		v2

Notes:

1. AERMOD v.19191 was used for all contaminants
2. v2 = Version 2.0 - April 2018

EMISSION SUMMARY AND DISPERSION MODELLING REPORT CHECKLIST

Company Name:	Lehigh Hanson Materials Limited
Company Address:	1370 County Rd 49, Prince Edward, ON
Location Facility	1370 County Rd 49, Prince Edward, ON

The attached Emission Summary and Dispersion Modelling Report was prepared in accordance with s.26 of O. Reg. 419/05 and the guidance in the MECP document "Procedure for Preparing an Emission Summary and Dispersion Modelling Report" dated March 2018 and "Air Dispersion Modelling Guideline for Ontario" dated February 2017 and the minimum required information identified in the check-list on the reverse of this sheet has been submitted.

Company Contact:	
Name:	Nick Papanicolaou
Title:	Environmental Manager
Phone Number:	613-438-0361
Signature:	
Date:	November 24, 2022

Technical Contact:	
Name:	Jeff Zywicki
Representing:	Golder Associates Ltd.
Phone Number:	613-592-9600 ext. 3253
Signature:	
Date:	November 24, 2022

	Required Information			
			Submitted	Explanation/ Reference
	Executive Summary and Emission Summary Table			
	1.1	Overview of ESDM Report	☒ Yes	Executive Summary
	1.2	Emission Summary Table	☒ Yes	Table I
1.0	**Introduction and Facility Description**			
	1.1	Purpose and Scope of ESDM Report	☒ Yes	Section 1.1
	1.2	Description of Processes and NAICS code(s)	☒ Yes	Section 1.2
	1.3	Description of Products and Raw Materials	☒ Yes	Section 1.3
	1.4	Process Flow Diagram	☒ Yes	Section 1.4
	1.5	Operating Schedule	☒ Yes	Section 1.5
2.0	**Initial Identification of Sources and Contaminants**			
	2.1	Sources and Contaminants Identification Table	☒ Yes	Section 2.1
3.0	**Assessment of the Significance of Contaminants and Sources**		☒ Yes	
	3.1	Identification of Negligible Contaminants and Sources	☒ Yes	Section 3.1
	3.2	Rationale for Assessment	☒ Yes	Section 3.3
4.0	**Operating Conditions, Emission Estimating and Data Quality**			
	4.1	Description of operating conditions, for each significant contaminant that results in the maximum POI concentration for that contaminant	☒ Yes	Section 4.1
	4.2	Explanation of Method used to calculate the emission rate for each contaminant	☒ Yes	Section 4.3
	4.3	Sample calculation for each method	☒ Yes	Section 4.4
	4.4	Assessment of Data Quality for each emission rate	☒ Yes	Section 4.5
5.0	**Source Summary Table and Property Plan**			
	5.1	Source Summary Table* – sorted by sources	☒ Yes	Table 2a and 2b
	5.2	Source Summary Table* – sorted by contaminant	☐ Yes	N/A as Source Summary Table sorted by sources provided
	5.3	Site Plan (scalable)	☒ Yes	Figure 1
	5.4	A scalable roof layout indicating discharge locations and air intakes	☒ Yes	Figure 4
6.0	**Dispersion Modelling**			
	6.1	Dispersion Modelling Input Summary Table	☒ Yes	Table 3
	6.2	Land Use Zoning Designation Plan	☒ Yes	Figure 2
	6.3	Dispersion Modelling Input and Output Files	☒ Yes	Appendix F
7.0	**Emission Summary Table and Conclusions**			
	7.1	Emission Summary Table	☒ Yes	Section 7.1, Table 5a and 5b
	7.2	Assessment of Contaminants with no MECP POI Limits	☒ Yes	Section 7.3

PIBS 5357e * This checklist is taken from the document titled “Procedure for Preparing an Emission Summary and Dispersion Modelling Report” dated February 2017

	Required Information			
			Submitted	Explanation/ Reference
	7.3	Assessment Values (if contaminants with Annual Standards are emitted – see Technical Bulletin - Methodology For Using “Assessment Values” For Contaminants With Annual Air Standards under O. Reg. 419/05)	☒ Yes	Section 7.4
	7.4	Conclusions	☒ Yes	Section 8.0
	Appendices			
	Assessment of Frequency of Exceedances (if applicable) (see section 30 requirements for URTs and section 33 requirements for site-specific standards)		☐ Yes	
	Assessment of Frequency of Exceedances (if applicable) (see Technical Bulletin - Methodology For Using “Assessment Values” For Contaminants With Annual Air Standards under O. Reg. 419/05		☐ Yes	
	Appendix A – Modification Log		☒ Yes	
	Appendix B – Emission Rate Calculations		☒ Yes	
	Appendix C – Supporting Information for Negligibility		☒ Yes	
	Appendix D – Supporting Information for Emission Rate Calculations		☒ Yes	
	Appendix E – Supporting Information for Dispersion Modelling		☒ Yes	
	Appendix F – Dispersion Modelling Files		☒ Yes	
	Appendix G – Transitional Operating Conditions		☒ Yes	
	Appendix H – ALCF Emission Increase Methodology		☒ Yes	
	Appendix I – Lehigh Supporting Documents		☒ Yes	
	Appendix J – In-stack Limit Comparison		☒ Yes	
	Appendix K – Emission Rate and Maximum POI Concentration Comparison with and without ALCFs		☒ Yes	

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APPENDICES

1.0 INTRODUCTION AND FACILITY DESCRIPTION

Lehigh Hanson Materials Limited (Lehigh) operates a cement manufacturing facility located at 1370 County Rd 49, Picton, Ontario (the Facility).

The location of the Facility is presented in Figure 1 – Site Location Plan and the land use designation of the site and surrounding area is presented in Figure 2 – Land Use Zoning Designation Plan.

1.1 Purpose and Scope of ESDM Report

This Emission Summary and Dispersion Modelling (ESDM) Report was prepared to support an application for an amendment to Environmental Compliance Approval (ECA) with Limited Operational Flexibility (LOF) for air and noise under Part II.1 of the *Ontario Environmental Protection Act* (EPA) for Lehigh Hanson Materials Limited (Lehigh) cement manufacturing facility located at 1370 Highway 49, Picton, Ontario (the Facility). Lehigh is undertaking efforts to use Alternative Low Carbon Fuels (ALCFs) to supplement the energy required to make Portland Cement at their Facility. ALCFs are in use in many cement plants all over the world and represent a proven to reduce greenhouse gas emissions. The Facility currently operates under ECA Number 0073-BHGQHC, issued October 31, 2019.

Lehigh has prepared an application under Part II.1 of the Ontario Environmental Protection Act (EPA) to amend the existing ECA, to allow for a Non-Demonstration (Permanent) Project to use ALCFs at the Site, satisfying Ontario Regulation (O. Reg.) 79/15 (as amended by O. Reg. 54/21 and 824/21) (the ECA Amendment Application).

As part of the ECA Amendment Application, Lehigh is requesting approval to for the following:

- An ALCF daily throughput of up to 200 tonnes per day, which may include the following materials:
  - Construction & Demolition (C&D) Materials; including but not limited to primarily wood material with minor amounts of non-recyclable paper and plastic.
  - Industrial, Commercial, and Institutional (IC&I) Materials; including but not limited to primarily non-recyclable paper, plastic and textiles wood material, and tire fibre and fluff.
  - The combustible fraction of non-recyclable household waste (commonly referred to as Refuse Derived Fuel [RDF]).
  - Discarded treated seed.
- Installation of new conveyance and storage equipment for ALCFs at the site using enclosed containers and buildings.
- Renew the LOF condition 2.1 of ECA Number 0073-BHGQHC, which expires on July 1, 2023.

The Site will target approximately 33% thermal replacement by using mixtures of ALCFs to replace petroleum coke and coal. The above noted ALCFs would meet the following criteria to satisfy the fuel requirements of O. Reg. 79/15:

- be used as mixtures of non-recyclable and non-odorous materials;
- not be derived from or composed of any material set out in Schedule 1 of O. Reg. 79/15;

- wholly derived from or composed of materials that are biomass, municipal waste, or a combination of both; and
- have a high heat value of at least 10 megajoules per kilogram

The contents of this ESDM Report satisfy the requirements of s.26 of O. Reg. 419/05. In addition, guidance in the Ontario Ministry of the Environment, Conservation and Parks (the Ministry) publication "*Guideline A-10: Procedure for Preparing an Emission Summary and Dispersion Modelling (ESDM) Report, Version 4.1"*, dated March 2018 (ESDM Procedure Document) PIBS 3614e04.1 was followed, as appropriate.

The Facility is being assessed to s.20 of O. Reg. 419/05; therefore, the Facility's assessment of compliance was performed using version 19191 of the AERMOD dispersion model and its pre-processors to demonstrate compliance with the schedule 3 standards of O. Reg. 419/05.

The information provided in this report could be used to derive proprietary information on Lehigh as well as production numbers at the facility. This information is thus considered to be a trade secret and of a proprietary nature by Lehigh. It is therefore requested that it be held in confidence and not released to anyone outside of the review procedure without prior consent of Lehigh. This request relies on Section 17 of the Ontario Freedom of Information and Protection of Individual Privacy Act.

As outlined in the Version Control section, this is the sixth version of this ESDM Report. A modification log is included in Appendix A to document future revisions to the ESDM Report.

1.2 Description of Processes and NAICS Code(s)

Lehigh manufactures cement. A quarry is located adjacent to the cement plant in which raw materials (limestone and shale) are extracted. These raw materials are transferred to the plant by truck and either fed directly to the primary crusher or stockpiled nearby the crusher (and later fed to the crusher). Once the limestone is crushed to less than eight (8) inches in diameter, it is fed to a grinder. There are mills which are used to produce various grades of cement by grinding clinker and gypsum. Cement and clinker are sent-off site by ship with a small percentage by truck.

There are also support operations at the Facility, namely: comfort heating (both natural gas and oil), ventilating and air conditioning equipment, and a welding shop in which majority (70%) of the maintenance welding occurs with the remaining welding occurring throughout the plant.

Product usages and process information are provided in detail in Appendix B – Emission Rate Calculations. Table 1 – Sources and Contaminants Identification Table contains a summary of the individual sources of emissions at the Facility.

The North American Industry Classification System (NAICS) code that best applies to the Facility is 327310 (cement manufacturing).

1.3 Description of Products and Raw Materials

The following sections describe the process flow and equipment used in the clinker and cement manufacturing process.

Raw Material Receiving

Limestone makes up the majority of the raw materials within cement manufacturing, which is quarried on site. Other raw materials include low sulfur coal (LSC), petcoke, gypsum (anhydride and crude), silica, iron, alumina, and blended additives, which are shipped to the site.

The Facility is requesting to use up to 200 tonnes per day of alternative low-carbon fuels to displace approximately 33% of LSC or petcoke to fuel the process kiln on a thermal basis.

Raw Materials Storage and Transfers

Limestone from the quarry is loaded onto trucks and travels under Highway 49 via a tunnel, where the limestone is unloaded directly into the primary crusher or unloaded for temporary storage. Once the limestone experiences primary crushing, the material is conveyed into an enclosed building to the secondary crusher.

Raw Mill

After the secondary crusher, the material is conveyed for storage or conveyed directly to the raw mills where it is blended with other additives (silica, iron, alumina and other additives), dried using the kiln exhaust and natural gas dryers, and sized to form the raw meal prior to conveyance to the kiln.

Kiln 4 and Kiln 4 Bypass

The purpose of the kiln is to convert the raw meal into clinker through a process referred to as pyroprocessing (i.e., heating the material to temperatures greater than 1,400˚C). The high temperatures of the kiln cause the ingredients in the raw meal to form clinker.

Kiln 4 is a preheater style kiln equipped with an electrostatic precipitator (ESP) and currently relies on a fuel mixture of LSC, petcoke, and some natural gas. The rotation speed of the kiln is controlled to gradually move the raw materials towards the burning zone (flame end and outlet of clinker) which provides a long residence time ensuring complete combustion/calcination.

The first step in the clinker manufacturing process is to convey the raw meal from the raw meal storage to the top of the preheater tower where heat exchange between the raw meal and hot kiln gases allows for the calcination process; the liberation of carbon dioxide (CO_2) from the calcium carbonate (limestone) produces the active ingredient in the chemical process – Lime (CaO). Fuel addition located at the kiln riser utilizes approximately 25% of the thermal load requirement and is used to manage the temperatures in the pre-heat tower and concurrently the degree of calcination.

Once the raw meal completes the preheating stage, it enters the inlet of the kiln (feed end) of the sloped rotary kiln for direct firing. The fuel for the kiln, the remaining 75% of the thermal load, is introduced at the lower end (outlet of clinker) of the kiln which is equipped with a burner (flame end). This design creates a counter-current flow with the raw meal and the fuel combustion gases. As the kiln turns, the raw meal is conveyed towards the flame end and the fuel combustion gases are exhausted through the preheater through an evaporative cooling gas conditioning tower, the vertical raw mills and then to dust collection in the ESP. The fuel combustion gases in the kiln will reach temperatures in excess of 1,800˚C.

To manage the volatile cycle of some compounds in the kiln, Lehigh employs a bypass stack. Under normal operating conditions, approximately 97% of the flue gases from the kiln pass through the pre-heater and raw mill and are exhausted through the ESP and Kiln 4 main stack, while the remaining 3% of the kiln flue gases goes through the bypass system (i.e., “bypassing” the preheater, raw mills and the ESP on the Kiln 4 main stack). The purpose of the bypass system is to remove volatile components (e.g., chlorine) from the kiln system as they accumulate in a volatile cycle, changing state from gas to solid at temperatures within the kiln and pre-heat tower. The bypass utilizes a quench fan condensing the volatile components into the bypass kiln dust. The chemical reactions and physical processes under high temperatures and with a long residence time transform the raw meal into clinker. The high temperatures, long residence times and the oxidizing atmosphere in the kiln system result in the complete destruction of the organic components of the fuels (conventional/ALCF) and raw materials. The clinker formed inside the kiln retains the majority of the inorganic components of the fuels and raw materials including heavy metals. The active ingredient, lime, produced in the pre-heater tower and kiln is an inherent scrubber capturing volatile compounds and forming them into clinker compounds.

The Facility also uses a Selective Non-Catalytic Reduction (SNCR) ammonia solution injection system to reduce nitrogen oxides emissions and employs hydrated lime injection to reduce sulphur dioxide emissions from the kiln 4 stack.

The Facility uses a continuous emissions monitoring (CEM) system to monitor emissions from the main stack and bypass stack on kiln 4, including nitrogen oxides (NO_x), sulphur dioxide (SO_2), carbon monoxide (CO) and suspended particulate matter (SPM) at all times. At this time, Kiln 3 is not in operation and there is no plan to operate this kiln in the future.

Petcoke and Low Sulphur Coal Receiving and Grinding

The Facility receives petcoke and LSC via boats where it is unloaded and stored near shore. The petcoke and LSC is loaded into trucks where it is unloaded at the coal mill prior to being conveyed to Kiln 4.

ALCF Receiving and Storage

This ESDM update includes the proposed use of ALCFs at the Facility. Lehigh is proposing to use up to 200 tonnes per day of ALCFs (as identified in section 1.1 of this ESDM Report) which includes the installation of a proposed ALCF storage building and covered conveyance equipment.

ALCFs will be delivered by enclosed trucks, which would enter the proposed fuel storage building. To minimize potential for fugitive emissions from the unloading of the ALCFs once received at the Facility, material will be unloaded directly from the truck into the ALCF building.

The ALCF materials may require further size reduction to be fed as a fuel and blending to ensure consistency in the fuel feed. This is accomplished through loading the material into a de-lumper. Materials would then be fed via conveyor to the ALCF feed hopper of the fuel delivery system.

The fuel preparation and handling system will include the following:

1) An in-feed drag conveyor to a de-lumper to ensure appropriate particle sizes are achieved and to blend materials.

1) A drum or belt magnetic separator.

2) An enclosed conveyor to transfer materials to the hopper for the ALCF feeding system.

3) An ALCF feeding system, electronically controlled, and specifically designed to handle light and low bulk density materials.

Clinker Storage and Transfer

Once the clinker has cooled, it is conveyed to the clinker storage hall. Some of the clinker is loaded onto trucks and sent off-site as bulk clinker. The remainder is conveyed to the Cement Mill where it is milled and blended to form cement.

Cement Mills

At the Cement Mill, the clinker undergoes grinding and blending with other materials (e.g., limestone, gypsum, silica fumes, fly ash and other cement) to produce the various grades of cement.

Finished Cement

The finished cement is stored in one of several cement silos. The cement may be loaded on trucks to be sent off site or conveyed to be packaged in the Cement Packaging Area. Silo filling and unloading dust emissions will be controlled by dust collectors.

This ESDM also includes the proposed conversion of the existing clinker dome to a finished cement dome, which will be equipped with various enclosed conveyance equipment (including pneumatic conveyance) and dust collection.

1.4 Process Flow Diagram

Process flow diagrams of the processes described in Section 1.3 are provided in Figures 3a to 3f.

1.5 Operating Schedule

The Facility operates 24 hours a day, seven days a week, up to 52 weeks per year, with the main facility hours from 7 am to 7 pm. Blasting occurs two days per week at 2 pm, with two blasts occurring for 10 minutes each on blasting days.

1.6 Facility Production Limit

The Facility is requesting a production limit of 1.4 million tonnes annually of cement clinker which is based on Kiln 4 operating at 163 tonnes per hour, 24 hours per day for 365 days per year.

Additionally, Lehigh is requesting a maximum usage of 200 tonnes of ALCFs per day to fuel the kiln.

1.7 Summary of Modifications

A full list of modifications since the last ESDM (the Original ESDM), dated February 15, 2018, that was submitted with the last ECA Application in February 2018 is provided in Appendix A. The key changes since the last submission include:

- Assessments of proposed ALCFs
- Conversion of clinker dome to a cement dome (the Cement Dome Project)
- Assessment of the ammonia injection control as part of the pre-existing selective catalytic non-reactive (SNCR) system on Kiln 4 to reduce NOx emissions.
- Removal of Kiln 3 and it’s associated sources

Appendix A documents all changes to the ESDM since the Original ESDM.

2.0 INITIAL IDENTIFICATION OF SOURCES AND CONTAMINANTS

2.1 Sources and Contaminants Identification Table

Table 1 – Sources and Contaminants Identification Table includes all the emission sources at the Facility. The expected contaminants emitted from each source are also identified in Table 1. Each of the identified sources has been assigned a source reference number.

There may be general ventilation from the Facility that only discharges uncontaminated air from the workspaces or air from the workspace that may include contaminants that come from commercial office supplies, building maintenance products or supplies and activities; these types of ventilation sources are considered to be negligible and were not identified as sources at the Facility. General ventilation located in the process area that does not vent process emissions is also considered to be negligible.

The process activities at the Facility can be separated into four main emission source groups. These include:

- Quarry Operations
- Clinker Production
- Cement Production
- Ancillary Operations

The primary compounds emitted from production are suspended particulate matter (SPM), products of combustion and metals. Emission estimates were calculated using Ministry approved methods. These include mass balance calculations, emission factor calculations, and engineering calculations. Detailed emission calculations for each source are provided in Appendix B. A detailed summary of sources and contaminants is provided in Table 1 – Sources and Contaminants Identification Table.

Source groups and potential contaminants associated with these sources are summarized in the table below.

Table III: Expected Contaminants from the Facility

<table>
<tr><th rowspan="2">Source Group</th><th rowspan="2">Activity</th><th rowspan="2">Individual Sources</th><th colspan="3">Expected Contaminants</th></tr>
<tr><th>SPM</th><th>Metals</th><th>Combustion Products</th></tr>
<tr><td rowspan="3">Quarry Operations</td><td>Drilling</td><td>▪ Drilling</td><td>✓</td><td></td><td rowspan="3">✓</td></tr>
<tr><td>Blasting</td><td>▪ Blasting</td><td>✓</td><td></td></tr>
<tr><td>Material Transfers & Storage</td><td>▪ Material transfers & storage</td><td>✓</td><td></td></tr>
<tr><td rowspan="2">Clinker Production</td><td>Material Transfers</td><td>▪ Raw material receiving/storage
▪ Petcoke/gypsum unloading from ship
▪ Additive drop to piles
▪ Clinker drop to piles & out loading to sales
▪ Fuel drop into feed hopper</td><td>✓
✓
✓
✓
✓</td><td></td><td></td></tr>
<tr><td>Clinker Production</td><td>▪ Kiln 4 with ESP
▪ Kiln 4 by-pass with baghouse
▪ Slag dryer</td><td>✓
✓
✓</td><td>✓
✓</td><td>✓
✓</td></tr>
</table>

Source Group	Activity	Individual Sources	Expected Contaminants		
			SPM	Metals	Combustion Products
Cement Production	Storage & Transfers	■ Outdoor Storage Piles	✓		
		■ Paved and Unpaved Roads	✓		
	Cement Grinding	■ 8 Mill stacks	✓		
		■ Primary & secondary crushing	✓		
Ancillary Operations	Ancillary Operations	■ Maintenance (Parts Washer)	✓	✓	✓
		■ Welding	✓		
		■ Comfort Heating	✓		
		■ Paved and Unpaved Roads	✓		

3.0 ASSESSMENT OF THE SIGNIFICANCE OF CONTAMINANTS AND SOURCES

Contaminants and sources at the Facility were assessed for significance following the guidance outlined in the ESDM Procedure Document.

3.1 Identification of Negligible Contaminants and Sources

Contaminants that are discharged from the Facility in a negligible amounts and/or sources that discharge a contaminant in a negligible amount were excluded from further analysis. The rationale for these exclusions are provided below. Of the sources listed in Table 1 – Sources and Contaminants Identification Table, several sources have been identified as negligible. Similarly, some contaminants from the sources that are considered significant have been deemed negligible. These contaminants are listed in Appendix C – supporting information for Assessment of Negligibility.

There are two primary methods to classify sources as negligible: Table B-3A Sources of the ESDM Guidance document, and sources that are insignificant relative to total emissions.

The following sources are listed in Table B-3A of the ESDM Procedure document, thus for the purposes of this assessment are considered negligible:

- Parts washers in maintenance shop
- Small maintenance and janitorial activities
- Quality assurance and quality control fume hoods
- On-site storage tanks for fueling of on-site vehicles

The following sources were considered negligible as they have emissions in negligible amounts (<1% of the total facility emissions for specific contaminants), with the cumulative emissions from all negligible sources to be less than 5% of total facility emissions:

- Maintenance welding
- Comfort heating equipment
- Dust Collector associated with cement dome conversion

Additionally, the Facility operates with a Best Management Practices Plan (BMPP) and as per section 7.4 of the ESDM Procedure Document, fugitive dust emissions from roads and outdoor storage piles have been excluded from the dispersion modelling analysis.

3.2 Identification of Significant Contaminants Using an Emission Threshold

The list of negligible contaminants was identified using the Emission Threshold calculation in s.7.1.2 of the ESDM Procedure Document and can be found in Appendix C – Assessment of Negligibility. These contaminants were excluded from the dispersion modelling analysis.

As per the ESDM Procedure Document, contaminants that are emitted from a specific facility may be identified as negligible when they are below the emission thresholds that are developed using the following formula:

$$Emission\ Threshold\ \left(\frac{g}{s}\right) = \frac{0.5\ x\ Ministry\ POI\ Limit\ \frac{\mu g}{m^3}}{Dispersion\ Factor\ (\frac{\mu g}{m^3}\ per\ \frac{g}{s})}$$

The dispersion factor selected for the Facility was the Ministry's rural dispersion factor of 2800 (µg/m^3 per g/s emission) for a distance from source of 200 m and based on a 1-hour averaging period. This dispersion factor was developed by the Ministry using a series of conservative modelling factors for a short stack on a 6 m tall building and can be found in Table B-1 of the ESDM Procedure Document. The Facility has a mix of short and tall stacks; however, most of the non-negligible sources are located much greater than 200 m away from the nearest point of impingement (POI) locations and are either located much higher than 6 m above ground or on buildings that are much higher than 6 m. For contaminants that had Ministry POI that are not based on 1-hour averaging periods, the conversion to the appropriate averaging periods was completed using the Ministry recommended conversion factors, as documented in the Ministry *publication "Guideline A-11: Air Dispersion Modelling Guideline for Ontario, Version, 3.0"*, dated February 2017 (ADMGO) PIBS 5165e03.

Of the 92 contaminants assessed, 42 were considered negligible using the Emission Threshold calculation. The remaining 50 contaminants were carried forward into the dispersion modelling analysis and the results are presented in Table 5a and 5b. For a list of contaminants considered negligible using this method, please refer to Table C1 in Appendix C

3.3 Rationale for Assessment

For each source and contaminant that has been deemed negligible, information required to substantiate this classification, including references to Ministry guidance where applicable, is provided in Table 1 / Appendix C – Supporting Information for Assessment of Negligibility.

In accordance with s.8 of O Reg. 419/05, emission rate calculations and dispersion modelling does not have to be performed for emissions from negligible sources. The emissions of negligible contaminants are included in the emission rate calculations; however, are excluded from the dispersion modelling assessment.

4.0 OPERATING CONDITIONS, EMISSION ESTIMATING AND DATA QUALITY

4.1 Description of Normal Operating Conditions

Section 10 of O. Reg. 419/05 states that an acceptable operating condition is a scenario in which operating conditions for the Facility would result, for the relevant contaminant, in the highest concentration of the contaminant possible at the point of impingement (POI).

The maximum emission scenario for the dispersion modelling analysis includes all sources at the Facility operating simultaneously at their respective maximum rates. The following table outlines the maximum rates for each significant source of emissions as assessed herein (as indicated in the rationale column of Table 1 appended to this ESDM).

Table IV: Emission Methodology and Rate Summary

Source	Source ID(s)	Model ID(s)	Emissions Methodology	Maximum Rate
Quarry Operations				
Material transfers		QUARRY	EF: AP-42 Ch 13.2.4 Aggregate Handling and Storage Piles	390 tonnes/hour
Material Transfers (Plant)				
Primary Crushing		VFUG4, VFUG4A	EF: AP-42 Ch 13.2.4 Aggregate Handling and Storage Piles	390 tonnes / hour
Secondary Crushing		SECOND	EF: AP-42 Ch 11.19.2 Crushed Stone Processing and Pulverized Mineral Processing	370 tonnes / hour
Raw Material Transfers		COALSHIP	EF: AP-42 Ch 13.2.4 Aggregate Handling and Storage Piles	1 083 tonnes / hour LSC unloading 2 600 tonnes / hour Coke unloading
		COALTD	EF: AP-42 Ch 13.2.4 Aggregate Handling and Storage Piles	29 tonnes / hour LSC outloading 29 tonnes / hour Petcoke outloading
		GYPSHIP	EF: AP-42 Ch 13.2.4 Aggregate Handling and Storage Piles	2 800 tonnes / hour anhydride gypsum unloading 2 800 tonnes / hour crude gypsum unloading
		GYPSUMTD	EF: AP-42 Ch 13.2.4 Aggregate Handling and Storage Piles	65 tonnes / hour Anhydride gypsum outloading 65 tonnes / hour crude gypsum outloading
		MISCDROP	EF: AP-42 Ch 13.2.4 Aggregate Handling and Storage Piles	80 tonnes / hour silica drop to pile 80 tonnes / hour iron drop to pile 80 tonnes / hour alumina drop to pile 200 tonnes / hour additives drop to storage
		CKD	EF: AP-42 Ch 13.2.4 Aggregate Handling and Storage Piles	3 tonnes / hour CKD drop to pile 21 tonnes / hour CKD outloading
		VFUG5	EF: AP-42 Ch 13.2.4 Aggregate Handling and Storage Piles	17 tonnes / hour fuel drop to hopper

Source	Source ID(s)	Model ID(s)	Emissions Methodology	Maximum Rate
Kilns				
Kiln 4 stack with ESP; Loesche Mills		KILN4	EF: AP-42 Ch. 11.6 Portland Cement Manufacturing ST: 2021 Source Testing Program, Wood November 2021 *ALCF Methodology described in Appendix H	163 tonnes/hour of clinker 190 tonnes/hour of raw meal
Kiln 4 Cooler with baghouse		KILN4_C	EF: AP-42 Ch. 11.6 Portland Cement Manufacturing	163 tonnes/hour of clinker
Kiln 4 Bypass Stack with baghouse		KILN4_BP	EF: ESDM Procedure Document Table C-2 EF: AP-42 Ch. 11.6 Portland Cement Manufacturing ST: 2021 Source Testing Program, Wood November 2021 *ALCF Methodology described in Appendix H	20 mg/m^3 for largest baghouse 163 tonnes/hour of clinker
Baghouses				
Raw and Cement Mills (#1 to #8)		SRC3, SRC5 to SRC8, and SRC68	EF: AP-42 Ch. 11.6 Portland Cement Manufacturing	45 to 80 tonne/hour of raw meal or clinker
Primary and Secondary Crushing		SRC11 to SRC13, SRC49	EF: AP-42 Ch. 11.6 Portland Cement Manufacturing	350 to 390 tonnes/hour
Various Baghouses		SRC4, SRC14 to SRC17, SRC19 to SRC29, SRC35, SRC36, SRC42 to SRC48, SRC51, SRC55, SRC58, SRC61 to SRC67, SRCID69	EF: ESDM Procedure Document Table C-2	20 mg/m3 for largest baghouse and 10 mg/m3 outlet loading concentration for the remaining
Clinker Transfers		ClINK1	EF: AP-42 Ch.11.19.2 Crushed Stone Processing and Pulverized Mineral Processing	9 tonne / hour clinker transfer
		ClINK2		9 tonne / hour clinker transfer
		ClINK3		9 tonne / hour clinker transfer
		VFUG6		9 tonne / hour clinker transfer
		VFUG8A		9 tonne / hour clinker transfer
		VFUG8B		163 tonne / hour clinker transfer
		VFUG11		163 tonne / hour clinker transfer
		VFUG12		188 tonne / hour clinker transfer

Notes: EF= emission factor, ST = Source Testing

The averaging periods for the maximum rates provided in the above table were selected based on the averaging periods for the Ministry POI Limits of the significant contaminants emitted from each source. The use of the above maximum rates to estimate emission rates of contaminants for each emission source results in an operating condition which satisfies section 10 of O. Reg. 419/05. More details on the maximum operating rates are provided in Appendix B – Emission Rate Calculations.

4.2 Description of ALCF Emission Rate Estimates

The emissions from the use of ALCFs have the potential to be emitted from the Kiln 4 main stack and the Kiln 4 Bypass stack. These stacks emit process combustion air from the kiln. All material handling activities related to ALCFs will occur in an enclosed building with no expectation of emissions.

A detailed explanation of how Kiln 4 and Kiln 4 Bypass emissions rates with the use of ALCFs have been assessed is presented in Appendix H – ACLF Emission Increase Methodology and summarized below.

With the use of ALCFs, the two types of contaminant groups that are anticipated to have the potential for a non-negligible change are the target reduction of non-biogenic CO_2 and the potential increase of trace inorganic metals and chlorinated compounds as they can have higher concentrations in the ALCFs when compared to LSC or petcoke.

The potential increases in emissions of trace organic metals and chlorinated compounds emissions from the use of ALCFs were estimated by comparing the composition of the ALCFs with LSC and petcoke (i.e., assessing the changes in contaminant inputs into the kiln). This was carried out so that a mass balance increase in emission rate could be estimated for the contaminants that have greater concentrations in the ALCFs than LSC and petcoke.

Lab analysis for these contaminants was carried out on the LSC, petcoke, and the four ALCFs under consideration for use in the process kiln. Of the 39 contaminants that were analyzed, 16 contaminants were found to have higher concentrations in LSC or petcoke and were excluded from further assessment. The 23 remaining contaminants that were found to have higher concentrations in one of the four ALCFs were assessed and an estimated increase in emission rate was applied to the Kiln 4 Bypass Stack. Please refer to Appendix H to see how the percentage increase based on mass balance was calculated and please refer to Appendix B (Source ID 4 – Kilns) to see how the emission rate was scaled.

Several metals analyzed are considered non-volatile or semi-volatile and will not be emitted from the kiln (KILN4) as a result of fuel combustion. This is due to the expectation that these contaminants will condense and re-circulate in the pre-heater and kiln and eventually be contained in the clinker matrix as per section 1.3.4.7 of the EU BAT (2013)[1] and in consultation with Lehigh process engineers. The six contaminants that would not be bound in the clinker matrix had an estimated increase in emission rate applied to them from the kiln. A complete description of the methods used to estimate the increased emission rates from using ALCFs to fuel the kiln is provided in Appendix H. A summary of the number of contaminants from the ALCFs and how they have been assessed is presented in the table below.

[1] Frauke Schorcht et al., Best Available Techniques (BAT) Reference Document for the Production of Cement, Lime and Magnesium Oxide, 2013

Table V: ALCF Contaminant Screening Summary

Contaminant Category	Number of Contaminants	Contaminants
Contaminants from ALCFs assessed	39	Trace Metals/inorganics
Contaminants from ALCFs with higher concentrations in LSC or petcoke (screened out from the assessment)	16	Aluminum, beryllium, boron, fluorine, lithium, molybdenum, nickel, potassium, selenium, silicon dioxide, strontium, sulfur, thallium, uranium, vanadium, and yttrium
Contaminants from ALCFs with higher concentrations in one of the four ALCFs	23	Antimony, arsenic, barium, bismuth, cadmium, calcium, chlorine, chromium, cobalt, copper, iron, lead, magnesium, manganese, mercury, phosphorous, silicon, silver, sodium, tin, titanium, tungsten and zinc
Contaminants from ALCFs with increased emission rates applied to the Kiln 4 bypass stack	23	Antimony, arsenic, barium, bismuth, cadmium, calcium, chlorine, chromium, cobalt, copper, iron, lead, magnesium, manganese, mercury, phosphorous, silicon, silver, sodium, tin, titanium, tungsten and zinc
Contaminants from ALCFs with increased emission rates applied to Kiln 4**	6	Chlorine, cobalt, mercury, phosphorous, tin and silicon

Notes: ** 17 contaminants were screened out from Kiln 4 due to them being non-volatile, refractory or semi-volatile. Please refer to appendix H for more information.

4.3 Description of Transitional Operating Conditions

An assessment of the transitional operating conditions (TOC) in accordance with the requirements of s.10 of O. Reg. 419/05 has been considered for the Facility. The assessment was limited to estimating emissions of nitrogen oxides, sulphur dioxides, carbon monoxide and SPM from the Facility's continuous emissions monitoring system (CEMS) on the KILN4 and KILN4_BP sources for the 2018 (SPM) and 2021 years (NOx, SO_2, CO).

During start-up and shutdown of Kiln 4 and supporting mills, the Facility can experience spikes in NOx, SO_2, CO and SPM. The Facility will not use ALCFs to fuel the kiln during start-up or shutdown.

A summary of the CEMS data used to represent the maximum operating scenario during the TOC are included in Appendix G.

4.4 Explanation of the Methods Used to Calculate Emission Rates

The maximum emission rates for each significant contaminant emitted from the significant sources were estimated in accordance with requirements of s.11 of O.Reg.419/05 and the ESDM Procedure Document. These rates and methods are summarized in Table 2a and Table 2b appended with this report.

4.5 Sample Calculations

Sample calculations are presented in Appendix B – Emission Rate Calculations. All the emission estimation methods are acceptable methods as outlined in the ESDM Procedure Document. Where the emission rate calculation relies on data that is not readily available, the data are provided in Appendix D – Supporting Information for Emission Rate Calculations. Additionally, Appendix H provides the methods for estimating emissions from the use ALCFs.

The basic equation for calculating emissions is:

$$R = SE * E * (1 - C)$$

Where:

R = estimated mass emission rate in the specified unit

SE = source extent (e.g. production rate, exposed area, distance travelled)

E = uncontrolled emission factor in the specified particle range (i.e. mass of uncontrolled emission per unit of source extent)

C = fractional efficiency of control

4.6 Assessment of Data Quality

As outlined in the ESDM Guidance document, each emission estimate for each significant contaminant must be supported by an assessment of the data quality used to assess emissions.

For each contaminant, the emission rate was estimated, and the data quality of the estimate is documented in Table 2a and Table 2b appended with this report.

4.7 Conservatism of Emission Estimates and Operating Condition

The following assumptions were included in the development of the emission estimates and operating condition for the Facility:

- The highest emission rate that each source is capable of (i.e., maximum usage rates or throughputs) was used to characterize the emissions.
- All sources are assumed to be operating simultaneously at the corresponding maximum emission rate for the averaging period.
- All fuel-fired combustion equipment (i.e., comfort heating and emergency power) emission rates were determined using the highest emission factor, combined with the maximum thermal heat input or engine rating for each piece of equipment.
- The mass balance approach to estimating emissions from the use of ALCFs was very conservative for the following reasons:
  - The maximum contaminant concentration from any of the ALCFs was used to represent any ALCF fuel.
  - For the 23 contaminants that were assessed to be higher in ALCFs in comparison to the displaced LSC and petcoke, the emission rates from Kiln 4 and Kiln 4 Bypass were scaled linearly with the percent increase in concentration of the contaminant in the ACLFs when compared to petcoke or LSC. This is very conservative as it assumes that the emissions from the preheating and calcination of the raw meal (i.e. raw materials that include limestone) are not a significant source of the contaminants, when in reality the raw meal would be a significant source of the contaminants (e.g., calcium oxide and iron) from a mass balance perspective.

- Emission rates for three (iron, sodium and zinc) of the 23 contaminants from the Kiln 4 Bypass Stack were estimated to have increases resulting in emission rates greater than the SPM emission rate as a result of using ALCFs as a fuel. It is not possible for the speciated metal emissions to be greater than SPM; and therefore, emission rates for these contaminants were set equal to the emission rate of SPM. Setting these contaminants equal to the SPM emission rate is very conservative as it assumes that 100% of the SPM emissions are made up of each contaminant when in reality it would be a blend of the main clinker ingredients (clinker and silicates).
- Three (bismuth, magnesium and tungsten) of the 23 contaminants from the Kiln 4 Bypass Stack were not assessed prior to the use of ALCFs and therefore an increase in emission rates could not be estimated. As a result, emission rates for these contaminants were set equal to the emission rate of SPM. Similarly to above, this is very conservative as it assumes that 100% of the SPM emissions are made up of each contaminant
- Silicon was not analysed in the LSC or petcoke and therefore an increase in emission rate could not be estimated. As a result, the emission rate for silicon from Kiln 4 and the Kiln 4 Bypass Stack was set equal to the emission rate of SPM from these sources. Similarly to above, This is conservative as it assumes that 100% of the SPM emissions are made up of silicon.

Based on the conservative assumptions summarized above and detailed in Appendix B – Emission Rate Calculations and Appendix H – ALCF Emission Increase Methodology, the emission rates listed in Table 2a and 2b are not likely to be an underestimate of the actual emission rates.

5.0 SOURCE SUMMARY TABLE AND SITE PLAN

5.1 Source Summary Table

The emission rates for each source of significant contaminants are documented in Table 2a – Source Summary Table (Normal) and Table 2b – Source Summary Table (TOC) in accordance with requirements of sub paragraph 8 of s.26(1) of O. Reg. 419/05.

5.2 Site Plan

The following tables summarizes the required details to be included on the Figures.

Table VI: Required Information on Figures Summary

Criteria	Required Information	Figure
Property Boundary and Coordinates	▪ the property boundary ▪ the co-ordinates for sufficient points on the property boundary to accurately describe the boundary	Figure 1 – Site Location Plan Figure 4 – Emissions Source and Exhaust Location Plan Figure 5 – Dispersion Modelling Plan
Significant Sources	▪ each significant source of significant contaminants (i.e., all stacks)	Figure 4 – Emissions Source and Exhaust Location Plan Figure 5 – Dispersion Modelling Plan
Structures on the Property	▪ the location, dimensions and elevation of every structure on the property	Figure 4 – Dispersion Modelling Plan
On-site Sensitive Receptors	▪ an indication of which structures contain sensitive receptors (if applicable)	Not Applicable

Where reasonable, the location, dimensions, and elevations of only those on-site structures that may affect the dispersion of emissions from significant sources are included.

For ease of reference, each of the sources is labelled with the source reference number in Table 2a and 2b.

The proposed layout of the ALCF buildings and conveyance equipment is indicated on Figure 4 and 5, and the preliminary plot plan of the ALCF equipment is included in Appendix I.

6.0 DISPERSION MODELLING

Dispersion modelling was conducted in accordance with the Ministry *publication "Guideline A-11: Air Dispersion Modelling Guideline for Ontario, Version, 3.0"*, dated February 2017 (ADMGO) PIBS 5165e03.

The Facility is being assessed to s.20 of O. Reg. 419/05; therefore, the modelled impact to POI criteria are required to be assessed using an advanced dispersion model such as AERMOD.

The AERMOD modelling system is made up of the AERMOD dispersion model, the AERMET meteorological pre-processor, the AERMAP terrain pre-processor and the BPIP building downwash pre-processor. The AERMET pre-processor was not used in this assessment; however, the most current version of the appropriate pre-processed Ministry meteorological dataset was used.

The following is a list of the model and pre-processors which were used in this assessment, along with the version numbers of each:

- AERMOD dispersion model (v. 19191)
- AERMAP surface preprocessor (v. v. 18081)
- BPIP building downwash pre-processor (v.04272)

The dispersion modelling was conducted in accordance with the ADMGO and the Ministry technical bulletin *Methodology for Modelling Assessments with 10-Minute Average Standards and Guidelines under O. Reg. 419/05*, dated April 2008 (Ministry Technical Bulletin). A general description of the input data used in the dispersion model is provided below and summarized in Table 3.

The emission rates used in the dispersion model meet the requirements of s.11(1)1 of O. Reg. 419/05, which requires that the emission rate used in the dispersion model be at least as high as the maximum emission rate that the source of contaminant is reasonably capable of for the relevant contaminant. These emission rates are further described in Appendix B – Emission Rate Calculations.

6.1 Dispersion Modelling Input Summary Table

A description of the way in which the approved dispersion model was performed is included as Table 3 – Dispersion Modelling Input Summary Table. This table meets both the requirements of s.26(1)11 and sections 8-17 of O. Reg. 419/05 and follows the format provided in the ESDM Procedure Document.

6.1.1 Dispersion Modelling Source Parameters

The source parameter data required for each source was characterized according to the procedures provided in ADMGO. Furthermore, the dispersion modelling input parameters are summarized in Table 4 – Dispersion Modelling Source Summary Table.

There are 47 point sources, 18 volume sources, and 1 open pit source, as presented in Figure 5 – Dispersion Modelling Plan.

Material handling sources were modeled as volume sources, with initial lateral dimensions, initial vertical dimensions and release heights estimated based on guidance in the National Stone, Sand and Gravel Association document "Modeling Fugitive Dust Sources" (dated 2004) (NSSGA document). The data used to estimate the volume source parameters are provided in Appendix E.

Material transfers occurring within the quarry were modelled as an open pit source. The area of the open pit source was determined by a placing a rectangle of best fit with an equivalent surface area over the pit footprint. The pit depth was provided by Lehigh.

6.2 Land Use Zoning Designation Plan

The land use designation of the site and surrounding area is presented in Figure 2 – Land Use Zoning Designation Plan.

6.3 Coordinate System

The Universal Transverse Mercator (UTM) coordinate system, as per Section 5.2.2 of the ADMGO, was used to specify model object sources, buildings and receptors. All coordinates were defined in the North American Datum of 1983 (NAD83).

6.4 Meteorology and Surrounding Land Use

Sub paragraph 10 of s.26(1) of O.Reg.419/05 requires a description of the local land use conditions if meteorological data, as described in paragraph 2 of s.13(l) of O.Reg.419/05, was used. In this assessment, the AERMOD model was run using Ministry provided site-specific meteorology in accordance with paragraph 3 of s.13(1) of O.Reg.419/05.

6.5 Terrain

Terrain data used in this assessment was obtained from Ministry and include the following:

- cdem_dem_031C

6.6 Receptors

Receptors were chosen based on recommendations provided in Section 7.1 of the ADMGO, which is in accordance with s.14 of O.Reg.419/05. Specifically, a nested receptor grid, centered around the outer edges of all the sources, was placed as follows:

a) 20 m spacing, within an area of 200 m by 200 m

b) 50 m spacing, within an area surrounding the area described in (a) with a boundary at 300 m by 300 m outside the boundary of the area described in (a)

c) 100 m spacing, within an area surrounding the area described in (b) with a boundary at 800 m by 800 m outside the boundary of the area described in (a)

d) 200 m spacing, within an area surrounding the area described in (c) with a boundary at 1,800 m by 1,800 m outside the boundary of the area described in (a)

e) 500 m spacing, within an area surrounding the area described in (d) with a boundary at 4,800 m by 4,800 m outside the boundary of the area described in (a)

In addition to using the nested receptor grid, receptors were also placed every 10 m along the property line in sections of the property line that are within 200 m of an emission source and every 100 m in sections of the property line that are greater than 200 m from an emission source. Only receptors located outside of the property line were considered. The area of modeling coverage is illustrated on Figure 9 – Dispersion Modelling Receptors and POI Locations.

6.7 Building Downwash

Building wake effects were considered in this assessment using the U.S. EPAs Building Profile Input Program (BPIP-PRIME), another pre-processor to AERMOD. The inputs into this pre-processor include the coordinates and heights of the buildings and stacks. The output data from BPIP is used in the AERMOD building wake effect calculations.

See Figure 5– Dispersion Modelling Plan for an illustration of the buildings which were considered in the BPIP exercise for this assessment. The BPIP input file is provided in Appendix F (Dispersion Modelling Files).

6.8 Averaging Periods and Conversions

Section 20 of O. Reg. 419/05 applies to this Facility. Many of these standards and guidelines are based on 1-hour and 24-hour averaging times, which are averaging times that are easily provided by AERMOD. In cases where a standard and/or guideline has an averaging period that AERMOD is not designed to predict (e.g. ½-hr or 30-day), a conversion to the appropriate averaging period was completed using the Ministry recommended conversion factors, as documented in the ADMGO.

6.9 Dispersion Modelling Options

The options used in the AERMOD dispersion model are summarized in the table below.

Table VII: AERMOD Modelling Options

Modelling Parameter	Description	Used in the Assessment?
DFAULT	Specifies that regulatory default options will be used	Yes
CONC	Specifies that concentration values will be calculated	Yes
AVERTIME	Time averaging periods calculated	1-hr, 24-hr, Annual
EMISFACT WSPEED	Specifies the use of variable emission rates based on wind speed	Yes, for material handling

6.10 Special Modelling Considerations

The SPM and crystalline silica emission rates from the active area (i.e. material transfer) were calculated using the maximum daily wind speed, as shown in Appendix B, but were modelled using variable emissions by wind speed. This allows for the use of the actual wind speeds in the meteorological data file to be used for the emission rates and avoids over-conservatism in the calculation and modelling of the emissions from material handling. This provides a more representative modelling of the emissions at the Facility.

The emission rate fractions within each wind class are relative to the maximum wind speed of 17 metres per second (m/s) obtained from the Ministry site-specific meteorology for the Facility. The table below outlines the fraction of the maximum emission rate per wind speed classes and the corresponding drop equation emission factors.

Table VIII: Wind Class and Emission Rate Fractions

Wind Speed Classes (m/s)	1.54	3.09	5.14	8.23	10.8	17
Emission Rate Fraction	0.04	0.11	0.21	0.39	0.55	1.0

6.10.1 Shoreline Fumigation

Since the Facility is on the Bay of Quinte and in proximity to Lake Ontario, the Ministry has requested an investigation into the possible affects of shoreline fumigation on the emissions from the Facility per Section 4.5.3 of the ADMGO. The Lake Ontario shoreline is over 10 km away from the KILN4 and KILN4_BP stacks; therefore, no impact from a thermal internal boundary layer is expected and an alternative model was not required.

6.11 Dispersion Modelling Input and Output Files

Electronic copies of all input and output files are provided in Appendix F (as a zip file). Meteorological anomalies were removed as per Section 6.5 of the ADMGO.

For the compounds that were not screened for negligibility as described in section 3.2, a conservative unit run screening model was completed for the compounds that are only emitted from KILN4 and KILN4_BP. The results of the assessment are presented in Table E.2 in Appendix E. This approach is further described below in section 6.11.1.

6.11.1 Unit Run Model Screening

For compounds that were emitted only from KILN4 and KILN4_BP, a unit run model was completed with an emission rate of 1 g/s from each stack. All contaminants with the exception to the contaminant specific models were screened using this approach. The results from the unit run model yield source specific dispersion factors, and for each contaminant, the POI was estimated by summing the product of the emission rate from each source by each source specific dispersion factor. This is a conservative approach as it assumes that the maximum ground level concentration from each source will occur at the same time and place for each of the sources in the unit run.

Of the 50 contaminants that were not screened as negligible as described in section 3.2, 39 contaminants were assessed as below their POI using this screening method. The contaminants that were modelled and assessed with the Unit Run are indicated in Table 5a under the 'Model Run Name' column.

6.11.2 Contaminant Specific Models

The following 11 compounds were modelled individually.

1) SPM

2) Calcium Oxide

3) Nitrogen Oxides

4) Sulphur Dioxide

5) Carbon Monoxide

6) Hydrogen Chloride

7) Crystalline Silica

8) Dioxins and Furans (TEQ)

9) Sulphur Trioxide

10) Carbon dioxide

11) Iron

6.12 Consideration of New SO2 Standard

As discussed in the meeting between the Ministry, Lehigh and Golder Associates Ltd. (Golder) on May 11, 2022, Lehigh is currently trialing the following as part of sulphur dioxide (SO_2) abatement activities from the Facility:

- the effectiveness of lime injection in the Kiln 4 exhaust flue; and
- modifying the quarry extraction to trial limestone rock that is lower in sulphur compounds.

The trial is now complete and the assessment of the effectiveness of the trial is underway. Lehigh anticipates that they will be able to report to the Ministry in late Q4/early Q1 of 2023 on whether the lime injection and the modified quarry plan is sufficient to reduce emissions from the Kiln 4 and Kiln 4 Bypass stacks to levels that result in compliance with incoming 2023 standard SO_2 of 100 µg/m^3 on a 1-hour basis and 10 µg/m^3 on an annual basis.

7.0 EMISSION SUMMARY TABLE

7.1 Emission Summary Table

A POI concentration for each significant contaminant emitted from the Facility was calculated based on the emission rates listed in Table 2a – Source Summary Table (Normal) and Table 2b – Source Summary Table (TOC) and the output from the dispersion model. The results are presented in Table 5a – Emission Summary Table (Normal) and Table 5b – Emission Summary Table (TOC

The POI concentrations listed in Table 5a and 5b were compared against the Ministry POI Limits. At 48%, crystalline silica has the highest concentration relative to the corresponding Ministry POI Limit during normal operations.

For the TOC scenario, nitrogen oxides has the highest emission relative to its corresponding 1-hour Ministry POI Limit at 68%.

7.2 Emission Summary Table Comparison with and without ALCFs

As described in section 4.2, the addition of ALCFs as a source of fuel for the process kiln potentially increases emissions of trace inorganic metals and chlorinated compounds from the kiln 4 main stack and kiln 4 bypass stack. These potential increases have been estimated and the results are presented in Table I, showing the Facility is in compliance for all contaminants. Table K1 in Appendix K compares the total facility emission rate, maximum POI concentration, and percentage of Ministry POI limit with and without the use of ALCFs. Despite the conservatisms in section 4.7, the increase in maximum POI concentrations and percentage of Ministry POI limits are not significant and are below any levels of concern.

7.3 Assessment of Contaminants with no Ministry POI Limits

Sub paragraph 14 subsection viii of s.26(1) O. Reg. 419/05 requires an indication of the likelihood, nature and location of any adverse effect if the contaminant is not listed in any of Schedules 1, 2 and 3.

Contaminants released by the Facility that do not have Benchmark 1 standards or guidelines in the ACB List are considered to be 'Contaminants with No Ministry POI Limits'. Where applicable, predicted POI concentrations for Contaminants with No Ministry POI Limits were screened against the Benchmark 2 screening levels in the ACB List or the *de minimus* limit. For Contaminants with No Ministry POI Limits whose predicted POI concentrations were found to be above the Benchmark 2 screening level or the *de minimus* limit a "*Supporting Information for a Maximum Ground Level Concentration Acceptability Request for Compounds with no Ministry POI Limit Supplement to Application for Approval, EPA s.9*" Form was submitted with the ECA Application in February 2018. These are listed below with their performance limits:

Contaminant	Performance Limit [ug/m3]
Ammonium	1.45E+01
Chloride	5.18E+00
Nitrate	6.20E-01
Potassium	2.42E+00
Sodium	5.39E+00
Sulfate	2.36E+00

7.4 Assessment of Contaminants with Annual Standards

Concentrations of contaminants with annual standards were also compared to the daily and annual assessment values in accordance with the Ministry Technical Bulletin - Methodology For Using "Assessment Values" For Contaminants With Annual Air Standards under O. Reg. 419/05 dated March 2017. The predicted concentrations were found to be less than the Assessment Values for all relevant contaminants.

7.5 Assessment of Contaminants with In-Stack Emission Limits

As discussed in the meeting between the Ministry, Lehigh and Golder on May 11th, 2022, the Ministry has requested a table that compares the current in-stack concentrations of contaminants against the in-stack emission limits for cement and lime kilns from Table 2 of the Ministry Guideline A-7: Air Pollution Control, Design and Operation Guidelines for Municipal Waste Thermal. This table is presented in Appendix J – In-stack Limit Comparison.

7.6 Summary of Assessment

To simplify the presentation of the results and to focus the report on the assessment of compliance, the contaminants have been categorized, as follows:

Contaminant Category	Number of Contaminants in this ESDM
Significant Contaminants	
Number of contaminants assessed	92
Number of contaminants screened out using the Emission threshold, documented in Appendix C	42
Number of contaminants below current Ministry POI Limits or Performance Limits in current ECA	50

8.0 CONCLUSIONS

This ESDM Report was prepared in accordance with s.26 of O. Reg. 419/05. In addition, guidance in the ESDM Procedure Document was followed, as appropriate.

Section 20 of O. Reg. 419/05 was used to assess Facility compliance using the AERMOD dispersion model.

All the emission rates listed in Table 2a – Source Summary Table (Normal) and Table 2b – Source Summary Table (TOC) correspond to the operating scenario which results in the maximum POI concentration from the site, including the potential increase in emissions from the use of ALCFs to fuel the process kiln. For this reason and conservatisms discussed in s.4.7, the emission rates listed in Table 2a and Table 2b are not likely to be an underestimate of the actual emission rates.

A POI concentration for each significant contaminant emitted from the Facility was calculated based on the calculated emission rates and the output from the dispersion model. The results are presented in Table 5a – Emission Summary Table (Normal) and Table 5b – Emission Summary Table (TOC).

The POI concentrations in the Emission Summary Table were compared against the applicable s.20 standards and guidelines listed as Benchmark 1 in the *Air Contaminants Benchmark (ACB) List*, dated April 2018. At 48%, crystalline silica has the highest predicted POI concentration relative to the corresponding Ministry POI Limit.

For the TOC scenario, nitrogen oxides has the highest emission relative to its corresponding 1-hour Ministry POI Limit at 68%.

Contaminants released by the Facility that do not have Benchmark 1 standards or guidelines in the ACB List are considered to be ‘Contaminants with No Ministry POI Limits’. Where applicable, predicted POI concentrations for Contaminants with No Ministry POI Limits were screened against the Benchmark 2 screening levels in the ACB List or the *de minimus* limit. For Contaminants with No Ministry POI Limits whose predicted POI concentrations were found to be above the Benchmark 2 screening level or the *de minimus* limit a “*Supporting Information for a Maximum Ground Level Concentration Acceptability Request for Compounds with no Ministry POI Limit Supplement to Application for Approval, EPA s.9*” Form was submitted with the ECA Application in February 2018.

It is assumed that the conservative emission rates, when combined with the conservative operating conditions and conservative dispersion modelling assumptions, are not likely to under predict the concentrations at a POI. Therefore, this assessment demonstrates that the Facility can operate in compliance with s.20 of O. Reg. 419/05.

9.0 LIMITATIONS OF REPORT

9.1 Standard of Care

Golder Associates Ltd., member of WSP, has prepared this report in a manner consistent with that level of care and skill ordinarily exercised by members of the engineering and science professions currently practicing under similar conditions in the jurisdiction in which the services are provided, subject to the time limits and physical constraints applicable to this report. No other warranty, expressed or implied is made.

9.2 Basis and Use of the Report

This ESDM Report was prepared for the exclusive use of Lehigh and once finalized, is intended to fulfil Ministry data requirements to support the Facility's ECA Amendment Application. This ESDM Report cannot account for changes in Facility conditions and operational practices completed after it has been finalized and submitted to the Ministry.

The information, recommendations and opinions expressed in this report are for the sole benefit of Lehigh, subject to the limitations and purposes described herein. Use of or reliance on this report by others is prohibited and is without responsibility to Golder Associates Ltd. The report, all plans, data, drawings and other documents as well as all electronic media prepared by Golder Associates Ltd. are considered its professional work product and shall remain the copyright property of Golder Associates Ltd. If Lehigh gives, lend, sell, or otherwise make available the report or any portion thereof to any other party, it does so at its own risk and liability. Lehigh acknowledges that electronic media is susceptible to unauthorized modification, deterioration and incompatibility and therefore Lehigh cannot rely upon the electronic media versions of Golder Associates Ltd.'s report or other work products.

When evaluating the Facility and developing this report, Golder Associates Ltd. has relied on information provided by Lehigh, the regulatory authorities, and others. Golder Associates Ltd. has acted in good faith and accepts no responsibility for any deficiencies, misstatements, or inaccuracies contained in this report resulting from omissions, misinterpretations or falsifications by those who provided Golder Associates Ltd. with information.

While ensuring that the report was prepared in general conformance with regulatory and guideline requirements, Golder Associates Ltd. cannot guarantee that it will be accepted in its entirety by the Ministry or other regulatory body.

Physical sampling of atmospheric emission sources was not completed as part of the scope of work.

Signature Page

Golder Associates Ltd.

Jeff Zywicki, B.Sc.Eng
Air Quality Specialist

Jamie McEvoy, P.Eng
Senior Air Quality Engineer

LL/JJZ/JDM/ca

https://golderassociates.sharepoint.com/sites/150044e/lehighlowcarbonfuelsecaontario/shared documents/draft eca application (internal master)/att 4 - esdm report/2148080301-r-rev0-lehigh alcf esdmr-nov2022_public.docx

Table 1
Sources and Contaminants Identification Table

Source Information					Expected Contaminants	Significant (Yes or No)?	Modelled (Yes or No)?	Rationale
Source ID	Model Source ID	Source Costing Category	Source Name	General Location				
Quarry Operations								
Q1	DRILL	Previously Reviewed	Blasting - Hole Drilling	Quarry	SPM, crystalline silica	Yes	No	Not required as drilling and blasting are regulated under the Aggregate Resources Act (O. Reg 244/97)
Q2	BLAST	Previously Reviewed	Blasting	Quarry	SPM, crystalline silica, CO, NO2, SO2	Yes	No	
Q3	—	Previously Reviewed	Quarry storage piles	Quarry	SPM, crystalline silica	No	No	Wind Erosion was not considered as BMPs are established to control fugitive dust emissions associated with material handling, as per Section 7.4.1 of the ESDM procedure Document.
Q4	—	Previously Reviewed	Quarry unpaved roads	Quarry	SPM, crystalline silica	No	No	Roads were not considered as BMPs are established to control fugitive dust emissions associated with material handling, as per Section 7.4.1 of the ESDM procedure Document.
Q5	QUARRY	Previously Reviewed	Material transfers	Quarry	SPM, crystalline silica	Yes	Yes	N/A
Material Transfers								
1-1	VFUG4	Previously Reviewed	Haul Truck dump into Primary Crusher	Primary Crushing	SPM, crystalline silica	Yes	Yes	N/A
1-2	VFUG4A	Previously Reviewed	S-2 to Crushed Limestone Pile	Primary Crushing	SPM, crystalline silica	Yes	Yes	N/A
2	SECOND	Previously Reviewed	Secondary Crusher	Secondary Crushing	SPM, crystalline silica	Yes	Yes	N/A
3-1	COALSHIP	Previously Reviewed	LSC and coke unloading from ship	Coal Storage Area	SPM, crystalline silica	Yes	Yes	N/A
3-2	COALTD	Previously Reviewed	LSC and coke shore pile outloading	Coal Storage Area	SPM, crystalline silica	Yes	Yes	N/A
3-3	GYPSHIP	Previously Reviewed	Anhydride and crude gypsum unloading from ship	Gypsum Storage Area	SPM, crystalline silica	Yes	Yes	N/A
3-4	GYPSUMTD	Previously Reviewed	Anhydride and crude gypsum shore pile outloading	Gypsum Storage Area	SPM, crystalline silica	Yes	Yes	N/A
3-5	MISCDROP	Previously Reviewed	Silica, iron, and alumina additive drop to pile and drop to storage hall	Additives Storage Area	SPM, crystalline silica	Yes	Yes	N/A
3-6	CKD	Previously Reviewed	CKD drop to pile and outloading to sales	CKD Storage Area	SPM, crystalline silica	Yes	Yes	N/A
3-7	VFUG5	Previously Reviewed	Fuel drop into feed hopper	Coal Mill - Kiln 4	SPM, crystalline Silica	Yes	Yes	N/A
Kilns								
4-1	KILN3	Decommissioned	Kiln 3 Stack with baghouse	Kiln 3	SPM, Carbon Monoxide, Nitrogen Oxides, Ammonia, Sulfur Oxides, Carbon Dioxide, Metals, Inorganics and Organics, and Dioxins and Furans	No	No	Kiln 3 no longer operational at the Facility.
4-2	KILN4	Previously Reviewed (source requiring review)* Use of alternative low-carbon fuels (ALCFs) not previously reviewed	Kiln 4 Stack with ESPs, SNCR ammonia injection, and lime injection	Kiln 4	SPM, Carbon Monoxide, Nitrogen Oxides, Ammonia, Sulfur Oxides, Carbon Dioxide, Metals, Inorganics and Organics, and Dioxins and Furans	Yes	Yes	N/A
4-3	KILN3_C	Decommissioned	Kiln 3 Cooler with baghouse	Kiln 3	SPM, crystalline silica	No	No	Kiln 3 no longer operational at the Facility.
4-4	KILN4_C	Previously Reviewed	Kiln 4 Cooler with baghouse	Kiln 4	SPM, crystalline silica	Yes	Yes	N/A
4-5	KILN4_BP	Previously Reviewed (source requiring review)* Use of alternative low-carbon fuels (ALCFs) not previously reviewed	Kiln 4 Bypass Stack with baghouse	Kiln 4	SPM, Carbon Monoxide, Nitrogen Oxides, Ammonia, Sulfur Oxides, Carbon Dioxide, Metals, Inorganics and Organics, and Dioxins and Furans	Yes	Yes	N/A

Table 1
Sources and Contaminants Identification Table

Source Information					Expected Contaminants	Significant (Yes or No)?	Modelled (Yes or No)?	Rationale
Source ID	Model Source ID	Source Costing Category	Source Name	General Location				
Baghouses								
5-1	SRCID3	Previously Reviewed	#1 Mill Stack with Baghouse	Raw Mill for Kiln 4	SPM, crystalline silica	Yes	Yes	N/A
5-2	SRCID4	Previously Reviewed	#2 Mill Stack with Baghouse	Grinding Mill - Slag	SPM, crystalline silica	Yes	Yes	N/A
5-3	SRCID5	Previously Reviewed	#3 Mill Stack with Baghouse	Cement Mill	SPM, crystalline silica	Yes	Yes	N/A
5-4	SRCID6	Previously Reviewed	#4 Mill Stack with Baghouse	Cement Mill	SPM, crystalline silica	Yes	Yes	N/A
5-5	SRCID7	Previously Reviewed	#5 Mill Stack with Baghouse	Cement Mill	SPM, crystalline silica	Yes	Yes	N/A
5-6	SRCID8	Previously Reviewed	#6 & #7 Mill Stack with Baghouse	Cement Mill	SPM, crystalline silica	Yes	Yes	N/A
5-7	SRCID11	Previously Reviewed	Primary Crusher with Baghouse	Primary Crushing	SPM, crystalline silica	Yes	Yes	N/A
5-8	SRCID12	Previously Reviewed	Hammermill equipped with dust collector	Secondary Crushing	SPM, crystalline silica	Yes	Yes	N/A
5-9	SRCID13	Previously Reviewed	Screen House equipped with dust collector	Secondary Crushing	SPM, crystalline silica	Yes	Yes	N/A
5-10	SRCID14	Previously Reviewed	Blend Silo 2 equipped with dust collector	Raw Material	SPM, crystalline silica	Yes	Yes	N/A
5-11	SRCID15	Previously Reviewed	Blend Silo 3 equipped with dust collector	Raw Material	SPM, crystalline silica	Yes	Yes	N/A
5-12	SRCID16	Previously Reviewed	Blend Silo 4(#3 Kiln Feed) equipped with dust collector	Raw Material	SPM, crystalline silica	Yes	Yes	N/A
5-13	SRCID17	Previously Reviewed	Blend Silo 6 equipped with dust collector	Raw Material	SPM, crystalline silica	Yes	Yes	N/A
5-14	SRCID18	Previously Reviewed	Kiln 3 Feed System equipped with dust collector	Kiln 3	SPM, crystalline silica	No	No	Decommissioned as Kiln 3 is no longer operational at the Facility
5-15	SRCID19	Previously Reviewed	Packhouse Truck #1 equipped with dust collector	Product Shipping	SPM, crystalline silica	Yes	Yes	N/A
5-16	SRCID20	Previously Reviewed	Packhouse North Packer equipped with dust collector	Cement Product	SPM, crystalline silica	Yes	Yes	N/A
5-17	SRCID21	Previously Reviewed	Packhouse South Packer equipped with dust collector	Cement Product	SPM, crystalline silica	Yes	Yes	N/A
5-18	SRCID22	Previously Reviewed	Packhouse Masonary equipped with dust collector	Cement Product	SPM, crystalline silica	Yes	Yes	N/A
5-19	SRCID23	Previously Reviewed	Silo #4 equipped with dust collector	Cement Storage	SPM, crystalline silica	Yes	Yes	N/A
5-20	SRCID26	Previously Reviewed	Dock Silo 1 equipped with dust collector	Cement Storage	SPM, crystalline silica	Yes	Yes	N/A
5-21	SRCID27	Previously Reviewed	Dock Silo 2 equipped with dust collector	Cement Storage	SPM, crystalline silica	Yes	Yes	N/A
5-22	SRCID28	Previously Reviewed	Dock Silo 3 equipped with dust collector	Cement Storage	SPM, crystalline silica	Yes	Yes	N/A
5-23	SRCID29	Previously Reviewed	Dock Silo 4 equipped with dust collector	Cement Storage	SPM, crystalline silica	Yes	Yes	N/A
5-26	SRCID33	Previously Reviewed	Waste Dust Bin equipped with dust collector	K3 Process	SPM, crystalline silica	No	No	Decommissioned as Kiln 3 is no longer operational at the Facility
5-27	SRCID35	Previously Reviewed	Clinker Ship Loading equipped with dust collector	Clinker Product	SPM, crystalline silica	Yes	Yes	N/A
5-28	SRCID36	Previously Reviewed	Brick Saw K-4 equipped with dust collector	Kiln 4 Process	SPM, crystalline silica	Yes	Yes	N/A
5-31	SRCID42	Previously Reviewed	Coal Mill Dust Collector equipped with dust collector	Coal Mill	SPM, crystalline silica	Yes	Yes	N/A
5-32	SRCID43	Previously Reviewed	Indirect Firing - Coal Silo equipped with dust collector	Kiln Fuel	SPM, crystalline silica	Yes	Yes	N/A
5-33	SRCID44	Previously Reviewed	Indirect Firing - Coke Silo equipped with dust collector	Kiln Fuel	SPM, crystalline silica	Yes	Yes	N/A
5-34	SRCID45	Previously Reviewed	Ind. Firing - Weigh Feeder equipped with dust collector	Kiln Fuel	SPM, crystalline silica	Yes	Yes	N/A
5-35	SRCID46	Previously Reviewed	Ind. Firing - Weigh Feeder equipped with dust collector	Kiln Fuel	SPM, crystalline silica	Yes	Yes	N/A
5-36	SRCID47	Previously Reviewed	Coal Handling equipped with dust collector	Kiln Fuel	SPM, crystalline silica	Yes	Yes	N/A
5-37	SRCID48	Previously Reviewed	Coal Handling equipped with dust collector	Kiln Fuel	SPM, crystalline silica	Yes	Yes	N/A
5-38	SRCID49	Previously Reviewed	New Secondary Crusher equipped with dust collector	Secondary Crushing	SPM, crystalline silica	Yes	Yes	N/A
5-39	SRCID51	Previously Reviewed	Expansion - Limestone Storag e 105-1 equipped with dust collector	Raw Material	SPM, crystalline silica	Yes	Yes	N/A
5-40	SRCID55	Previously Reviewed	Expansion - Bucket Elev. Dedust. 105-5 equipped with dust collector	Crushed Limestone Storage	SPM, crystalline silica	Yes	Yes	N/A
5-41	SRCID58	Previously Reviewed	Blend Silo 5 equipped with dust collector	Raw Feed Storage	SPM, crystalline silica	Yes	Yes	N/A
5-42	SRCID61	Previously Reviewed	Lime addition silo equipped with dust collector	Raw Material	SPM, crystalline silica	Yes	Yes	N/A
5-43	SRCID62	Previously Reviewed	Pan conveyor equipped with dust collector	Clinker Transfers	SPM, crystalline silica	Yes	Yes	N/A
5-44	SRCID63	Previously Reviewed	Truck load dust collector 2 equipped with dust collector- South scale	Cement Product	SPM, crystalline silica	Yes	Yes	N/A
5-45	SRCID64	Previously Reviewed	Truck load dust collector 4 equipped with dust collector - South scale	Cement Product	SPM, crystalline silica	Yes	Yes	N/A
5-46	SRCID65	Previously Reviewed	Truck Load dust collector 3 equipped with dust collector - East	Cement Product	SPM, crystalline silica	Yes	Yes	N/A
5-47	SRCID66	Previously Reviewed	Expansion - Hopper Feedoweights equipped with dust collector	Raw Material Handling	SPM, crystalline silica	Yes	Yes	N/A
5-48	SRCID67	Previously Reviewed	Slag dryer equipped with dust collector	Raw Material	SPM, crystalline silica	Yes	Yes	N/A
5-49	SRCID68	Previously Reviewed	#8 Mill Stack	Cement Mill	SPM, crystalline silica	Yes	Yes	N/A
5-50	SRCID69	New	Cement dome dust collector	Cement Dome	SPM, crystalline silica	Yes	No	Emitted at less than 5% of the Facility's emissions
Other Sources								
6	CLINK1 to 3, VFUG6, VFUG8A, VFUG8B, VFUG11 and VFUG12	Previously Reviewed	Clinker transfers	Facility	SPM, crystalline silica	Yes	Yes	N/A
7	—	Previously Reviewed	Storage Piles	Outdoor Storage Areas	SPM	No	No	Wind Erosion was not considered as BMPs are established to control fugitive dust emissions associated with material handling, as per Section 7.4.1 of the ESDM procedure Document.
8	—	Previously Reviewed	Paved and Unpaved Roads	Outdoors	SPM	No	No	Roads were not considered as BMPs are established to control fugitive dust emissions associated with material handling, as per Section 7.4.1 of the ESDM procedure Document.
9	—	New (no significant emission)	Alternative Low Carbon Fuels Receiving and Handling	Indoor Storage Areas	SPM	No	No	Receving and handling of materials are both enclosed.

Table 1
Sources and Contaminants Identification Table

Source Information					Expected Contaminants	Significant (Yes or No)?	Modelled (Yes or No)?	Rationale
Source ID	Model Source ID	Source Costing Category	Source Name	General Location				
Supporting Processes								
NEG1	—	Previously Reviewed	Comfort Heating Equipment	Facility	Nitrogen oxides	No	No	The comfort heating equipment can be considered negligible as per Section 7.2.2 of the ESDM Procedure Document as it emits significantly less than 5% of the Facility's nitrogen oxides compared to the kilns.
NEG2	—	Previously Reviewed	Maintenance Welding	Facility	SPM, metals	Yes	No	All contaminants are either emitted at less than 5% of the total facility emissions or are below the emission threshold when screening.
NEG3	—	Previously Reviewed	Quality Assurance and Quality Control Fume Hoods	Facility	VOCs	No	No	Negligible as per Table B-3A of the ESDM Procedure Document
NEG4	—	Previously Reviewed	Parts washers for maintenance shops	Facility	VOCs	No	No	Negligible as per Table B-3A of the ESDM Procedure Document
NEG5	—	Previously Reviewed	On-site storage tanks for fueling of on-site vehicles	Facility	VOCs	No	No	Negligible as per Table B-3A of the ESDM Procedure Document

Made by: LL
Checked by: JJZ

Table 2a Normal
Source Summary Table

Source ID	Model Source ID	Source Description	Source Parameters								Emission Data						
			Stack Volumetric Flow Rate [Am^3/s]	Stack Velocity [m/s]	Stack Exit Gas Temperature [°C]	Stack Inner Diameter [m]	Stack Height Above Grade [m]	Stack Height Above Roof [m]	Source Location [X Coordinate]	Source Location [Y Coordinate]	Contaminant	CAS No.	Averaging Period [hours]	Maximum Emission Rate [g/s]	Emission Estimating Technique	Emissions Data Quality	Percentage of Overall Emissions [%]
Quarry Operations																	
Q1	—	Blasting - Hole Drilling	—	—	—	—	—	—	—	—	SPM	N/A-1	24	1.56E-02	EF	Marginal	<1%
											Crystalline Silica	14808-60-7	24	2.13E-03	EC	Marginal	<1%
Q2	—	Blasting	—	—	—	—	—	—	—	—	SPM	N/A-1	24	2.35E-02	EF	Average	<1%
											Crystalline Silica	14808-60-7	24	1.61E-03	EC	Average	<1%
											Carbon Monoxide	630-08-0	½	3.78E+01	EF	Marginal	63%
											Nitrogen Oxides	10102-44-0	1, 24	8.89E+00	EF	Marginal	7%
											Sulphur dioxide	7446-09-5	1, 24	1.11E+00	EF	Marginal	8%
Q5	QUARRY5	Material transfers	—	—	—	—	—	—	328898	4880219	SPM	N/A-1	24	2.05E+00	EF	Average	10%
	QUARRY5										Crystalline Silica	14808-60-7	24	1.23E-01	EC	Average	6%
Raw Materials Storage and Transfers																	
1-1	VFUG4	Haul Truck dump into Primary Crusher	—	—	—	—	—	—	330207	4879840	SPM	N/A-1	24	1.85E-01	EF	Marginal	<1%
	VFUG4										Crystalline Silica	14808-60-7	24	1.11E-02	EC	Average	<1%
1-2	VFUG4A	S-2 to Crushed Limestone Pile	—	—	—	—	—	—	330081	4879923	SPM	N/A-1	24	4.62E-01	EF	Above Average	2%
	VFUG4A										Crystalline Silica	14808-60-7	24	2.77E-02	EC	Average	1%
2	SECOND	Secondary Crusher	—	—	—	—	—	—	330135	4879962	SPM	N/A-1	24	6.38E-03	EF	Average	<1%
	SECOND										Crystalline Silica	14808-60-7	24	4.63E-04	EC	Marginal	<1%
3-1	COALSHIP	LSC and coke unloading from ship	—	—	—	—	—	—	329973	4879327	SPM	N/A-1	24	1.94E+00	EF	Average	10%
	COALSHIP										Crystalline Silica	14808-60-7	24	1.16E-01	EC	Above Average	6%
3-2	COALTD	LSC and coke shore pile outloading	—	—	—	—	—	—	329979	4879358	SPM	N/A-1	24	4.34E-02	EF	Average	<1%
	COALTD										Crystalline Silica	14808-60-7	24	2.60E-03	EC	Above Average	<1%
3-3	GYPSHIP	Anhydride and crude gypsum unloading from ship	—	—	—	—	—	—	330127	4879622	SPM	N/A-1	24	2.09E+00	EF	Above Average	10%
	GYPSHIP										Crystalline Silica	14808-60-7	24	1.25E-01	EC	Average	7%
3-4	GYPSUMTD	Anhydride and crude gypsum shore pile outloading	—	—	—	—	—	—	330127	4879654	SPM	N/A-1	24	9.68E-02	EF	Average	<1%
	GYPSUMTD										Crystalline Silica	14808-60-7	24	5.80E-03	EC	Average	<1%
3-5	MISCDROP	Silica, iron, and and alumina additive drop to pile and drop to storage hall	—	—	—	—	—	—	330150	4880323	SPM	N/A-1	24	3.87E-01	EF	Average	2%
	MISCDROP										Crystalline Silica	14808-60-7	24	2.32E-02	EC	Average	1%
3-6	CKD	CKD drop to pile and outloading to sales	—	—	—	—	—	—	3329967	4879735	SPM	N/A-1	24	3.72E-01	EF	Average	2%
	CKD										Crystalline Silica	14808-60-7	24	2.23E-02	EC	Average	1%
3-7	VFUG5	Fuel drop into feed hopper	—	—	—	—	—	—	330156	4880159	SPM	N/A-1	24	2.48E-02	EF	Average	<1%
	VFUG5										Crystalline Silica	14808-60-7	24	1.49E-03	EC	Average	<1%
Kilns																	
4-2	KILN4	Kiln 4 Stack with ESPs, SNCR ammonia injection, and lime injection	207.0	14.94	120	4.20	70.8	N/A	330054	4879945	SPM	N/A-1	24	6.21E+00	EF	Marginal	31%
4-2	KILN4	Kiln 4 Stack with ESPs, SNCR ammonia injection, and lime injection									Crystalline Silica	14808-60-7	24	7.24E-01	EF	Marginal	38%
4-2	KILN4	Kiln 4 Stack with ESPs, SNCR ammonia injection, and lime injection									Dioxins and Furans (TEQ)	N/A-4	24	1.81E-09	ST	Uncertain	97%
4-2	KILN4	Kiln 4 Stack with ESPs, SNCR ammonia injection, and lime injection									Carbon Monoxide	630-08-0	½	2.22E+01	EF	Marginal	37%
4-2	KILN4	Kiln 4 Stack with ESPs, SNCR ammonia injection, and lime injection									Carbon Dioxide	124-38-9	24	4.08E+04	EF	Average	50%
4-2	KILN4	Kiln 4 Stack with ESPs, SNCR ammonia injection, and lime injection									Nitrogen Oxides	10102-44-0	1, 24	1.09E+02	EF	Marginal	91%
4-2	KILN4	Kiln 4 Stack with ESPs, SNCR ammonia injection, and lime injection									Sulphur dioxide	7446-09-5	1, 24	1.22E+01	EF	Marginal	90%
4-2	KILN4	Kiln 4 Stack with ESPs, SNCR ammonia injection, and lime injection									Ammonia	7664-41-7	24	7.19E+00	EF	Uncertain	100%
4-2	KILN4	Kiln 4 Stack with ESPs, SNCR ammonia injection, and lime injection									Aluminum	7429-90-5	24	2.94E-01	EF	Marginal	50%
4-2	KILN4	Kiln 4 Stack with ESPs, SNCR ammonia injection, and lime injection									Ammonium	N/A-6	24	2.45E+00	EF	Marginal	50%
4-2	KILN4	Kiln 4 Stack with ESPs, SNCR ammonia injection, and lime injection									Antimony	7440-36-0	24	1.35E-04	ST	Uncertain	11%
4-2	KILN4	Kiln 4 Stack with ESPs, SNCR ammonia injection, and lime injection									Arsenic	7440-38-2	24	2.94E-04	EF	Marginal	77%
4-2	KILN4	Kiln 4 Stack with ESPs, SNCR ammonia injection, and lime injection									Barium	7440-39-3	24	8.15E-03	EF	Marginal	29%
4-2	KILN4	Kiln 4 Stack with ESPs, SNCR ammonia injection, and lime injection									Beryllium	7440-41-7	24	1.49E-05	EF	Marginal	94%
4-2	KILN4	Kiln 4 Stack with ESPs, SNCR ammonia injection, and lime injection									Cadmium	7440-43-9	24	1.90E-04	EF	Marginal	29%
4-2	KILN4	Kiln 4 Stack with ESPs, SNCR ammonia injection, and lime injection									Calcium Oxide	1305-78-8	24	5.43E+00	EF	Marginal	98.6%
4-2	KILN4	Kiln 4 Stack with ESPs, SNCR ammonia injection, and lime injection									Chloride	N/A-5	24	1.54E+01	EF	Marginal	100%
4-2	KILN4	Kiln 4 Stack with ESPs, SNCR ammonia injection, and lime injection									Chromium	7440-47-3	24	1.77E-04	EF	Marginal	14%
4-2	KILN4	Kiln 4 Stack with ESPs, SNCR ammonia injection, and lime injection									Cobalt	7440-48-4	24	1.23E-02	ST	Uncertain	93%
4-2	KILN4	Kiln 4 Stack with ESPs, SNCR ammonia injection, and lime injection									Copper	7440-50-8	24	1.18E-01	EF	Marginal	97%
4-2	KILN4	Kiln 4 Stack with ESPs, SNCR ammonia injection, and lime injection									Hydrogen Fluoride	7664-39-3	24	2.04E-02	EF	Marginal	89%
4-2	KILN4	Kiln 4 Stack with ESPs, SNCR ammonia injection, and lime injection									Hydrogen Chloride	7647-01-0	24	1.02E+01	EF	Marginal	98%
4-2	KILN4	Kiln 4 Stack with ESPs, SNCR ammonia injection, and lime injection									Iron	15438-31-0	24	3.85E-01	EF	Marginal	46%
4-2	KILN4	Kiln 4 Stack with ESPs, SNCR ammonia injection, and lime injection									Lead	7439-92-1	24, 30-day	1.63E-02	EF	Marginal	86%
4-2	KILN4	Kiln 4 Stack with ESPs, SNCR ammonia injection, and lime injection									Manganese	7439-96-5	24	1.95E-02	EF	Marginal	87%
4-2	KILN4	Kiln 4 Stack with ESPs, SNCR ammonia injection, and lime injection									Mercury	7439-97-6	24	4.47E-02	EF	Marginal	100%
4-2	KILN4	Kiln 4 Stack with ESPs, SNCR ammonia injection, and lime injection									Nickel	7440-02-0	24, Annual	4.78E-03	ST	Uncertain	91%
4-2	KILN4	Kiln 4 Stack with ESPs, SNCR ammonia injection, and lime injection									Nitrate	N/A-7	24	1.04E-01	EF	Marginal	50%
4-2	KILN4	Kiln 4 Stack with ESPs, SNCR ammonia injection, and lime injection									Phosphorus	7723-14-0	24	1.20E-01	ST	Uncertain	93%
4-2	KILN4	Kiln 4 Stack with ESPs, SNCR ammonia injection, and lime injection									Potassium	7440-09-7	24	4.08E-01	EF	Marginal	50%
4-2	KILN4	Kiln 4 Stack with ESPs, SNCR ammonia injection, and lime injection									Selenium	7782-49-2	24	3.40E-03	EF	Marginal	43%
4-2	KILN4	Kiln 4 Stack with ESPs, SNCR ammonia injection, and lime injection									Silicon	7440-21-3	24	6.21E+00	ST	Uncertain	93%
4-2	KILN4	Kiln 4 Stack with ESPs, SNCR ammonia injection, and lime injection									Silver	7440-22-4	24	1.40E-05	EF	Marginal	40%
4-2	KILN4	Kiln 4 Stack with ESPs, SNCR ammonia injection, and lime injection									Sodium	7440-23-5	24	9.06E-01	EF	Marginal	67%
4-2	KILN4	Kiln 4 Stack with ESPs, SNCR ammonia injection, and lime injection									Sulfate	N/A-8	24	4.53E+00	EF	Marginal	97%

Table 2a Normal
Source Summary Table

Source ID	Model Source ID	Source Description	Source Parameters								Emission Data						
			Stack Volumetric Flow Rate [Am³/s]	Stack Velocity [m/s]	Stack Exit Gas Temperature [°C]	Stack Inner Diameter [m]	Stack Height Above Grade [m]	Stack Height Above Roof [m]	Source Location [X Coordinate]	Source Location [Y Coordinate]	Contaminant	CAS No.	Averaging Period [hours]	Maximum Emission Rate [g/s]	Emission Estimating Technique	Emissions Data Quality	Percentage of Overall Emissions [%]
4-2	KILN4	Kiln 4 Stack with ESPs, SNCR ammonia injection, and lime injection									Sulfur trioxide	N/A-9	24	1.90E+00	EF	Marginal	85%
4-2	KILN4	Kiln 4 Stack with ESPs, SNCR ammonia injection, and lime injection									Thallium	7440-28-0	24	1.22E-04	EF	Marginal	93%
4-2	KILN4	Kiln 4 Stack with ESPs, SNCR ammonia injection, and lime injection									Tin	7440-31-5	24	1.23E-01	ST	Uncertain	95%
4-2	KILN4	Kiln 4 Stack with ESPs, SNCR ammonia injection, and lime injection									Titanium	7440-32-6	24	8.60E-03	EF	Marginal	40%
4-2	KILN4	Kiln 4 Stack with ESPs, SNCR ammonia injection, and lime injection									Vanadium	7440-62-2	24	1.62E-04	ST	Uncertain	91%
4-2	KILN4	Kiln 4 Stack with ESPs, SNCR ammonia injection, and lime injection									Zinc	7440-66-6	24	1.22E-02	EF	Marginal	3%
4-2	KILN4	Kiln 4 Stack with ESPs, SNCR ammonia injection, and lime injection									C3 benzenes	N/A-10	24	5.89E-05	EF	Marginal	50%
4-2	KILN4	Kiln 4 Stack with ESPs, SNCR ammonia injection, and lime injection									C4 benzenes	N/A-11	24	1.36E-04	EF	Marginal	50%
4-2	KILN4	Kiln 4 Stack with ESPs, SNCR ammonia injection, and lime injection									C6 benzenes	N/A-12	24	2.08E-05	EF	Marginal	50%
4-2	KILN4	Kiln 4 Stack with ESPs, SNCR ammonia injection, and lime injection									Acenaphthylene	208-96-8	24	2.67E-03	EF	Marginal	100%
4-2	KILN4	Kiln 4 Stack with ESPs, SNCR ammonia injection, and lime injection									Acetone	67-64-1	24	8.60E-03	EF	Marginal	50%
4-2	KILN4	Kiln 4 Stack with ESPs, SNCR ammonia injection, and lime injection									Benzaldehyde	100-52-7	24	5.43E-04	EF	Marginal	50%
4-2	KILN4	Kiln 4 Stack with ESPs, SNCR ammonia injection, and lime injection									Benzene	71-43-2	24, Annual	7.24E-02	EF	Marginal	100%
4-2	KILN4	Kiln 4 Stack with ESPs, SNCR ammonia injection, and lime injection									Benzo(a)anthracene	56-55-3	24	9.51E-07	EF	Marginal	96%
4-2	KILN4	Kiln 4 Stack with ESPs, SNCR ammonia injection, and lime injection									Benzo(a)pyrene	50-32-8	24, Annual	2.94E-06	EF	Marginal	99%
4-2	KILN4	Kiln 4 Stack with ESPs, SNCR ammonia injection, and lime injection									Benzo(b)fluoranthene	205-99-2	24	1.27E-05	EF	Marginal	100%
4-2	KILN4	Kiln 4 Stack with ESPs, SNCR ammonia injection, and lime injection									Benzo(g,h,i)perylene	191-24-2	24	1.77E-06	EF	Marginal	96%
4-2	KILN4	Kiln 4 Stack with ESPs, SNCR ammonia injection, and lime injection									Benzo(k)fluoranthene	207-08-9	24	3.49E-06	EF	Marginal	99%
4-2	KILN4	Kiln 4 Stack with ESPs, SNCR ammonia injection, and lime injection									Benzoic acid	65-85-0	24	8.15E-02	EF	Marginal	50%
4-2	KILN4	Kiln 4 Stack with ESPs, SNCR ammonia injection, and lime injection									Biphenyl	92-52-4	24	1.40E-04	EF	Marginal	50%
4-2	KILN4	Kiln 4 Stack with ESPs, SNCR ammonia injection, and lime injection									Bis(2-ethylhexyl)phthalate	117-81-7	24	2.17E-03	EF	Marginal	50%
4-2	KILN4	Kiln 4 Stack with ESPs, SNCR ammonia injection, and lime injection									Bromomethane	74-83-9	24	9.96E-04	EF	Marginal	50%
4-2	KILN4	Kiln 4 Stack with ESPs, SNCR ammonia injection, and lime injection									Carbon disulfide	75-15-0	24	2.49E-03	EF	Marginal	50%
4-2	KILN4	Kiln 4 Stack with ESPs, SNCR ammonia injection, and lime injection									Chlorobenzene	108-90-7	10-min, 24	3.62E-04	EF	Marginal	50%
4-2	KILN4	Kiln 4 Stack with ESPs, SNCR ammonia injection, and lime injection									Chloromethane	74-87-3	24	8.60E-03	EF	Marginal	50%
4-2	KILN4	Kiln 4 Stack with ESPs, SNCR ammonia injection, and lime injection									Chrysene	218-01-9	24	3.67E-06	EF	Marginal	99%
4-2	KILN4	Kiln 4 Stack with ESPs, SNCR ammonia injection, and lime injection									Di-n-butylphthalate	84-74-2	24	9.51E-04	EF	Marginal	50%
4-2	KILN4	Kiln 4 Stack with ESPs, SNCR ammonia injection, and lime injection									Dibenz(a,h)anthracene	53-70-3	24	1.40E-05	EF	Marginal	100%
4-2	KILN4	Kiln 4 Stack with ESPs, SNCR ammonia injection, and lime injection									Ethylbenzene	100-41-4	24	4.30E-04	EF	Marginal	74%
4-2	KILN4	Kiln 4 Stack with ESPs, SNCR ammonia injection, and lime injection									Fluoranthene	206-44-0	24	1.99E-04	EF	Marginal	100%
4-2	KILN4	Kiln 4 Stack with ESPs, SNCR ammonia injection, and lime injection									Fluorene	86-73-7	24	4.26E-04	EF	Marginal	100%
4-2	KILN4	Kiln 4 Stack with ESPs, SNCR ammonia injection, and lime injection									Formaldehyde	50-00-0	24	1.04E-02	EF	Marginal	50%
4-2	KILN4	Kiln 4 Stack with ESPs, SNCR ammonia injection, and lime injection									Freon 113	76-13-1	24	1.13E-03	EF	Marginal	50%
4-2	KILN4	Kiln 4 Stack with ESPs, SNCR ammonia injection, and lime injection									Indeno(1,2,3-cd)pyrene	193-39-5	24	1.95E-06	EF	Marginal	99%
4-2	KILN4	Kiln 4 Stack with ESPs, SNCR ammonia injection, and lime injection									Methyl ethyl ketone	78-93-3	24	6.79E-04	EF	Marginal	82%
4-2	KILN4	Kiln 4 Stack with ESPs, SNCR ammonia injection, and lime injection									Methylene chloride	75-09-2	24	1.13E-02	EF	Marginal	50%
4-2	KILN4	Kiln 4 Stack with ESPs, SNCR ammonia injection, and lime injection									Methylnaphthalene	90-12-0	24	9.51E-05	EF	Marginal	50%
4-2	KILN4	Kiln 4 Stack with ESPs, SNCR ammonia injection, and lime injection									Naphthalene	91-20-3	24	4.98E-03	EF	Marginal	100%
4-2	KILN4	Kiln 4 Stack with ESPs, SNCR ammonia injection, and lime injection									Phenanthrene	85-01-8	24	9.06E-03	EF	Marginal	100%
4-2	KILN4	Kiln 4 Stack with ESPs, SNCR ammonia injection, and lime injection									Phenol	108-95-2	24	2.49E-03	EF	Marginal	50%
4-2	KILN4	Kiln 4 Stack with ESPs, SNCR ammonia injection, and lime injection									Pyrene	129-00-0	24	9.96E-05	EF	Marginal	100%
4-2	KILN4	Kiln 4 Stack with ESPs, SNCR ammonia injection, and lime injection									Styrene	100-42-5	24	3.40E-05	EF	Marginal	19%
4-2	KILN4	Kiln 4 Stack with ESPs, SNCR ammonia injection, and lime injection									Toluene	108-88-3	24	4.53E-03	EF	Marginal	97%
4-2	KILN4	Kiln 4 Stack with ESPs, SNCR ammonia injection, and lime injection									Xylenes	1330-20-7	10-min, 24	2.94E-03	EF	Marginal	87%
4-2	KILN4	Kiln 4 Stack with ESPs, SNCR ammonia injection, and lime injection									PCBs	1336-36-3	24	1.76E-04	ST	Uncertain	100%
4-4	KILN4_C	Kiln 4 Cooler with baghouse	128.9	14.20	120	3.40	38.0	N/A	330215	4880156	SPM	N/A-1	24	3.08E+00	EF	Marginal	15%
4-4	KILN4_C	Kiln 4 Cooler with baghouse									Crystalline Silica	14808-60-7	24	3.59E-01	EF	Marginal	19%
4-5	KILN4_BP	Kiln 4 Bypass Stack with baghouse	22.8	12.56	120	1.52	83.2	N/A	330099	4880073	SPM	N/A-1	24	4.56E-01	EF	Average	2%
4-5	KILN4_BP	Kiln 4 Bypass Stack with baghouse									Crystalline Silica	14808-60-7	24	5.31E-02	EF	Marginal	3%
4-5	KILN4_BP	Kiln 4 Bypass Stack with baghouse									Dioxins and Furans (TEQ)	N/A-4	24	6.13E-11	ST	Uncertain	3%
4-5	KILN4_BP	Kiln 4 Bypass Stack with baghouse									Carbon Monoxide	630-08-0	½	1.33E-01	ST	Uncertain	<1%
4-5	KILN4_BP	Kiln 4 Bypass Stack with baghouse									Carbon Dioxide	124-38-9	24	4.08E+04	EF	Average	50%
4-5	KILN4_BP	Kiln 4 Bypass Stack with baghouse									Nitrogen Oxides	10102-44-0	1, 24	1.48E+00	ST	Uncertain	1%
4-5	KILN4_BP	Kiln 4 Bypass Stack with baghouse									Sulphur dioxide	7446-09-5	1, 24	2.47E-01	ST	Uncertain	2%
4-5	KILN4_BP	Kiln 4 Bypass Stack with baghouse									Ammonia	7664-41-7	24	1.57E-03	ST	Uncertain	<1%
4-5	KILN4_BP	Kiln 4 Bypass Stack with baghouse									Aluminum	7429-90-5	24	2.94E-01	EF	Marginal	50%
4-5	KILN4_BP	Kiln 4 Bypass Stack with baghouse									Ammonium	N/A-6	24	2.45E+00	EF	Marginal	50%
4-5	KILN4_BP	Kiln 4 Bypass Stack with baghouse									Antimony	7440-36-0	24	1.08E-03	ST	Uncertain	89%
4-5	KILN4_BP	Kiln 4 Bypass Stack with baghouse									Arsenic	7440-38-2	24	8.98E-05	ST	Uncertain	23%
4-5	KILN4_BP	Kiln 4 Bypass Stack with baghouse									Barium	7440-39-3	24	2.01E-02	EF	Marginal	71%
4-5	KILN4_BP	Kiln 4 Bypass Stack with baghouse									Beryllium	7440-41-7	24	1.01E-06	ST	Uncertain	6%
4-5	KILN4_BP	Kiln 4 Bypass Stack with baghouse									Bismuth	7440-69-9	24	4.56E-01	MB	Average	100%
4-5	KILN4_BP	Kiln 4 Bypass Stack with baghouse									Cadmium	7440-43-9	24	4.58E-04	ST	Uncertain	71%
4-5	KILN4_BP	Kiln 4 Bypass Stack with baghouse									Calcium Oxide	1305-78-8	24	7.67E-02	ST	Uncertain	1.4%
4-5	KILN4_BP	Kiln 4 Bypass Stack with baghouse									Chloride	N/A-5	24	4.98E-02	EF	Marginal	<1%
4-5	KILN4_BP	Kiln 4 Bypass Stack with baghouse									Chromium	7440-47-3	24	1.11E-03	ST	Uncertain	86%
4-5	KILN4_BP	Kiln 4 Bypass Stack with baghouse									Cobalt	7440-48-4	24	9.40E-04	ST	Uncertain	7%
4-5	KILN4_BP	Kiln 4 Bypass Stack with baghouse									Copper	7440-50-8	24	3.29E-03	ST	Uncertain	3%

Table 2a Normal
Source Summary Table

Source ID	Model Source ID	Source Description	Source Parameters								Emission Data						
			Stack Volumetric Flow Rate [Am³/s]	Stack Velocity [m/s]	Stack Exit Gas Temperature [°C]	Stack Inner Diameter [m]	Stack Height Above Grade [m]	Stack Height Above Roof [m]	Source Location [X Coordinate]	Source Location [Y Coordinate]	Contaminant	CAS No.	Averaging Period [hours]	Maximum Emission Rate [g/s]	Emission Estimating Technique	Emissions Data Quality	Percentage of Overall Emissions [%]
4-5	KILN4_BP	Kiln 4 Bypass Stack with baghouse									Hydrogen Fluoride	7664-39-3	24	2.42E-03	ST	Uncertain	11%
4-5	KILN4_BP	Kiln 4 Bypass Stack with baghouse									Hydrogen Chloride	7647-01-0	24	2.17E-01	ST	Uncertain	2%
4-5	KILN4_BP	Kiln 4 Bypass Stack with baghouse									Iron	15438-31-0	24	4.56E-01	EF	Marginal	54%
4-5	KILN4_BP	Kiln 4 Bypass Stack with baghouse									Lead	7439-92-1	24, 30-day	2.73E-03	ST	Uncertain	14%
4-5	KILN4_BP	Kiln 4 Bypass Stack with baghouse									Magnesium	7439-95-4	24	4.56E-01	MB	Average	100%
4-5	KILN4_BP	Kiln 4 Bypass Stack with baghouse									Manganese	7439-96-5	24	2.90E-03	ST	Uncertain	13%
4-5	KILN4_BP	Kiln 4 Bypass Stack with baghouse									Mercury	7439-97-6	24	1.03E-04	ST	Uncertain	<1%
4-5	KILN4_BP	Kiln 4 Bypass Stack with baghouse									Nickel	7440-02-0	24, Annual	4.92E-04	ST	Uncertain	9%
4-5	KILN4_BP	Kiln 4 Bypass Stack with baghouse									Nitrate	N/A-7	24	1.04E-01	EF	Marginal	50%
4-5	KILN4_BP	Kiln 4 Bypass Stack with baghouse									Phosphorus	7723-14-0	24	8.92E-03	ST	Uncertain	7%
4-5	KILN4_BP	Kiln 4 Bypass Stack with baghouse									Potassium	7440-09-7	24	4.08E-01	EF	Marginal	50%
4-5	KILN4_BP	Kiln 4 Bypass Stack with baghouse									Selenium	7782-49-2	24	4.53E-03	EF	Marginal	57%
4-5	KILN4_BP	Kiln 4 Bypass Stack with baghouse									Silicon	7440-21-3	24	4.56E-01	ST	Uncertain	7%
4-5	KILN4_BP	Kiln 4 Bypass Stack with baghouse									Silver	7440-22-4	24	2.12E-05	EF	Marginal	60%
4-5	KILN4_BP	Kiln 4 Bypass Stack with baghouse									Sodium	7440-23-5	24	4.56E-01	EF	Marginal	33%
4-5	KILN4_BP	Kiln 4 Bypass Stack with baghouse									Sulfate	N/A-8	24	1.63E-01	EF	Marginal	3%
4-5	KILN4_BP	Kiln 4 Bypass Stack with baghouse									Sulfur trioxide	N/A-9	24	3.31E-01	EF	Marginal	15%
4-5	KILN4_BP	Kiln 4 Bypass Stack with baghouse									Thallium	7440-28-0	24	8.99E-06	ST	Uncertain	7%
4-5	KILN4_BP	Kiln 4 Bypass Stack with baghouse									Tin	7440-31-5	24	6.23E-03	ST	Uncertain	5%
4-5	KILN4_BP	Kiln 4 Bypass Stack with baghouse									Titanium	7440-32-6	24	1.30E-02	EF	Marginal	60%
4-5	KILN4_BP	Kiln 4 Bypass Stack with baghouse									Tungsten	7440-33-7	24	4.56E-01	MB	Average	100%
4-5	KILN4_BP	Kiln 4 Bypass Stack with baghouse									Vanadium	7440-62-2	24	1.54E-05	ST	Uncertain	9%
4-5	KILN4_BP	Kiln 4 Bypass Stack with baghouse									Zinc	7440-66-6	24	4.56E-01	ST	Uncertain	97%
4-5	KILN4_BP	Kiln 4 Bypass Stack with baghouse									C3 benzenes	N/A-10	24	5.89E-05	EF	Marginal	50%
4-5	KILN4_BP	Kiln 4 Bypass Stack with baghouse									C4 benzenes	N/A-11	24	1.36E-04	EF	Marginal	50%
4-5	KILN4_BP	Kiln 4 Bypass Stack with baghouse									C6 benzenes	N/A-12	24	2.08E-05	EF	Marginal	50%
4-5	KILN4_BP	Kiln 4 Bypass Stack with baghouse									Acenaphthylene	208-96-8	24	7.19E-08	ST	Uncertain	<1%
4-5	KILN4_BP	Kiln 4 Bypass Stack with baghouse									Acetone	67-64-1	24	8.60E-03	EF	Marginal	50%
4-5	KILN4_BP	Kiln 4 Bypass Stack with baghouse									Benzaldehyde	100-52-7	24	5.43E-04	EF	Marginal	50%
4-5	KILN4_BP	Kiln 4 Bypass Stack with baghouse									Benzene	71-43-2	24, Annual	1.48E-04	ST	Uncertain	<1%
4-5	KILN4_BP	Kiln 4 Bypass Stack with baghouse									Benzo(a)anthracene	56-55-3	24	4.26E-08	ST	Uncertain	4%
4-5	KILN4_BP	Kiln 4 Bypass Stack with baghouse									Benzo(a)pyrene	50-32-8	24, Annual	2.34E-08	ST	Uncertain	<1%
4-5	KILN4_BP	Kiln 4 Bypass Stack with baghouse									Benzo(b)fluoranthene	205-99-2	24	2.73E-08	ST	Uncertain	<1%
4-5	KILN4_BP	Kiln 4 Bypass Stack with baghouse									Benzo(g,h,i)perylene	191-24-2	24	7.79E-08	ST	Uncertain	4%
4-5	KILN4_BP	Kiln 4 Bypass Stack with baghouse									Benzo(k)fluoranthene	207-08-9	24	2.73E-08	ST	Uncertain	<1%
4-5	KILN4_BP	Kiln 4 Bypass Stack with baghouse									Benzoic acid	65-85-0	24	8.15E-02	EF	Marginal	50%
4-5	KILN4_BP	Kiln 4 Bypass Stack with baghouse									Biphenyl	92-52-4	24	1.40E-04	EF	Marginal	50%
4-5	KILN4_BP	Kiln 4 Bypass Stack with baghouse									Bis(2-ethylhexyl)phthalate	117-81-7	24	2.17E-03	EF	Marginal	50%
4-5	KILN4_BP	Kiln 4 Bypass Stack with baghouse									Bromomethane	74-83-9	24	9.96E-04	EF	Marginal	50%
4-5	KILN4_BP	Kiln 4 Bypass Stack with baghouse									Carbon disulfide	75-15-0	24	2.49E-03	EF	Marginal	50%
4-5	KILN4_BP	Kiln 4 Bypass Stack with baghouse									Chlorobenzene	108-90-7	10-min, 24	3.62E-04	EF	Marginal	50%
4-5	KILN4_BP	Kiln 4 Bypass Stack with baghouse									Chloromethane	74-87-3	24	8.60E-03	EF	Marginal	50%
4-5	KILN4_BP	Kiln 4 Bypass Stack with baghouse									Chrysene	218-01-9	24	2.06E-08	ST	Uncertain	<1%
4-5	KILN4_BP	Kiln 4 Bypass Stack with baghouse									Di-n-butylphthalate	84-74-2	24	9.51E-04	EF	Marginal	50%
4-5	KILN4_BP	Kiln 4 Bypass Stack with baghouse									Dibenz(a,h)anthracene	53-70-3	24	4.26E-08	ST	Uncertain	<1%
4-5	KILN4_BP	Kiln 4 Bypass Stack with baghouse									Ethylbenzene	100-41-4	24	1.48E-04	ST	Uncertain	26%
4-5	KILN4_BP	Kiln 4 Bypass Stack with baghouse									Fluoranthene	206-44-0	24	1.35E-07	ST	Uncertain	<1%
4-5	KILN4_BP	Kiln 4 Bypass Stack with baghouse									Fluorene	86-73-7	24	2.80E-07	ST	Uncertain	<1%
4-5	KILN4_BP	Kiln 4 Bypass Stack with baghouse									Formaldehyde	50-00-0	24	1.04E-02	ST	Uncertain	50%
4-5	KILN4_BP	Kiln 4 Bypass Stack with baghouse									Freon 113	76-13-1	24	1.13E-03	EF	Marginal	50%
4-5	KILN4_BP	Kiln 4 Bypass Stack with baghouse									Indeno(1,2,3-cd)pyrene	193-39-5	24	2.73E-08	ST	Uncertain	1%
4-5	KILN4_BP	Kiln 4 Bypass Stack with baghouse									Methyl ethyl ketone	78-93-3	24	1.48E-04	ST	Uncertain	18%
4-5	KILN4_BP	Kiln 4 Bypass Stack with baghouse									Methylene chloride	75-09-2	24	1.13E-02	EF	Marginal	50%
4-5	KILN4_BP	Kiln 4 Bypass Stack with baghouse									Methylnaphthalene	90-12-0	24	9.51E-05	EF	Marginal	50%
4-5	KILN4_BP	Kiln 4 Bypass Stack with baghouse									Naphthalene	91-20-3	24	7.73E-06	ST	Uncertain	<1%
4-5	KILN4_BP	Kiln 4 Bypass Stack with baghouse									Phenanthrene	85-01-8	24	5.19E-07	ST	Uncertain	<1%
4-5	KILN4_BP	Kiln 4 Bypass Stack with baghouse									Phenol	108-95-2	24	2.49E-03	EF	Marginal	50%
4-5	KILN4_BP	Kiln 4 Bypass Stack with baghouse									Pyrene	129-00-0	24	1.19E-07	ST	Uncertain	<1%
4-5	KILN4_BP	Kiln 4 Bypass Stack with baghouse									Styrene	100-42-5	24	1.48E-04	ST	Uncertain	81%
4-5	KILN4_BP	Kiln 4 Bypass Stack with baghouse									Toluene	108-88-3	24	1.58E-04	ST	Uncertain	3%
4-5	KILN4_BP	Kiln 4 Bypass Stack with baghouse									Xylenes	1330-20-7	10-min, 24	4.44E-04	ST	Uncertain	13%
4-5	KILN4_BP	Kiln 4 Bypass Stack with baghouse									PCBs	1336-36-3	24	1.44E-07	ST	Uncertain	<1%

Made by: LL
Checked by: JJZ

Table 2a Normal
Source Summary Table

			Source Parameters								Emission Data						
Source ID	Model Source ID	Source Description	Stack Volumetric Flow Rate [Am³/s]	Stack Velocity [m/s]	Stack Exit Gas Temperature [°C]	Stack Inner Diameter [m]	Stack Height Above Grade [m]	Stack Height Above Roof [m]	Source Location [X Coordinate]	Source Location [Y Coordinate]	Contaminant	CAS No.	Averaging Period [hours]	Maximum Emission Rate [g/s]	Emission Estimating Technique	Emissions Data Quality	Percentage of Overall Emissions [%]
Baghouses																	
5-1	SRCID3	#1 Mill Stack with Baghouse	20.2	31.75	65	0.9	51.2	24.2	330059	4880137	SPM	N/A-1	24	1.38E-01	EF	Marginal	<1%
5-1	SRCID3	#1 Mill Stack with Baghouse									Crystalline Silica	14808-60-7	24	1.60E-02	EF	Marginal	<1%
5-2	SRCID4	#2 Mill Stack with Baghouse	18.7	29.39	65	0.9	51.2	24.2	330065	4880146	SPM	N/A-1	24	1.38E-01	EF	Marginal	<1%
5-2	SRCID4	#2 Mill Stack with Baghouse									Crystalline Silica	14808-60-7	24	1.60E-02	EF	Marginal	<1%
5-3	SRCID5	#3 Mill Stack with Baghouse	20.2	31.75	85	0.9	51.2	24.2	330070	4880157	SPM	N/A-1	24	5.25E-02	EF	Marginal	<1%
5-3	SRCID5	#3 Mill Stack with Baghouse									Crystalline Silica	14808-60-7	24	6.11E-03	EF	Marginal	<1%
5-4	SRCID6	#4 Mill Stack with Baghouse	20.2	31.75	85	0.9	51.2	24.2	330076	4880165	SPM	N/A-1	24	5.25E-02	EF	Marginal	<1%
5-4	SRCID6										Crystalline Silica	14808-60-7	24	6.11E-03	EF	Marginal	<1%
5-5	SRCID7	#5 Mill Stack with Baghouse	30.8	20.01	82	1.4	45.7	18.7	330072	4880191	SPM	N/A-1	24	6.42E-02	EF	Marginal	<1%
5-5	SRCID7										Crystalline Silica	14808-60-7	24	7.47E-03	EF	Marginal	<1%
5-6	SRCID8	#6 & #7 Mill Stack with Baghouse	60.7	39.43	85	1.4	45.7	18.7	330088	4880187	SPM	N/A-1	24	9.33E-02	EF	Marginal	<1%
	SRCID8	#6 & #7 Mill Stack with Baghouse									Crystalline Silica	14808-60-7	24	1.09E-02	EF	Marginal	<1%
5-7	SRCID11	Primary Crusher with Baghouse	3.2	19.26	Ambient	0.46	12	—	330210	4879837	SPM	N/A-1	24	7.64E-02	EF	Marginal	<1%
5-7	SRCID11	Primary Crusher with Baghouse									Crystalline Silica	14808-60-7	24	8.90E-03	EF	Marginal	<1%
5-8	SRCID12	Hammermill equipped with dust collector	4.3	14.81	Ambient	0.608	24.7	—	330139	4879968	SPM	N/A-1	24	4.86E-02	EF	Marginal	<1%
5-8	SRCID12	Hammermill equipped with dust collector									Crystalline Silica	14808-60-7	24	5.66E-03	EF	Marginal	<1%
5-9	SRCID13	Screen House equipped with dust collector	9.0	20.00	Ambient	0.757	24.7	—	330177	4880012	SPM	N/A-1	24	1.07E-02	EF	Marginal	<1%
5-9	SRCID13	Screen House equipped with dust collector									Crystalline Silica	14808-60-7	24	1.25E-03	EF	Marginal	<1%
5-10	SRCID14	Blend Silo 2 equipped with dust collector	0.9	7.16	80	0.40	36.6	—	329980.809	4880076	SPM	N/A-1	24	9.00E-03	EF	Average	<1%
5-10	SRCID14	Blend Silo 3 equipped with dust collector									Crystalline Silica	14808-60-7	24	1.05E-03	EF	Average	<1%
5-11	SRCID15	Blend Silo 3 equipped with dust collector	6.6	18.72	80	0.67	36.6	—	329959.116	4880070	SPM	N/A-1	24	1.32E-01	EF	Average	<1%
5-11	SRCID15	Blend Silo 3 equipped with dust collector									Crystalline Silica	14808-60-7	24	1.54E-02	EF	Average	<1%
5-12	SRCID16	Blend Silo 4(#3 Kiln Feed) equipped with dust collector	4.5	14.71	80	0.62	36.6	—	329967.960	4880084	SPM	N/A-1	24	4.50E-02	EF	Average	<1%
5-12	SRCID16	Blend Silo 4(#3 Kiln Feed) equipped with dust collector									Crystalline Silica	14808-60-7	24	5.24E-03	EF	Average	<1%
5-13	SRCID17	Blend Silo 6 equipped with dust collector	5.2	26.48	80	0.5	36.6	—	329965.869	4880053	SPM	N/A-1	24	5.20E-02	EF	Average	<1%
5-13	SRCID17	Blend Silo 6 equipped with dust collector									Crystalline Silica	14808-60-7	24	6.06E-03	EF	Average	<1%
5-15	SRCID19	Packhouse Truck #1 equipped with dust collector	0.4	8.29	90	0.254	8	—	329979	4880228	SPM	N/A-1	24	4.20E-03	EF	Average	<1%
5-15	SRCID19	Packhouse Truck #1 equipped with dust collector									Crystalline Silica	14808-60-7	24	4.89E-04	EF	Average	<1%
5-16	SRCID20	Packhouse North Packer equipped with dust collector	5.2	18.48	50	0.598	15	—	329979	4880228	SPM	N/A-1	24	1.04E-01	EF	Average	<1%
5-16	SRCID20	Packhouse North Packer equipped with dust collector									Crystalline Silica	14808-60-7	24	1.21E-02	EF	Average	<1%
5-17	SRCID21	Packhouse South Packer equipped with dust collector	2.9	14.77	50	0.50	13	5	329979	4880228	SPM	N/A-1	24	2.90E-02	EF	Average	<1%
5-17	SRCID21	Packhouse South Packer equipped with dust collector									Crystalline Silica	14808-60-7	24	3.38E-03	EF	Average	<1%
5-18	SRCID22	Packhouse Masonary equipped with dust collector	1.2	16.98	50	0.30	35.3	2.3	330002	4880229	SPM	N/A-1	24	1.20E-02	EF	Average	<1%
5-18	SRCID22	Packhouse Masonary equipped with dust collector									Crystalline Silica	14808-60-7	24	1.40E-03	EF	Average	<1%
5-19	SRCID23	Silo #4 equipped with dust collector	6.6	20.07	100	0.647	35.3	2.3	330022	4880230	SPM	N/A-1	24	1.32E-01	EF	Average	<1%
5-19	SRCID23	Silo #4 equipped with dust collector									Crystalline Silica	14808-60-7	24	1.54E-02	EF	Average	<1%
5-20	SRCID26	Dock Silo 1 equipped with dust collector	4.5	10.19	80	0.75	48.1	—	330229.865	4879868	SPM	N/A-1	24	4.50E-02	EF	Average	<1%
5-20	SRCID26	Dock Silo 1 equipped with dust collector									Crystalline Silica	14808-60-7	24	5.24E-03	EF	Average	<1%
5-21	SRCID27	Dock Silo 2 equipped with dust collector	4.5	10.19	80	0.75	48.1	—	330238.514	4879883	SPM	N/A-1	24	4.50E-02	EF	Average	<1%
5-21	SRCID27	Dock Silo 2 equipped with dust collector									Crystalline Silica	14808-60-7	24	5.24E-03	EF	Average	<1%
5-22	SRCID28	Dock Silo 3 equipped with dust collector	4.5	10.19	80	0.75	48.1	—	330244	4879892	SPM	N/A-1	24	4.50E-02	EF	Average	<1%
5-22	SRCID28	Dock Silo 3 equipped with dust collector									Crystalline Silica	14808-60-7	24	5.24E-03	EF	Average	<1%
5-23	SRCID29	Dock Silo 4 equipped with dust collector	4.5	10.19	80	0.75	48.1	—	330248.061	4879898	SPM	N/A-1	24	4.50E-02	EF	Average	<1%
5-23	SRCID29	Dock Silo 4 equipped with dust collector									Crystalline Silica	14808-60-7	24	5.24E-03	EF	Average	<1%
5-27	SRCID35	Clinker Ship Loading equipped with dust collector	6.6	15.95	Ambient	0.73	17	—	330341	4879983	SPM	N/A-1	24	2.40E-02	EF	Average	<1%
5-27	SRCID35	Clinker Ship Loading equipped with dust collector									Crystalline Silica	14808-60-7	24	2.79E-03	EF	Average	<1%
5-28	SRCID36	Brick Saw K-4 equipped with dust collector	2.4	14.44	Ambient	0.46	0.1	—	330175	4880156	SPM	N/A-1	24	9.90E-03	EF	Average	<1%
5-28	SRCID36	Brick Saw K-4 equipped with dust collector									Crystalline Silica	14808-60-7	24	1.15E-03	EF	Average	<1%
5-31	SRCID42	Coal Mill Dust Collector equipped with dust collector	23.6	15.96	65	1.372	50.3	—	330181	4880167	SPM	N/A-1	24	4.72E-01	EF	Average	2%
5-31	SRCID42	Coal Mill Dust Collector equipped with dust collector									Crystalline Silica	14808-60-7	24	5.50E-02	EF	Average	3%
5-32	SRCID43	Indirect Firing - Coal Silo equipped with passive fabric filter	1.4	19.81	75	0.3	34.4	—	330181	4880167	SPM	N/A-1	24	1.40E-02	EF	Average	<1%
5-32	SRCID43	Indirect Firing - Coal Silo equipped with passive fabric filter									Crystalline Silica	14808-60-7	24	1.63E-03	EF	Average	<1%
5-33	SRCID44	Indirect Firing - Coke Silo equipped with passive fabric filter	1.4	19.81	75	0.3	34.4	—	330181	4880167	SPM	N/A-1	24	1.40E-02	EF	Average	<1%
5-33	SRCID44	Indirect Firing - Coke Silo equipped with passive fabric filter									Crystalline Silica	14808-60-7	24	1.63E-03	EF	Average	<1%
5-34	SRCID45	Ind. Firing - Weigh Feeder equipped with dust collector	0.3	22.10	75	0.12	14.6	—	330181	4880167	SPM	N/A-1	24	2.50E-03	EF	Average	<1%
5-34	SRCID45	Ind. Firing - Weigh Feeder equipped with dust collector									Crystalline Silica	14808-60-7	24	2.91E-04	EF	Average	<1%
5-35	SRCID46	Ind. Firing - Weigh Feeder equipped with dust collector	0.3	22.10	75	0.12	14.6	—	330181	4880167	SPM	N/A-1	24	2.50E-03	EF	Average	<1%
5-35	SRCID46	Ind. Firing - Weigh Feeder equipped with dust collector									Crystalline Silica	14808-60-7	24	2.91E-04	EF	Average	<1%
5-36	SRCID47	Coal Handling equipped with dust collector	0.3	39.30	75	0.09	14.6	—	330206	4880169	SPM	N/A-1	24	9.00E-04	EF	Average	<1%
5-36	SRCID47	Coal Handling equipped with dust collector									Crystalline Silica	14808-60-7	24	1.05E-04	EF	Average	<1%
5-37	SRCID48	Coal Handling equipped with dust collector	0.1	14.15	75	0.09	14.6	—	330201	4880174	SPM	N/A-1	24	9.00E-04	EF	Average	<1%
5-37	SRCID48	Coal Handling equipped with dust collector									Crystalline Silica	14808-60-7	24	1.05E-04	EF	Average	<1%
5-38	SRCID49	New Secondary Crusher equipped with dust collector	5.2	8.99	Ambient	0.858	14.6	—	330150	4879963	SPM	N/A-1	24	1.56E-02	EF	Marginal	<1%
5-38	SRCID49	New Secondary Crusher equipped with dust collector									Crystalline Silica	14808-60-7	24	1.81E-03	EF	Marginal	<1%
5-39	SRCID51	Expansion - Limestone Storag e 105-1 equipped with dust collector	3.0	10.61	Ambient	0.6	27.7	—	330075	4880075	SPM	N/A-1	24	3.00E-02	EF	Average	<1%
5-39	SRCID51	Expansion - Limestone Storag e 105-1 equipped with dust collector									Crystalline Silica	14808-60-7	24	3.49E-03	EF	Average	<1%

Table 2a Normal
Source Summary Table

			Source Parameters								Emission Data						
Source ID	Model Source ID	Source Description	Stack Volumetric Flow Rate [Am³/s]	Stack Velocity [m/s]	Stack Exit Gas Temperature [°C]	Stack Inner Diameter [m]	Stack Height Above Grade [m]	Stack Height Above Roof [m]	Source Location [X Coordinate]	Source Location [Y Coordinate]	Contaminant	CAS No.	Averaging Period [hours]	Maximum Emission Rate [g/s]	Emission Estimating Technique	Emissions Data Quality	Percentage of Overall Emissions [%]
5-40	SRCID55	Expansion - Bucket Elev. Dedust. 105-5 equipped with dust collector	1.5	11.94	Ambient	0.4	11.9	—	330075	4880075	SPM	N/A-1	24	1.50E-02	EF	Average	<1%
5-40	SRCID55	Expansion - Bucket Elev. Dedust. 105-5 equipped with dust collector									Crystalline Silica	14808-60-7	24	1.75E-03	EF	Average	<1%
5-41	SRCID58	Blend Silo 5 equipped with dust collector	2.5	10.52	80	0.55	29	—	329975	4880071	SPM	N/A-1	24	2.50E-02	EF	Average	<1%
5-41	SRCID58	Blend Silo 5 equipped with dust collector									Crystalline Silica	14808-60-7	24	2.91E-03	EF	Average	<1%
5-42	SRCID61	Lime addition silo equipped with dust collector	0.6	45.90	Ambient	0.12	20	2	330093	4880032	SPM	N/A-1	24	5.60E-03	EF	Average	<1%
5-42	SRCID61	Lime addition silo equipped with dust collector									Crystalline Silica	14808-60-7	24	6.52E-04	EF	Average	<1%
5-43	SRCID62	Pan conveyor equipped with dust collector	3.3	16.68	Ambient	0.50	7	—	330176	4880168	SPM	N/A-1	24	3.30E-02	EF	Average	<1%
5-43	SRCID62	Pan conveyor equipped with dust collector									Crystalline Silica	14808-60-7	24	3.84E-03	EF	Average	<1%
5-44	SRCID63	Truck load dust collector 2 equipped with dust collector- South scale	0.9	13.30	80	0.3	15	—	329979	4880228	SPM	N/A-1	24	9.40E-03	EF	Average	<1%
5-44	SRCID63	Truck load dust collector 2 equipped with dust collector- South scale									Crystalline Silica	14808-60-7	24	1.09E-03	EF	Average	<1%
5-45	SRCID64	Truck load dust collector 4 equipped with dust collector - South scale	0.9	13.30	80	0.3	15	—	329979	4880228	SPM	N/A-1	24	9.40E-03	EF	Average	<1%
5-45	SRCID64	Truck load dust collector 4 equipped with dust collector - South scale									Crystalline Silica	14808-60-7	24	1.09E-03	EF	Average	<1%
5-46	SRCID65	Truck Load dust collector 3 equipped with dust collector - East	1.3	18.39	80	0.3	15	—	329979	4880228	SPM	N/A-1	24	1.30E-02	EF	Average	<1%
5-46	SRCID65	Truck Load dust collector 3 equipped with dust collector - East									Crystalline Silica	14808-60-7	24	1.51E-03	EF	Average	<1%
5-47	SRCID66	Expansion - Hopper Feedoweights equipped with dust collector	6.0	21.22	Ambient	0.6	30	—	330075	4880075	SPM	N/A	24	1.20E-01	EF	Average	<1%
5-47	SRCID66	Expansion - Hopper Feedoweights equipped with dust collector									Crystalline Silica	14808-60-7	24	1.40E-02	EF	Average	<1%
5-48	SRCID67	Slag dryer equipped with dust collector	9.2	20.28	120	0.76	45		330127	4880214	SPM	N/A-1	24	1.84E-01	EF	Average	<1%
5-48	SRCID67	Slag dryer equipped with dust collector									Crystalline Silica	14808-60-7	24	2.14E-02	EF	Average	1%
5-49	SRCID68	#8 Mill Stack	10.4	8.47	95	1.25	18.3	—	330206	4880248	SPM	N/A-1	24	9.92E-02	EF	Marginal	<1%
5-49	SRCID68	#8 Mill Stack									Crystalline Silica	14808-60-7	24	1.15E-02	EF	Marginal	<1%
5-50	SRCID69	Cement dome dust collector	6.1	16.45	Above Ambient	0.689	110.49	—	330169	4880072	SPM	N/A-1	24	1.23E-01	EF	Average	<1%
5-50	SRCID69	Cement dome dust collector									Crystalline Silica	14808-60-7	24	1.43E-02	EF	Average	<1%
Clinker Transfers																	
6-1	CLINK1	Clinker Storage Hall Left (Src 60 & 62)	—	—	—	—	—	—	330140	4880175	SPM	N/A-1	24	3.82E-04	EF	Marginal	<1%
	CLINK1										Crystalline Silica	14808-60-7	24	2.62E-05	EF	Marginal	<1%
6-2	CLINK2	Clinker Storage Hall Middle (Src 60 & 62)	—	—	—	—	—	—	330115	4880200	SPM	N/A-1	24	3.82E-04	EF	Marginal	<1%
	CLINK2										Crystalline Silica	14808-60-7	24	2.62E-05	EF	Marginal	<1%
6-3	CLINK3	Clinker Storage Hall Right (Src 60 & 62)	—	—	—	—	—	—	330129	4880222	SPM	N/A-1	24	3.82E-04	EF	Marginal	<1%
	CLINK3										Crystalline Silica	14808-60-7	24	2.62E-05	EF	Marginal	<1%
6-4	VFUG11	Clinker Storage Hall East Right (Src 60 & 62)	—	—	—	—	—	—	330057	4880109	SPM	N/A-1	24	3.82E-04	EF	Marginal	<1%
	VFUG11										Crystalline Silica	14808-60-7	24	2.62E-05	EF	Marginal	<1%
6-5	VFUG12	Clinker Storage Hall East Left (Src 60 & 62)	—	—	—	—	—	—	330047	4880087	SPM	N/A-1	24	3.82E-04	EF	Marginal	<1%
	VFUG12										Crystalline Silica	14808-60-7	24	2.62E-05	EF	Marginal	<1%
6-6	VFUG6	K3 Clinker Handling (Src 52) (Product drop into open conveyor C-11)	—	—	—	—	—	—	330060	4880274	SPM	N/A-1	24	6.77E-03	EF	Marginal	<1%
	VFUG6										Crystalline Silica	14808-60-7	24	4.64E-04	EF	Marginal	<1%
6-7	VFUG8A	Clinker Screening S-9 (Src 58) Clinker (Conveyor S-9 product drops)	—	—	—	—	—	—	330181	4880218	SPM	N/A-1	24	6.77E-03	EF	Marginal	<1%
	VFUG8A										Crystalline Silica	14808-60-7	24	4.64E-04	EF	Marginal	<1%
6-8	VFUG8B	Clinker Screening S-9 (Src 58) Weathered Clinker (Conveyor S-9 product drops)	—	—	—	—	—	—	330181	4880219	SPM	N/A-1	24	7.81E-03	EF	Marginal	<1%
	VFUG8B										Crystalline Silica	14808-60-7	24	5.35E-04	EF	Marginal	<1%
6-9	—	Outside Clinker Storage	—	—	—	—	—	—	—	—	SPM	N/A-1	24	6.77E-02	EF	Marginal	<1%
											Crystalline Silica	14808-60-7	24	4.64E-03	EF	Marginal	<1%
Supporting Processes																	
9-1		Maintenance Welding									SPM	N/A-1	24	6.17E-04	EF	Average	<1%
9-1		Maintenance Welding									Chromium	7440-47-3	24	2.01E-07	EF	Average	<1%
9-1		Maintenance Welding									Cobalt	7440-48-4	24	3.35E-08	EF	Average	<1%
9-1		Maintenance Welding									Manganese	7439-96-5	24	3.46E-05	EF	Average	<1%
9-1		Maintenance Welding									Nickel	7440-02-0	24, Annual	6.71E-08	EF	Average	<1%
9-1		Maintenance Welding									Iron	15438-31-0	24, Annual	6.17E-04	EF	Average	<1%
9-1		Maintenance Welding									Calcium Carbonate	1317-65-3	24	6.17E-05	EF	Average	100%
9-1		Maintenance Welding									Fluorides	16984-48-8	24	3.09E-05	EF	Average	100%
9-1	—	Maintenance Welding	—	—	—	—	—	—	—	—	Titanium Dioxide	13463-67-7	24	3.09E-05	EF	Average	100%
9-1		Maintenance Welding									Sodium Silicate	1344-09-8	24	3.09E-05	EF	Average	100%
9-1		Maintenance Welding									Potassium Silicate	1312-76-1	24	3.09E-05	EF	Average	100%
9-1		Maintenance Welding									Feldspar	68476-25-5	24	6.17E-06	EF	Average	100%
9-1		Maintenance Welding									Silicon	7440-21-3	24	6.17E-06	EF	Average	<1%
9-1		Maintenance Welding									Ferric Oxide	1309-37-1	24	6.17E-06	EF	Average	100%
9-1		Maintenance Welding									Carboxymethyl cellulous, sodium salt	9004-32-4	24	6.17E-06	EF	Average	100%
9-1		Maintenance Welding									Crystalline Silica	14808-60-7	24	6.17E-06	EF	Average	<1%
9-1		Maintenance Welding									Hydroxyethyl cellulous	9004-62-0	24	6.17E-06	EF	Average	100%
10-1	—	Comfort Heating	—	—	—	—	—	—	—	—	Nitrogen Oxides	10102-44-0	1, 24	4.91E-02	EF	Excellent	<1%

Notes: "V-ST" - Validated Source Test, "ST" - Source Test, "EF" - Emission Factor, "MB" Mass Balance, "EC" - Engineering Calculation
Data Quality Categories: "Highest"; "Above-Average"; "Average"; and "Marginal"
* Metallic iron

WSP GOLDER

Made by: LL
Checked by: JJZ

Table 2b TOC
Source Summary Table

			Source Parameters								Emission Data						
Source ID	Model Source ID	Source Description	Stack Volumetric Flow Rate [Am³/s]	Stack Velocity [m/s]	Stack Exit Gas Temperature [°C]	Stack Inner Diameter [m]	Stack Height Above Grade [m]	Stack Height Above Roof [m]	Source Location [X Coordinate]	Source Location [Y Coordinate]	Contaminant	CAS No.	Averaging Period [hours]	Maximum Emission Rate [g/s]	Emission Estimating Technique	Emissions Data Quality	Percentage of Overall Emissions [%]
Quarry Operations																	
Q1	—	Blasting - Hole Drilling	—	—	—	—	—	—	—	—	SPM	N/A-1	24	1.56E-02	EF	Marginal	<1%
Q2	—	Blasting	—	—	—	—	—	—	—	—	SPM	N/A-1	24	2.35E-02	EF	Average	<1%
											Carbon Monoxide	630-08-0	½	3.78E+01	EF	Marginal	21%
											Nitrogen Oxides	10102-44-0	1, 24	8.89E+00	EF	Marginal	4%
											Sulphur dioxide	7446-09-5	1, 24	1.11E+00	EF	Marginal	<1%
Q5	QUARRY5	Material transfers	—	—	—	—	—	—	328898	4880219	SPM	N/A-1	24	2.05E+00	EF	Average	8%
Raw Materials Storage and Transfers																	
1-1	VFUG4	Haul Truck dump into Primary Crusher	—	—	—	—	—	—	330207	4879840	SPM	N/A-1	24	1.85E-01	EF	Marginal	<1%
1-2	VFUG4A	S-2 to Crushed Limestone Pile	—	—	—	—	—	—	330081	4879923	SPM	N/A-1	24	4.62E-01	EF	Above Average	2%
2	SECOND	Secondary Crusher	—	—	—	—	—	—	330135	4879962	SPM	N/A-1	24	6.38E-03	EF	Average	<1%
3-1	COALSHIP	LSC and coke unloading from ship	—	—	—	—	—	—	329973	4879327	SPM	N/A-1	24	1.94E+00	EF	Average	8%
3-2	COALTD	LSC and coke shore pile outloading	—	—	—	—	—	—	329979	4879358	SPM	N/A-1	24	4.34E-02	EF	Average	<1%
3-3	GYPSHIP	Anhydride and crude gypsum unloading from ship	—	—	—	—	—	—	330127	4879622	SPM	N/A-1	24	2.09E+00	EF	Above Average	8%
3-4	GYPSUMTD	Anhydride and crude gypsum shore pile outloading	—	—	—	—	—	—	330127	4879654	SPM	N/A-1	24	9.68E-02	EF	Average	<1%
3-5	MISCDROP	Silica, iron, and and alumina additive drop to pile and drop to storage hall	—	—	—	—	—	—	330150	4880323	SPM	N/A-1	24	3.87E-01	EF	Average	2%
3-6	CKD	CKD drop to pile and outloading to sales	—	—	—	—	—	—	3329967	4879735	SPM	N/A-1	24	3.72E-01	EF	Average	2%
3-7	VFUG5	Fuel drop into feed hopper	—	—	—	—	—	—	330156	4880159	SPM	N/A-1	24	2.48E-02	EF	Average	<1%
Kilns																	
4-2	KILN4	Kiln 4 Stack with ESPs, SNCR ammonia injection, and lime injection	207.0	14.94	120	4.20	70.8	N/A	330054	4879945	SPM	N/A-1	24	1.08E+01	EF	Marginal	44%
4-2	KILN4	Kiln 4 Stack with ESPs, SNCR ammonia injection, and lime injection									Carbon Monoxide	630-08-0	½	1.41E+02	V-ST	Highest	79%
4-2	KILN4	Kiln 4 Stack with ESPs, SNCR ammonia injection, and lime injection									Nitrogen Oxides	10102-44-0	1, 24	2.02E+02	V-ST	Highest	93%
4-2	KILN4	Kiln 4 Stack with ESPs, SNCR ammonia injection, and lime injection									Sulphur dioxide	7446-09-5	1, 24	1.64E+02	V-ST	Highest	92%
4-4	KILN4_C	Kiln 4 Cooler with baghouse	128.9	14.20	120	3.40	38.0	N/A	330215	4880156	SPM	N/A-1	24	3.08E+00	EF	Marginal	12%
4-5	KILN4_BP	Kiln 4 Bypass Stack with baghouse	22.8	12.56	120	1.52	83.2	N/A	330099	4880073	SPM	N/A-1	24	4.56E-01	EF	Average	2%
4-5	KILN4_BP	Kiln 4 Bypass Stack with baghouse									Carbon Monoxide	630-08-0	½	6.39E-01	V-ST	Highest	<1%
4-5	KILN4_BP	Kiln 4 Bypass Stack with baghouse									Nitrogen Oxides	10102-44-0	1, 24	6.67E+00	V-ST	Highest	3%
4-5	KILN4_BP	Kiln 4 Bypass Stack with baghouse									Sulphur dioxide	7446-09-5	1, 24	1.37E+01	V-ST	Highest	8%

Made by: LL
Checked by: JJZ

Table 2b TOC
Source Summary Table

Source ID	Model Source ID	Source Description	Source Parameters								Emission Data						
			Stack Volumetric Flow Rate [Am³/s]	Stack Velocity [m/s]	Stack Exit Gas Temperature [°C]	Stack Inner Diameter [m]	Stack Height Above Grade [m]	Stack Height Above Roof [m]	Source Location [X Coordinate]	Source Location [Y Coordinate]	Contaminant	CAS No.	Averaging Period [hours]	Maximum Emission Rate [g/s]	Emission Estimating Technique	Emissions Data Quality	Percentage of Overall Emissions [%]
Baghouses																	
5-1	SRCID3	#1 Mill Stack with Baghouse	20.2	31.75	65	0.9	51.2	24.2	330059	4880137	SPM	N/A-1	24	1.38E-01	EF	Marginal	<1%
5-2	SRCID4	#2 Mill Stack with Baghouse	18.7	29.39	65	0.9	51.2	24.2	330065	4880146	SPM	N/A-1	24	1.38E-01	EF	Marginal	<1%
5-3	SRCID5	#3 Mill Stack with Baghouse	20.2	31.75	85	0.9	51.2	24.2	330070	4880157	SPM	N/A-1	24	5.25E-02	EF	Marginal	<1%
5-4	SRCID6	#4 Mill Stack with Baghouse	20.2	31.75	85	0.9	51.2	24.2	330076	4880165	SPM	N/A-1	24	5.25E-02	EF	Marginal	<1%
5-5	SRCID7	#5 Mill Stack with Baghouse	30.8	20.01	82	1.4	45.7	18.7	330072	4880191	SPM	N/A-1	24	6.42E-02	EF	Marginal	<1%
5-6	SRCID8	#6 & #7 Mill Stack with Baghouse	60.7	39.43	85	1.4	45.7	18.7	330088	4880187	SPM	N/A-1	24	9.33E-02	EF	Marginal	<1%
5-7	SRCID11	Primary Crusher with Baghouse	3.2	19.26	Ambient	0.46	12	—	330210	4879837	SPM	N/A-1	24	7.64E-02	EF	Marginal	<1%
5-8	SRCID12	Hammermill equipped with dust collector	4.3	14.81	Ambient	0.608	24.7	—	330139	4879968	SPM	N/A-1	24	4.86E-02	EF	Marginal	<1%
5-9	SRCID13	Screen House equipped with dust collector	9.0	20.00	Ambient	0.757	24.7	—	330177	4880012	SPM	N/A-1	24	1.07E-02	EF	Marginal	<1%
5-10	SRCID14	Blend Silo 2 equipped with dust collector	0.9	7.16	80	0.40	36.6	—	329980.809	4880076	SPM	N/A-1	24	9.00E-03	EF	Average	<1%
5-11	SRCID15	Blend Silo 3 equipped with dust collector	6.6	18.72	80	0.67	36.6	—	329959.116	4880070	SPM	N/A-1	24	1.32E-01	EF	Average	<1%
5-12	SRCID16	Blend Silo 4(#3 Kiln Feed) equipped with dust collector	4.5	14.71	80	0.62	36.6	—	329967.960	4880084	SPM	N/A-1	24	4.50E-02	EF	Average	<1%
5-13	SRCID17	Blend Silo 6 equipped with dust collector	5.2	26.48	80	0.5	36.6	—	329965.869	4880053	SPM	N/A-1	24	5.20E-02	EF	Average	<1%
5-15	SRCID19	Packhouse Truck #1 equipped with dust collector	0.4	8.29	90	0.254	8	—	329979	4880228	SPM	N/A-1	24	4.20E-03	EF	Average	<1%
5-16	SRCID20	Packhouse North Packer equipped with dust collector	5.2	18.48	50	0.598	15	—	329979	4880228	SPM	N/A-1	24	1.04E-01	EF	Average	<1%
5-17	SRCID21	Packhouse South Packer equipped with dust collector	2.9	14.77	50	0.50	13	5	329979	4880228	SPM	N/A-1	24	2.90E-02	EF	Average	<1%
5-18	SRCID22	Packhouse Masonary equipped with dust collector	1.2	16.98	50	0.30	35.3	2.3	330002	4880229	SPM	N/A-1	24	1.20E-02	EF	Average	<1%
5-19	SRCID23	Silo #4 equipped with dust collector	6.6	20.07	100	0.647	35.3	2.3	330022	4880230	SPM	N/A-1	24	1.32E-01	EF	Average	<1%
5-20	SRCID26	Dock Silo 1 equipped with dust collector	4.5	10.19	80	0.75	48.1	—	330229.865	4879868	SPM	N/A-1	24	4.50E-02	EF	Average	<1%
5-21	SRCID27	Dock Silo 2 equipped with dust collector	4.5	10.19	80	0.75	48.1	—	330238.514	4879883	SPM	N/A-1	24	4.50E-02	EF	Average	<1%
5-22	SRCID28	Dock Silo 3 equipped with dust collector	4.5	10.19	80	0.75	48.1	—	330244	4879892	SPM	N/A-1	24	4.50E-02	EF	Average	<1%
5-23	SRCID29	Dock Silo 4 equipped with dust collector	4.5	10.19	80	0.75	48.1	—	330248.061	4879898	SPM	N/A-1	24	4.50E-02	EF	Average	<1%
5-27	SRCID35	Clinker Ship Loading equipped with dust collector	6.6	15.95	Ambient	0.73	17	—	330341	4879983	SPM	N/A-1	24	2.40E-02	EF	Average	<1%
5-28	SRCID36	Brick Saw K-4 equipped with dust collector	2.4	14.44	Ambient	0.46	0.1	—	330175	4880156	SPM	N/A-1	24	9.90E-03	EF	Average	<1%
5-31	SRCID42	Coal Mill Dust Collector equipped with dust collector	23.6	15.96	65	1.372	50.3	—	330181	4880167	SPM	N/A-1	24	4.72E-01	EF	Average	2%
5-32	SRCID43	Indirect Firing - Coal Silo equipped with passive fabric filter	1.4	19.81	75	0.3	34.4	—	330181	4880167	SPM	N/A-1	24	1.40E-02	EF	Average	<1%
5-33	SRCID44	Indirect Firing - Coke Silo equipped with passive fabric filter	1.4	19.81	75	0.3	34.4	—	330181	4880167	SPM	N/A-1	24	1.40E-02	EF	Average	<1%
5-34	SRCID45	Ind. Firing - Weigh Feeder equipped with dust collector	0.3	22.10	75	0.12	14.6	—	330181	4880167	SPM	N/A-1	24	2.50E-03	EF	Average	<1%
5-35	SRCID46	Ind. Firing - Weigh Feeder equipped with dust collector	0.3	22.10	75	0.12	14.6	—	330181	4880167	SPM	N/A-1	24	2.50E-03	EF	Average	<1%
5-36	SRCID47	Coal Handling equipped with dust collector	0.3	39.30	75	0.09	14.6	—	330206	4880169	SPM	N/A-1	24	9.00E-04	EF	Average	<1%
5-37	SRCID48	Coal Handling equipped with dust collector	0.1	14.15	75	0.09	14.6	—	330201	4880174	SPM	N/A-1	24	9.00E-04	EF	Average	<1%
5-38	SRCID49	New Secondary Crusher equipped with dust collector	5.2	8.99	Ambient	0.858	14.6	—	330150	4879963	SPM	N/A-1	24	1.56E-02	EF	Marginal	<1%
5-39	SRCID51	Expansion - Limestone Storag e 105-1 equipped with dust collector	3.0	10.61	Ambient	0.6	27.7	—	330075	4880075	SPM	N/A-1	24	3.00E-02	EF	Average	<1%
5-40	SRCID55	Expansion - Bucket Elev. Dedust. 105-5 equipped with dust collector	1.5	11.94	Ambient	0.4	11.9	—	330075	4880075	SPM	N/A-1	24	1.50E-02	EF	Average	<1%
5-41	SRCID58	Blend Silo 5 equipped with dust collector	2.5	10.52	80	0.55	29	—	329975	4880071	SPM	N/A-1	24	2.50E-02	EF	Average	<1%
5-42	SRCID61	Lime addition silo equipped with dust collector	0.6	45.90	Ambient	0.12	20	2	330093	4880032	SPM	N/A-1	24	5.60E-03	EF	Average	<1%
5-43	SRCID62	Pan conveyor equipped with dust collector	3.3	16.68	Ambient	0.50	7	—	330176	4880168	SPM	N/A-1	24	3.30E-02	EF	Average	<1%
5-44	SRCID63	Truck load dust collector 2 equipped with dust collector- South scale	0.9	13.30	80	0.3	15	—	329979	4880228	SPM	N/A-1	24	9.40E-03	EF	Average	<1%
5-45	SRCID64	Truck load dust collector 4 equipped with dust collector - South scale	0.9	13.30	80	0.3	15	—	329979	4880228	SPM	N/A-1	24	9.40E-03	EF	Average	<1%
5-46	SRCID65	Truck Load dust collector 3 equipped with dust collector - East	1.3	18.39	80	0.3	15	—	329979	4880228	SPM	N/A-1	24	1.30E-02	EF	Average	<1%
5-47	SRCID66	Expansion - Hopper Feedoweights equipped with dust collector	6.0	21.22	Ambient	0.6	30	—	330075	4880075	SPM	N/A	24	1.20E-01	EF	Average	<1%
5-48	SRCID67	Slag dryer equipped with dust collector	9.2	20.28	120	0.76	45		330127	4880214	SPM	N/A-1	24	1.84E-01	EF	Average	<1%
5-49	SRCID68	#8 Mill Stack	10.4	8.47	95	1.25	18.3	—	330206	4880248	SPM	N/A-1	24	9.92E-02	EF	Marginal	<1%
5-50	SRCID69	Cement dome dust collector	6.1	16.45	Above Ambient	0.689	110.49	—	330169	4880072	SPM	N/A-1	24	1.23E-01	EF	Average	<1%
Clinker Transfers																	
6-1	CLINK1	Clinker Storage Hall Left (Src 60 & 62)	—	—	—	—	—	—	330140	4880175	SPM	N/A-1	24	3.82E-04	EF	Marginal	<1%
6-2	CLINK2	Clinker Storage Hall Middle (Src 60 & 62)	—	—	—	—	—	—	330115	4880200	SPM	N/A-1	24	3.82E-04	EF	Marginal	<1%
6-3	CLINK3	Clinker Storage Hall Right (Src 60 & 62)	—	—	—	—	—	—	330129	4880222	SPM	N/A-1	24	3.82E-04	EF	Marginal	<1%
6-4	VFUG11	Clinker Storage Hall East Right (Src 60 & 62)	—	—	—	—	—	—	330057	4880109	SPM	N/A-1	24	3.82E-04	EF	Marginal	<1%
6-5	VFUG12	Clinker Storage Hall East Left (Src 60 & 62)	—	—	—	—	—	—	330047	4880087	SPM	N/A-1	24	3.82E-04	EF	Marginal	<1%
6-6	VFUG6	K3 Clinker Handling (Src 52) (Product drop into open conveyor C-11)	—	—	—	—	—	—	330060	4880274	SPM	N/A-1	24	6.77E-03	EF	Marginal	<1%
6-7	VFUG8A	Clinker Screening S-9 (Src 58) Clinker (Conveyor S-9 product drops)	—	—	—	—	—	—	330181	4880218	SPM	N/A-1	24	6.77E-03	EF	Marginal	<1%
6-8	VFUG8B	Clinker Screening S-9 (Src 58) Weathered Clinker (Conveyor S-9 product drops)	—	—	—	—	—	—	330181	4880219	SPM	N/A-1	24	7.81E-03	EF	Marginal	<1%
6-9	—	Outside Clinker Storage	—	—	—	—	—	—	—	—	SPM	N/A-1	24	6.77E-02	EF	Marginal	<1%
Supporting Processes																	
9-1	—	Maintenance Welding	—	—	—	—	—	—	—	—	SPM	N/A-1	24	6.17E-04	EF	Average	<1%
10-1	—	Comfort Heating	—	—	—	—	—	—	—	—	Nitrogen Oxides	10102-44-0	1, 24	4.91E-02	EF	Excellent	<1%

Notes: "V-ST" - Validated Source Test, "ST" - Source Test, "EF" - Emission Factor, "MB" Mass Balance, "EC" - Engineering Calculation
Data Quality Categories: "Highest"; "Above-Average"; "Average"; and "Marginal"
* Metallic iron

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Table 3
Dispersion Modelling Input Summary Table

Relevant Section of the Regulation	Section Title	Summary of How the Approved Dispersion Model Was Used	Location of Supporting Documentation in ESDM Report
Section 6	Approved Dispersion Model	AERMOD v.19191 AERMAP v.18081 BPIP v.04274	Section 6.0
Section 8	Negligible Sources of Contaminants	Sources and contaminants that were considered negligible were explicitly identified, and therefore were not modelled in accordance with s.8 of O.Reg.419/05.	Section 3.0, Table 1
Section 9	Same Structure Contamination	Not applicable as the Facility is the only tenant occupying the building, and does not have a child care facility, health care facility, senior's residence, long-term care facility or an education facility located at the on-site.	N/A
Section 10	Operating Conditions	When applicable, all equipment was assumed to be operating at the maximum production rates, simultaneously.	Section 4.0, Table 4
Section 11	Source of Contaminant Emission Rates	The emission rate for each significant contaminant emitted from a significant source was estimated, the methodology for the calculation is documented in Table 2 - Source Summary Table.	Section 4.0, Table 2
Section 12	Combined Effect of Assumptions for Operating Conditions and Emission Rates	The Operating Conditions were estimated in accordance with s.10(1) 1 and s.11(1) 1 of O.Reg.419/05 and are therefore considered to result in the highest POI concentration that the Facility is capable of for each contaminant emitted.	Section 4.0
Section 13	Meteorological Conditions	Site-specific meteorology prvided by MECP under s.13 of O. Reg. 419/05	Section 6.0
Section 14	Area of Modelling Coverage (receptor locations)	Model coverage set to match MECP guidelines.	Section 6.0
Section 15	Stack Height for Certain New Sources of Contaminant	N/A	Section 6.0
Section 16	Terrain Data	MECP cdem_dem_031C	Section 6.0
Section 17	Averaging Periods	Maximum 1-hour and 24-hour emission rates were used in the AERMOD model to produce 1-hour and 24-hour modelled POI concentrations. For contaminants with 10-min, 0.5 hour, monthly and annual averaged POI Limits, the 1- hour or 24-hour modelled concentrations were converted to 10-min, 0.5 hour, monthly or annual concentrations using the conversion factors in the ADMGO.	Section 4.0

Table 4
Supplemental Dispersion Modelling Summary Table

Modelling ID	Source ID(s)	Source Description	Source Type	Modelling Source Data: Open Pit Sources								Emission Data				
				Area [m^2]	Average Release Height Above Base of Pit [m]	Length of X side of the Open Pit [m]	Length of Y side of the Open Pit [m]	Pit Volume [m^3]	Source X-Coordinate [m]	Source Y-Coordinate [m]	Angle [º]	Contaminant	CAS No.	OPENPIT Source Emission Rate [g/s]	OPENPIT Source Emission Rate as Inputted into AERMOD [g/m^2-s]	Averaging Period [hours]
QUARRY5	Q5	Material transfers	Open Pit	292500	24	450	650	14040000	328898	4880219	25	SPM	N/A-1	2.05E+00	7.00E-06	24
												Crystalline Silica	14808-60-7	1.23E-01	4.19E-07	24

Modelling ID	Source ID(s)	Source Description	Source Type	Modelling Source Data: Volume Sources							Emission Data			
				Release Height Above Grade [m]	Length of Side [m]	Volume Source Height [m]	Initial Lateral Dimension of Volume [m]	Initial Vertical Dimension of Volume [m]	Source X-Coordinate [m]	Source Y-Coordinate [m]	Contaminant	CAS No.	Maximum Emission Rate [g/s]	Averaging Period [hours]
VFUG4	1-1	Haul Truck dump into Primary Crusher	Volume	1.5	3.1	15.0	0.71	6.98	330207	4879840	SPM	N/A-1	1.85E-01	24
VFUG4											Crystalline Silica	14808-60-7	1.11E-02	24
VFUG4A	1-2	S-2 to Crushed Limestone Pile	Volume	13	1.0	13.0	0.23	0.47	330081	4879923	SPM	N/A-1	4.62E-01	24
VFUG4A											Crystalline Silica	14808-60-7	2.77E-02	24
SECOND	2	Secondary Crusher	Volume	8.5	15.0	17.0	3.49	0.47	330135	4879962	SPM	N/A-1	6.38E-03	24
SECOND											Crystalline Silica	14808-60-7	4.63E-04	24
COALSHIP	3-1	LSC and coke unloading from ship	Volume	13	1.0	5.0	0.23	0.47	329973	4879327	SPM	N/A-1	1.94E+00	24
COALSHIP											Crystalline Silica	14808-60-7	1.16E-01	24
COALTD	3-2	LSC and coke shore pile outloading	Volume	1.52	5.0	5.0	1.16	2.33	329979	4879358	SPM	N/A-1	4.34E-02	24
COALTD											Crystalline Silica	14808-60-7	2.60E-03	24
GYPSHIP	3-3	Anhydride and crude gypsum unloading from ship	Volume	13	1.0	5.0	0.23	0.47	330127	4879622	SPM	N/A-1	2.09E+00	24
GYPSHIP											Crystalline Silica	14808-60-7	1.25E-01	24
GYPSUMTD	3-4	Anhydride and crude gypsum shore pile outloading	Volume	1.52	5.0	5.0	1.16	2.33	330127	4879654	SPM	N/A-1	9.68E-02	24
GYPSUMTD											Crystalline Silica	14808-60-7	5.80E-03	24
MISCDROP	3-5	Silica, iron, and and alumina additive drop to pile and drop to storage hall	Volume	1.5	3.1	5.0	0.71	2.33	330150	4880323	SPM	N/A-1	3.87E-01	24
MISCDROP											Crystalline Silica	14808-60-7	2.32E-02	24
CKD	3-6	CKD drop to pile and outloading to sales	Volume	1.5	5.0	5.0	1.16	2.33	3329967	4879735	SPM	N/A-1	3.72E-01	24
CKD											Crystalline Silica	14808-60-7	2.23E-02	24
VFUG5	3-7	Fuel drop into feed hopper	Volume	1.5	3.1	5.0	0.71	2.33	330156	4880159	SPM	N/A-1	2.48E-02	24
VFUG5											Crystalline Silica	14808-60-7	1.49E-03	24
CLINK1	6-1	Clinker Storage Hall Left (Src 60 & 62)	Volume	13.5	25.0	27.0	5.81	12.56	330140	4880175	SPM	N/A-1	3.82E-04	24
CLINK1											Crystalline Silica	14808-60-7	2.62E-05	24
CLINK2	6-2	Clinker Storage Hall Middle (Src 60 & 62)	Volume	13.5	25.0	27.0	5.81	12.56	330115	4880200	SPM	N/A-1	3.82E-04	24
CLINK2											Crystalline Silica	14808-60-7	2.62E-05	24
CLINK3	6-3	Clinker Storage Hall Right (Src 60 & 62)	Volume	13.5	25.0	27.0	5.81	12.56	330129	4880222	SPM	N/A-1	3.82E-04	24
CLINK3											Crystalline Silica	14808-60-7	2.62E-05	24
VFUG11	6-4	Clinker Storage Hall East Right (Src 60 & 62)	Volume	13.5	25.0	27.0	5.81	12.56	330057	4880109	SPM	N/A-1	3.82E-04	24
VFUG11											Crystalline Silica	14808-60-7	2.62E-05	24
VFUG12	6-5	Clinker Storage Hall East Left (Src 60 & 62)	Volume	13.5	25.0	27.0	5.81	12.56	330047	4880087	SPM	N/A-1	3.82E-04	24
VFUG12											Crystalline Silica	14808-60-7	2.62E-05	24
VFUG6	6-6	K3 Clinker Handling (Src 52) (Product drop into open conveyor C-11)	Volume	7.5	16.0	15.0	3.72	6.98	330060	4880274	SPM	N/A-1	6.77E-03	24
VFUG6											Crystalline Silica	14808-60-7	4.64E-04	24
VFUG8A	6-7	Clinker Screening S-9 (Src 58) Clinker (Conveyor S-9 product drops)	Volume	22	1.5	1.5	0.35	0.70	330181	4880218	SPM	N/A-1	6.77E-03	24
VFUG8A											Crystalline Silica	14808-60-7	4.64E-04	24
VFUG8B	6-8	Clinker Screening S-9 (Src 58) Weathered Clinker (Conveyor S-9 product drops)	Volume	22	1.5	1.5	0.35	0.70	330181	4880219	SPM	N/A-1	7.81E-03	24
VFUG8B											Crystalline Silica	14808-60-7	5.35E-04	24

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Modelling ID	Source ID(s)	Source Description	Source Type	Modelling Source Data: Point Sources							Emission Data			
				Stack Height Above Grade [m]	Stack Volumetric Flow Rate [Am^3/s]	Stack Gas Exit Velocity [m/s]	Stack Gas Exit Temperature [K]	Stack Inner Diameter [m]	Source X-Coordinate [m]	Source Y-Coordinate [m]	Contaminant	CAS No.	Maximum Emission Rate [g/s]	Averaging Period [hours]
KILN4	4-2	Kiln 4 Stack with ESPs, SNCR ammonia injection, and lime injection	Point	70.8	207.0	14.94	393.15	4.20	330054	4879945	SPM	N/A-1	6.21E+00	24
											Crystalline Silica	14808-60-7	7.24E-01	24
											Dioxins and Furans (TEQ)	N/A-4	1.81E-09	24
											Carbon Monoxide	630-08-0	2.22E+01	½
											Nitrogen Oxides	10102-44-0	1.09E+02	1, 24
											Sulphur dioxide	7446-09-5	1.22E+01	1, 24
											Ammonia	7664-41-7	7.19E+00	24
											Aluminum	7429-90-5	2.94E-01	24
											Ammonium	N/A-6	2.45E+00	24
											Arsenic	7440-38-2	2.94E-04	24
											Barium	7440-39-3	8.15E-03	24
											Beryllium	7440-41-7	1.49E-05	24
											Cadmium	7440-43-9	1.90E-04	24
											Calcium Oxide	1305-78-8	5.43E+00	24
											Chloride	N/A-5	1.54E+01	24
											Chromium	7440-47-3	1.77E-04	24
											Cobalt	7440-48-4	1.23E-02	24
											Copper	7440-50-8	1.18E-01	24
											Hydrogen Fluoride	7664-39-3	2.04E-02	24
											Hydrogen Chloride	7647-01-0	1.02E+01	24
											Iron	15438-31-0	3.85E-01	24
											Lead	7439-92-1	1.63E-02	24, 30-day
											Manganese	7439-96-5	1.95E-02	24
											Mercury	7439-97-6	4.47E-02	24
											Nickel	7440-02-0	4.78E-03	24, Annual
											Nitrate	N/A-7	1.04E-01	24
											Phosphorus	7723-14-0	1.20E-01	24
											Potassium	7440-09-7	4.08E-01	24
											Selenium	7782-49-2	3.40E-03	24
											Silicon	7440-21-3	6.21E+00	24
											Sodium	7440-23-5	9.06E-01	24
											Sulfate	N/A-8	4.53E+00	24
											Sulfur trioxide	N/A-9	1.90E+00	24
											Tin	7440-31-5	1.23E-01	24
											Zinc	7440-66-6	1.22E-02	24
											C3 benzenes	N/A-10	5.89E-05	24
											C4 benzenes	N/A-11	1.36E-04	24
											Acenaphthylene	208-96-8	2.67E-03	24
											Benzaldehyde	100-52-7	5.43E-04	24
											Benzene	71-43-2	7.24E-02	24, Annual
											Benzo(a)pyrene	50-32-8	2.94E-06	24, Annual
											Carbon Dioxide	124-38-9	4.08E+04	24
											Fluoranthene	206-44-0	1.99E-04	24
											Fluorene	86-73-7	4.26E-04	24
											Phenanthrene	85-01-8	9.06E-03	24
											Pyrene	129-00-0	9.96E-05	24
											PCBs	1336-36-3	1.76E-04	24
KILN4_C	4-4	Kiln 4 Cooler with baghouse	Point	38.0	128.9	14.20	393.15	3.40	330215	4880156	SPM	N/A-1	3.08E+00	24
											Crystalline Silica	14808-60-7	3.59E-01	24

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				Modelling Source Data: Point Sources							Emission Data			
Modelling ID	Source ID(s)	Source Description	Source Type	Stack Height Above Grade [m]	Stack Volumetric Flow Rate [Am^3/s]	Stack Gas Exit Velocity [m/s]	Stack Gas Exit Temperature [K]	Stack Inner Diameter [m]	Source X-Coordinate [m]	Source Y-Coordinate [m]	Contaminant	CAS No.	Maximum Emission Rate [g/s]	Averaging Period [hours]
KILN4_BP	4-5	Kiln 4 Bypass Stack with baghouse	Point	83.2	22.8	12.56	393.15	1.52	330099	4880073	SPM	N/A-1	4.56E-01	24
											Crystalline Silica	14808-60-7	5.31E-02	24
											Dioxins and Furans (TEQ)	N/A-4	6.13E-11	24
											Carbon Monoxide	630-08-0	1.33E-01	½
											Nitrogen Oxides	10102-44-0	1.48E+00	1, 24
											Sulphur dioxide	7446-09-5	2.47E-01	1, 24
											Ammonia	7664-41-7	1.57E-03	24
											Aluminum	7429-90-5	2.94E-01	24
											Ammonium	N/A-6	2.45E+00	24
											Arsenic	7440-38-2	8.98E-05	24
											Barium	7440-39-3	2.01E-02	24
											Beryllium	7440-41-7	1.01E-06	24
											Bismuth	7440-69-9	4.56E-01	24
											Cadmium	7440-43-9	4.58E-04	24
											Calcium Oxide	1305-78-8	7.67E-02	24
											Chloride	N/A-5	4.98E-02	24
											Chromium	7440-47-3	1.11E-03	24
											Cobalt	7440-48-4	9.40E-04	24
											Copper	7440-50-8	3.29E-03	24
											Hydrogen Fluoride	7664-39-3	2.42E-03	24
											Hydrogen Chloride	7647-01-0	2.17E-01	24
											Iron	15438-31-0	4.56E-01	24
											Lead	7439-92-1	2.73E-03	24, 30-day
											Magnesium	7439-95-4	4.56E-01	24
											Manganese	7439-96-5	2.90E-03	24
											Mercury	7439-97-6	1.03E-04	24
											Nickel	7440-02-0	4.92E-04	24, Annual
											Nitrate	N/A-7	1.04E-01	24
											Phosphorus	7723-14-0	8.92E-03	24
											Potassium	7440-09-7	4.08E-01	24
											Selenium	7782-49-2	4.53E-03	24
											Silicon	7440-21-3	4.56E-01	24
											Sodium	7440-23-5	4.56E-01	24
											Sulfate	N/A-8	1.63E-01	24
											Sulfur trioxide	N/A-9	3.31E-01	24
											Tin	7440-31-5	6.23E-03	24
											Tungsten	7440-33-7	4.56E-01	24
											Zinc	7440-66-6	4.56E-01	24
											Acenaphthylene	208-96-8	7.19E-08	24
											Benzaldehyde	100-52-7	5.43E-04	24
											Benzene	71-43-2	1.48E-04	24, Annual
											Benzo(a)pyrene	50-32-8	2.34E-08	24, Annual
											C3 benzenes	N/A-10	5.89E-05	24
											C4 benzenes	N/A-11	1.36E-04	24
											Carbon Dioxide	124-38-9	4.08E+04	24
											Fluoranthene	206-44-0	1.35E-07	24
											Fluorene	86-73-7	2.80E-07	24
											Phenanthrene	85-01-8	5.19E-07	24
											Pyrene	129-00-0	1.19E-07	24
											PCBs	1336-36-3	1.44E-07	24

Made by: LL
Checked by: JJZ

Modelling ID	Source ID(s)	Source Description	Source Type	Modelling Source Data: Point Sources						Emission Data				
				Stack Height Above Grade [m]	Stack Volumetric Flow Rate [Am^3/s]	Stack Gas Exit Velocity [m/s]	Stack Gas Exit Temperature [K]	Stack Inner Diameter [m]	Source X-Coordinate [m]	Source Y-Coordinate [m]	Contaminant	CAS No.	Maximum Emission Rate [g/s]	Averaging Period [hours]
SRCID3	5-1	#1 Mill Stack with Baghouse	Point	51.2	20.2	31.8	338.15	0.90	330059	4880137	SPM	N/A-1	1.38E-01	24
											Crystalline Silica	14808-60-7	1.60E-02	24
SRCID4	5-2	#2 Mill Stack with Baghouse	Point	51.2	18.7	29.4	338.15	0.90	330065	4880146	SPM	N/A-1	1.38E-01	24
											Crystalline Silica	14808-60-7	1.60E-02	24
SRCID5	5-3	#3 Mill Stack with Baghouse	Point	51.2	20.2	31.8	358.15	0.90	330070	4880157	SPM	N/A-1	5.25E-02	24
											Crystalline Silica	14808-60-7	6.11E-03	24
SRCID6	5-4	#4 Mill Stack with Baghouse	Point	51.2	20.2	31.8	358.15	0.90	330076	4880165	SPM	N/A-1	5.25E-02	24
											Crystalline Silica	14808-60-7	6.11E-03	24
SRCID7	5-5	#5 Mill Stack with Baghouse	Point	45.7	30.8	20.0	355.15	1.40	330072	4880191	SPM	N/A-1	6.42E-02	24
											Crystalline Silica	14808-60-7	7.47E-03	24
SRCID8	5-6	#6 & #7 Mill Stack with Baghouse	Point	45.7	60.7	39.4	358.15	1.40	330088	4880187	SPM	N/A-1	9.33E-02	24
											Crystalline Silica	14808-60-7	1.09E-02	24
SRCID11	5-7	Primary Crusher with Baghouse	Point	12.0	3.2	19.3	Ambient	0.46	330210	4879837	SPM	N/A-1	7.64E-02	24
											Crystalline Silica	14808-60-7	8.90E-03	24
SRCID12	5-8	Hammermill equipped with dust collector	Point	24.7	4.3	14.8	Ambient	0.61	330139	4879968	SPM	N/A-1	4.86E-02	24
											Crystalline Silica	14808-60-7	5.66E-03	24
SRCID13	5-9	Screen House equipped with dust collector	Point	24.7	9.0	20.0	Ambient	0.76	330177	4880012	SPM	N/A-1	1.07E-02	24
											Crystalline Silica	14808-60-7	1.25E-03	24
SRCID14	5-10	Blend Silo 2 equipped with dust collector	Point	36.6	0.9	7.2	353.15	0.40	329980.809	4880076	SPM	N/A-1	9.00E-03	24
											Crystalline Silica	14808-60-7	1.05E-03	24
SRCID15	5-11	Blend Silo 3 equipped with dust collector	Point	36.6	6.6	18.7	353.15	0.67	329959.116	4880070	SPM	N/A-1	1.32E-01	24
											Crystalline Silica	14808-60-7	1.54E-02	24
SRCID16	5-12	Blend Silo 4(#3 Kiln Feed) equipped with dust collector	Point	36.6	4.5	14.7	353.15	0.62	329967.960	4880084	SPM	N/A-1	4.50E-02	24
											Crystalline Silica	14808-60-7	5.24E-03	24
SRCID17	5-13	Blend Silo 6 equipped with dust collector	Point	36.6	5.2	26.5	353.15	0.50	329965.869	4880053	SPM	N/A-1	5.20E-02	24
											Crystalline Silica	14808-60-7	6.06E-03	24
SRCID19	5-15	Packhouse Truck #1 equipped with dust collector	Point	8.0	0.4	8.3	363.15	0.25	329979	4880228	SPM	N/A-1	4.20E-03	24
											Crystalline Silica	14808-60-7	4.89E-04	24
SRCID20	5-16	Packhouse North Packer equipped with dust collector	Point	15.0	5.2	18.5	323.15	0.60	329979	4880228	SPM	N/A-1	1.04E-01	24
											Crystalline Silica	14808-60-7	1.21E-02	24
SRCID21	5-17	Packhouse South Packer equipped with dust collector	Point	13.0	2.9	14.8	323.15	0.50	329979	4880228	SPM	N/A-1	2.90E-02	24
											Crystalline Silica	14808-60-7	3.38E-03	24
SRCID22	5-18	Packhouse Masonary equipped with dust collector	Point	35.3	1.2	17.0	323.15	0.30	330002	4880229	SPM	N/A-1	1.20E-02	24
											Crystalline Silica	14808-60-7	1.40E-03	24
SRCID23	5-19	Silo #4 equipped with dust collector	Point	35.3	6.6	20.1	373.15	0.65	330022	4880230	SPM	N/A-1	1.32E-01	24
											Crystalline Silica	14808-60-7	1.54E-02	24
SRCID26	5-20	Dock Silo 1 equipped with dust collector	Point	48.1	4.5	10.2	353.15	0.75	330229.865	4879868	SPM	N/A-1	4.50E-02	24
											Crystalline Silica	14808-60-7	5.24E-03	24
SRCID27	5-21	Dock Silo 2 equipped with dust collector	Point	48.1	4.5	10.2	353.15	0.75	330238.514	4879883	SPM	N/A-1	4.50E-02	24
											Crystalline Silica	14808-60-7	5.24E-03	24
SRCID28	5-22	Dock Silo 3 equipped with dust collector	Point	48.1	4.5	10.2	353.15	0.75	330244	4879892	SPM	N/A-1	4.50E-02	24
											Crystalline Silica	14808-60-7	5.24E-03	24
SRCID29	5-23	Dock Silo 4 equipped with dust collector	Point	48.1	4.5	10.2	353.15	0.75	330248.061	4879898	SPM	N/A-1	4.50E-02	24
											Crystalline Silica	14808-60-7	5.24E-03	24
SRCID35	5-27	Clinker Ship Loading equipped with dust collector	Point	17.0	6.6	16.0	Ambient	0.73	330341	4879983	SPM	N/A-1	2.40E-02	24
											Crystalline Silica	14808-60-7	2.79E-03	24
SRCID36	5-28	Brick Saw K-4 equipped with dust collector	Point	0.1	2.4	14.4	Ambient	0.46	330175	4880156	SPM	N/A-1	9.90E-03	24
											Crystalline Silica	14808-60-7	1.15E-03	24
SRCID42	5-31	Coal Mill Dust Collector equipped with dust collector	Point	50.3	23.6	16.0	338.15	1.37	330181	4880167	SPM	N/A-1	4.72E-01	24
											Crystalline Silica	14808-60-7	5.50E-02	24
SRCID43	5-32	Indirect Firing - Coal Silo equipped with passive fabric filter	Point	34.4	1.4	19.8	348.15	0.30	330181	4880167	SPM	N/A-1	1.40E-02	24
											Crystalline Silica	14808-60-7	1.63E-03	24
SRCID44	5-33	Indirect Firing - Coke Silo equipped with passive fabric filter	Point	34.4	1.4	19.8	348.15	0.30	330181	4880167	SPM	N/A-2	1.40E-02	24
											Crystalline Silica	14808-60-7	1.63E-03	24
SRCID45	5-34	Ind. Firing - Weigh Feeder equipped with dust collector	Point	14.6	0.3	22.1	348.15	0.12	330181	4880167	SPM	N/A-3	2.50E-03	24
											Crystalline Silica	14808-60-7	2.91E-04	24
SRCID46	5-35	Ind. Firing - Weigh Feeder equipped with dust collector	Point	14.6	0.3	22.1	348.15	0.12	330181	4880167	SPM	N/A-4	2.50E-03	24
											Crystalline Silica	14808-60-7	2.91E-04	24
SRCID47	5-36	Coal Handling equipped with dust collector	Point	14.6	0.3	39.3	348.15	0.09	330206	4880169	SPM	N/A-5	9.00E-04	24
											Crystalline Silica	14808-60-7	1.05E-04	24
SRCID48	5-37	Coal Handling equipped with dust collector	Point	14.6	0.1	14.1	348.15	0.09	330201	4880174	SPM	N/A-6	9.00E-04	24
											Crystalline Silica	14808-60-7	1.05E-04	24
SRCID49	5-38	New Secondary Crusher equipped with dust collector	Point	14.6	5.2	9.0	Ambient	0.86	330150	4879963	SPM	N/A-7	1.56E-02	24
											Crystalline Silica	14808-60-7	1.81E-03	24
SRCID51	5-39	Expansion - Limestone Storag e 105-1 equipped with dust collector	Point	27.7	3.0	10.6	Ambient	0.60	330075	4880075	SPM	N/A-8	3.00E-02	24
											Crystalline Silica	14808-60-7	3.49E-03	24
SRCID55	5-40	Expansion - Bucket Elev. Dedust. 105-5 equipped with dust collector	Point	11.9	1.5	11.9	Ambient	0.40	330075	4880075	SPM	N/A-9	1.50E-02	24
											Crystalline Silica	14808-60-7	1.75E-03	24
SRCID58	5-41	Blend Silo 5 equipped with dust collector	Point	29.0	2.5	10.5	353.15	0.55	329975	4880071	SPM	N/A-10	2.50E-02	24
											Crystalline Silica	14808-60-7	2.91E-03	24
SRCID61	5-42	Lime addition silo equipped with dust collector	Point	20.0	0.6	45.9	Ambient	0.12	330093	4880032	SPM	N/A-11	5.60E-03	24
											Crystalline Silica	14808-60-7	6.52E-04	24
SRCID62	5-43	Pan conveyor equipped with dust collector	Point	7.0	3.3	16.7	Ambient	0.50	330176	4880168	SPM	N/A-12	3.30E-02	24
											Crystalline Silica	14808-60-7	3.84E-03	24

				Modelling Source Data: Point Sources							Emission Data			
Modelling ID	Source ID(s)	Source Description	Source Type	Stack Height Above Grade [m]	Stack Volumetric Flow Rate [Am³/s]	Stack Gas Exit Velocity [m/s]	Stack Gas Exit Temperature [K]	Stack Inner Diameter [m]	Source X-Coordinate [m]	Source Y-Coordinate [m]	Contaminant	CAS No.	Maximum Emission Rate [g/s]	Averaging Period [hours]
SRCID63	5-44	Truck load dust collector 2 equipped with dust collector- South scale	Point	15.0	0.9	13.3	353.15	0.30	329979	4880228	SPM	N/A-13	9.40E-03	24
											Crystalline Silica	14808-60-7	1.09E-03	24
SRCID64	5-45	Truck load dust collector 4 equipped with dust collector - South scale	Point	15.0	0.9	13.3	353.15	0.30	329979	4880228	SPM	N/A-14	9.40E-03	24
											Crystalline Silica	14808-60-7	1.09E-03	24
SRCID65	5-46	Truck Load dust collector 3 equipped with dust collector - East	Point	15.0	1.3	18.4	353.15	0.30	329979	4880228	SPM	N/A-15	1.30E-02	24
											Crystalline Silica	14808-60-7	1.51E-03	24
SRCID66	5-47	Expansion - Hopper Feedoweights equipped with dust collector	Point	30.0	6.0	21.2	Ambient	0.60	330075	4880075	SPM	N/A-16	1.20E-01	24
											Crystalline Silica	14808-60-7	1.40E-02	24
SRCID67	5-48	Slag dryer equipped with dust collector	Point	45.0	9.2	20.3	393.15	0.76	330127	4880214	SPM	N/A-17	1.84E-01	24
											Crystalline Silica	14808-60-7	2.14E-02	24
SRCID68	5-49	#8 Mill Stack	Point	18.3	10.4	8.5	368.15	1.25	330206	4880248	SPM	N/A-1	9.92E-02	24
											Crystalline Silica	14808-60-7	1.15E-02	24
SRCID69	5-50	Cement dome dust collector	Point	110.5	6.1	16.5	Above Ambient	0.69	330169	4880072	SPM	N/A-1	1.23E-01	24
											Crystalline Silica	14808-60-7	1.43E-02	24

Notes: * Metallic iron

Table 5a
Emission Summary Table

Contaminant	CAS No.	Total Facility Emission Rate [g/s]	Air Dispersion Model Used [1]	Maximum POI Concentration [µg/m^3]	Averaging Period	MECP POI Limit [µg/m^3]	Limiting Effect	Schedule	Source	Benchmark	Percentage of MECP Limit [%]	Model Run Name	Notes	Version of ACB List [2]
Acenaphthylene	208-96-8	2.67E-03	AERMOD	8.54E-04	24	0.1	—	—	De Minimus	—	Below De Minimus	Unit Run		
Aluminum	7429-90-5	5.89E-01	AERMOD	1.09E+00	24	12	Health	Sch. 3	SL-JSL	B2	Below B2	Unit Run		v2
Ammonia	7664-41-7	7.19E+00	AERMOD	2.30E+00	24	100	Health	Sch. 3	Standard	B1	2%	Unit Run	ACB List (URT - Note 4, Table 4)	v2
Ammonium	14798-03-9	4.89E+00	AERMOD	9.05E+00	24	14.5	—	—	Previously Approved MAXGLC	—	Below Previously Approved MaxGLC	Unit Run		
Arsenic	7440-38-2	3.84E-04	AERMOD	3.98E-04	24	0.3	Health	Sch. 3	Guideline	B1	<1%	Unit Run		v2
Barium	7440-39-3	2.82E-02	AERMOD	7.06E-02	24	10	Health	Sch. 3	Guideline	B1	<1%	Unit Run		v2
Benzaldehyde	100-52-7	1.09E-03	AERMOD	2.01E-03	24	2	Health	Sch. 3	SL-JSL	B2	Below B2	Unit Run		v2
Benzene	71-43-2	7.26E-02	AERMOD	2.54E-03	Annual	0.45	Health	Sch. 3	Standard	B1	<1%	Unit Run	ACB List (Note 19, Table 2, 3, URT - Note 4, Table 4)	v2
Benzene	71-43-2	7.26E-02	AERMOD	2.36E-02	24	100	—	Sch. 6	DAV	—	Below DAV	Unit Run		
Benzene	71-43-2	7.26E-02	AERMOD	2.54E-03	Annual	4.5	—	—	AAV	—	Below AAV	Unit Run		
Benzo(a)pyrene	50-32-8	2.97E-06	AERMOD	1.08E-07	Annual	0.00001	Health	Sch. 3	Standard	B1	1%	Unit Run	ACB List (Note 7, 19, Table 2, 3, URT - Note 4, Table 4)	v2
Benzo(a)pyrene	50-32-8	2.97E-06	AERMOD	1.02E-06	24	0.005	—	Sch. 6	DAV	—	Below DAV	Unit Run		
Benzo(a)pyrene	50-32-8	2.97E-06	AERMOD	1.08E-07	Annual	0.0001	—	—	AAV	—	Below AAV	Unit Run		
Beryllium	7440-41-7	1.60E-05	AERMOD	8.19E-06	24	0.01	Health	Sch. 3	Standard	B1	<1%	Unit Run		v2
Bismuth	7440-69-9	4.56E-01	AERMOD	1.54E+00	24	2.5	Health	Sch. 3	SL-JSL	B2	Below B2	Unit Run		v2
C3 benzenes	N/A-10	1.18E-04	AERMOD	2.18E-04	24	0.1	—	—	De Minimus	—	Below De Minimus	Unit Run		
C4 benzenes	N/A-11	2.72E-04	AERMOD	5.03E-04	24	0.1	—	—	De Minimus	—	Below De Minimus	Unit Run		
Cadmium	7440-43-9	6.49E-04	AERMOD	1.61E-03	24	0.025	Health	Sch. 3	Standard	B1	6%	Unit Run	ACB List (URT - Note 4, Table 4)	v2
Calcium Oxide	1305-78-8	5.51E+00	AERMOD	1.68E+00	24	10	Corrosion	Sch. 3	Standard	B1	17%	Calcium Oxide		
Carbon Dioxide	124-38-9	8.15E+04	AERMOD	1.26E+05	24	255800	Health	Sch. 3	SL-PA	B2	Below B2	Carbon Dioxide		v2
Carbon Monoxide	630-08-0	6.01E+01	AERMOD	3.44E+01	½	6000	Health	Sch. 3	Standard	B1	<1%	Carbon Monoxide	ACB List (Note 9)	v2
Chloride	N/A-5	1.54E+01	AERMOD	5.09E+00	24	5.176	—	—	Previously Approved MAXGLC	—	Below Previously Approved MaxGLC	Unit Run		
Chromium	7440-47-3	1.28E-03	AERMOD	3.80E-03	24	0.5	Health	Sch. 3	Standard	B1	<1%	Unit Run	ACB List (Note 11a, URT - Note 4, Table 4)	v2
Cobalt	7440-48-4	1.33E-02	AERMOD	7.12E-03	24	0.1	Health	Sch. 3	Guideline	B1	7%	Unit Run		v2
Copper	7440-50-8	1.21E-01	AERMOD	4.87E-02	24	50	Health	Sch. 3	Standard	B1	<1%	Unit Run		v2
Crystalline Silica	14808-60-7	1.91E+00	AERMOD	2.41E+00	24	5	Health	Sch. 3	Guideline	B1	48%	Crystalline Silica		v2
Dioxins and Furans (TEQ)	N/A	1.87E-09	AERMOD	5.90E-10	24	0.0000001	Health	Sch. 3	Standard	B1	<1%	Dioxins and Furans (TEQ)	ACB List (Note 8, 8a, Table 1, URT - Note 4, Table 4)	v2
Fluoranthene	206-44-0	1.99E-04	AERMOD	6.41E-05	24	0.1	—	—	De Minimus	—	Below De Minimus	Unit Run		
Fluorene	86-73-7	4.26E-04	AERMOD	1.37E-04	24	0.1	—	—	De Minimus	—	Below De Minimus	Unit Run		
Hydrogen chloride	7647-01-0	1.04E+01	AERMOD	3.22E+00	24	20	Health	Sch. 3	Standard	B1	16%	Hydrogen chloride	ACB List (URT - Note 4, Table 4)	v2
Hydrogen Fluoride	7664-39-3	2.28E-02	AERMOD	1.47E-02	24	1.72	Vegetation	Sch. 3	Standard	B1	<1%	Unit Run	ACB List (Note 2, 20)	v2
Hydrogen Fluoride	7664-39-3	2.28E-02	AERMOD	5.73E-03	30-day	0.69	Vegetation	Sch. 3	Standard	B1	<1%	Unit Run	ACB List (Note 2, 20)	v2
Iron	7439-89-6	8.41E-01	AERMOD	1.40E+00	24	4	Health	Sch. 3	Standard	B1	35%	Iron		v2
Lead	7439-92-1	1.90E-02	AERMOD	1.45E-02	24	0.5	Health	Sch. 3	Standard	B1	3%	Unit Run	ACB List (Note 2, URT - Note 4, Table 4)	v2
Lead	7439-92-1	1.90E-02	AERMOD	5.64E-03	30-day	0.2	Health	Sch. 3	Standard	B1	3%	Unit Run	ACB List (Note 2, URT - Note 4, Table 4)	v2
Magnesium	7439-95-4	4.56E-01	AERMOD	1.54E+00	24	72	Health	—	SL-MD	B2	Below B2	Unit Run		
Manganese	7439-96-5	2.24E-02	AERMOD	1.60E-02	24	0.4	Health	Sch. 3	Standard	B1	4%	Unit Run	ACB List (URT - Note 4, Table 4)	v2
Mercury	7439-97-6	4.48E-02	AERMOD	1.46E-02	24	2	Health	Sch. 3	Standard	B1	<1%	Unit Run		v2
Nickel	7440-02-0	5.27E-03	AERMOD	3.08E-04	Annual	0.04	Health	Sch. 3	Standard	B1	<1%	Unit Run	ACB List (Note 19, Table 2, 3, URT - Note 4, Table 4)	v2
Nickel	7440-02-0	5.27E-03	AERMOD	3.19E-03	24	2	—	Sch. 6	DAV	—	Below DAV	Unit Run		
Nickel	7440-02-0	5.27E-03	AERMOD	3.08E-04	Annual	0.4	—	—	AAV	—	Below AAV	Unit Run		
Nitrate	14797-55-8	2.08E-01	AERMOD	3.85E-01	24	0.62	—	—	Previously Approved MAXGLC	—	Below Previously Approved MaxGLC	Unit Run		
Nitrogen Oxides	10102-44-0	1.19E+02	AERMOD	3.36E+01	24	200	Health	Sch. 3	Standard	B1	17%	Nitrogen Oxides	ACB List (Notes 2, 17)	v2
Nitrogen Oxides	10102-44-0	1.19E+02	AERMOD	1.42E+02	1	400	Health	Sch. 3	Standard	B1	36%	Nitrogen Oxides	ACB List (Notes 2, 17)	v2
PCBs	1336-36-3	1.76E-04	AERMOD	5.68E-05	24	0.15	Health	Sch. 3	Guideline	B1	<1%	Unit Run	ACB List (Note 8a)	v2
Phenanthrene	85-01-8	9.06E-03	AERMOD	2.90E-03	24	0.1	—	—	De Minimus	—	Below De Minimus	Unit Run		
Phosphorus	7723-14-0	1.29E-01	AERMOD	6.86E-02	24	0.5	Health	Sch. 3	SL-MD	B2	Below B2	Unit Run		
Potassium	7440-09-7	8.15E-01	AERMOD	1.51E+00	24	2.42	Health	Sch. 3	Previously Approved MAXGLC	—	Below Previously Approved MaxGLC	Unit Run		v2
Pyrene	129-00-0	9.97E-05	AERMOD	3.22E-05	24	0.1	—	—	De Minimus	—	Below De Minimus	Unit Run		
Selenium	7782-49-2	7.92E-03	AERMOD	1.64E-02	24	10	Health	Sch. 3	Guideline	B1	<1%	Unit Run		v2
Silicon	7440-21-3	6.67E+00	AERMOD	3.53E+00	24	27	Health	Sch. 3	SL-PA	B2	Below B2	Unit Run		
Sodium	7440-23-5	1.36E+00	AERMOD	1.83E+00	24	5.39	—	—	Previously Approved MAXGLC	—	Below Previously Approved MaxGLC	Unit Run		
Sulfate	14808-79-8	4.69E+00	AERMOD	2.00E+00	24	2.36	—	—	Previously Approved MAXGLC	—	Below Previously Approved MaxGLC	Unit Run		
Sulfur trioxide	7446-11-9	2.23E+00	AERMOD	1.07E+00	24	5	Health	Sch. 3	SL-JSL	B2	Below B2	Sulfur trioxide		v2
Sulphur dioxide	7446-09-5	1.36E+01	AERMOD	3.84E+00	24	275	ealth & Vegetati	Sch. 3	Standard	B1	1%	Sulphur dioxide	ACB List (Effective until July 1, 2023, Note 2, URT - Note 4, Table 4)	v2
Sulphur dioxide	7446-09-5	1.36E+01	AERMOD	1.61E+01	1	690	ealth & Vegetati	Sch. 3	Standard	B1	2%	Sulphur dioxide	ACB List (Effective until July 1, 2023, Note 2, URT - Note 4, Table 4)	v2
SPM	N/A	2.01E+01	AERMOD	3.52E+01	24	120	Visibility	Sch. 3	Standard	B1	29%	SPM		v2
Tin	7440-31-5	1.29E-01	AERMOD	6.03E-02	24	10	Health	Sch. 3	Standard	B1	<1%	Unit Run		
Tungsten	7440-33-7	4.56E-01	AERMOD	1.54E+00	24	5	Health	—	SL-JSL	B2	Below B2	Unit Run		
Zinc	7440-66-6	4.68E-01	AERMOD	1.55E+00	24	120	Particulate	Sch. 3	Standard	B1	1%	Unit Run		

Notes:

1. AERMOD v.19191 was used for all contaminants
2. v2 = Version 2.0 - April 2018
3. "SL-JSL" = Screening Limit - Jurisdictional Screening Limit, "SL-MD" = Screening Limit - Ministry-derived,"SL-PA" = Screening Limit - Previously Accepted", "URT" = Upper Risk Threshold, "DAV" = Daily Assessment Value, "AAV" = Annual Assessment Value, "Previously Approved MAXGLC" = Previously Approved Limit using the Maximum Ground Level Concentration Assessment submitted with the ECA Amendment.

Table 5b
Emission Summary Table

Contaminant	CAS No.	Total Facility Emission Rate [g/s]	Air Dispersion Model Used [(1)]	Maximum POI Concentration [µg/m³]	Averaging Period	MECP POI Limit [µg/m³]	Limiting Effect	Schedule	Source	Benchmark	Percentage of MECP Limit [%]	Model Run Name	Notes	Version of ACB List [(2)]
Carbon Monoxide	630-08-0	1.79E+02	AERMOD	2.18E+02	½	6000	Health	Sch. 3	Standard	B1	4%	Carbon Monoxide	ACB List (Note 9)	v2
Nitrogen Oxides	10102-44-0	2.17E+02	AERMOD	6.61E+01	24	200	Health	Sch. 3	Standard	B1	33%	Nitrogen Oxides	ACB List (Notes 2, 17)	v2
Nitrogen Oxides	10102-44-0	2.17E+02	AERMOD	2.72E+02	1	400	Health	Sch. 3	Standard	B1	68%	Nitrogen Oxides	ACB List (Notes 2, 17)	v2
Sulphur dioxide	7446-09-5	1.79E+02	AERMOD	6.23E+01	24	275	Health & Vegetation	Sch. 3	Standard	B1	23%	Sulphur dioxide	(Effective until July 1, 2023, Note 2, URT - Note 4	v2
Sulphur dioxide	7446-09-5	1.79E+02	AERMOD	2.40E+02	1	690	Health & Vegetation	Sch. 3	Standard	B1	35%	Sulphur dioxide	(Effective until July 1, 2023, Note 2, URT - Note 4	v2
SPM	N/A	2.54E+01	AERMOD	3.52E+01	24	120	Visibility	Sch. 3	Standard	B1	29%	SPM		v2

Notes:
1. AERMOD v.19191 was used for all compounds
2. v2 = Version 2.0 - April 2018

Made by: LL
Checked by: JJZ

KEY MAP

SCALE 1:2,500,000

LEGEND

- PROPERTY BOUNDARY
- ROADWAY
- WATERCOURSE
- WETLAND

NOTE(S)

1. ALL LOCATIONS ARE APPROXIMATE

REFERENCE(S)

1. PROPERTY BOUNDARY DIGITIZED FROM PRINCE EDWARD COUNTY PUBLIC GIS VIEWER.
2. LAND INFORMATION ONTARIO (LIO) DATA PRODUCED BY GOLDER ASSOCIATES LTD. UNDER LICENCE FROM ONTARIO MINISTRY OF NATURAL RESOURCES, © QUEENS PRINTER 2014
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SOURCE: ESRI, MAXAR, EARTHSTAR GEOGRAPHICS, AND THE GIS USER COMMUNITY
4. PROJECTION: TRANSVERSE MERCATOR, DATUM: NAD 83, COORDINATE SYSTEM: UTM ZONE 18, VERTICAL DATUM: CGVD28

0 250 500 1,000
1:35,000 METRES

CLIENT
LEHIGH HANSON MATERIALS LIMITED

PROJECT
EMISSION SUMMARY AND DISPERSION MODELLING REPORT
PICTON CEMENT PLANT, PICTON, ON

TITLE
SITE LOCATION PLAN

CONSULTANT
WSP GOLDER

YYYY-MM-DD	2022-11-24
DESIGNED	----
PREPARED	BR
REVIEWED	JJZ
APPROVED	JDM

PROJECT NO.	CONTROL	REV.	FIGURE
2148080301	0001	0	1

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: 25mm

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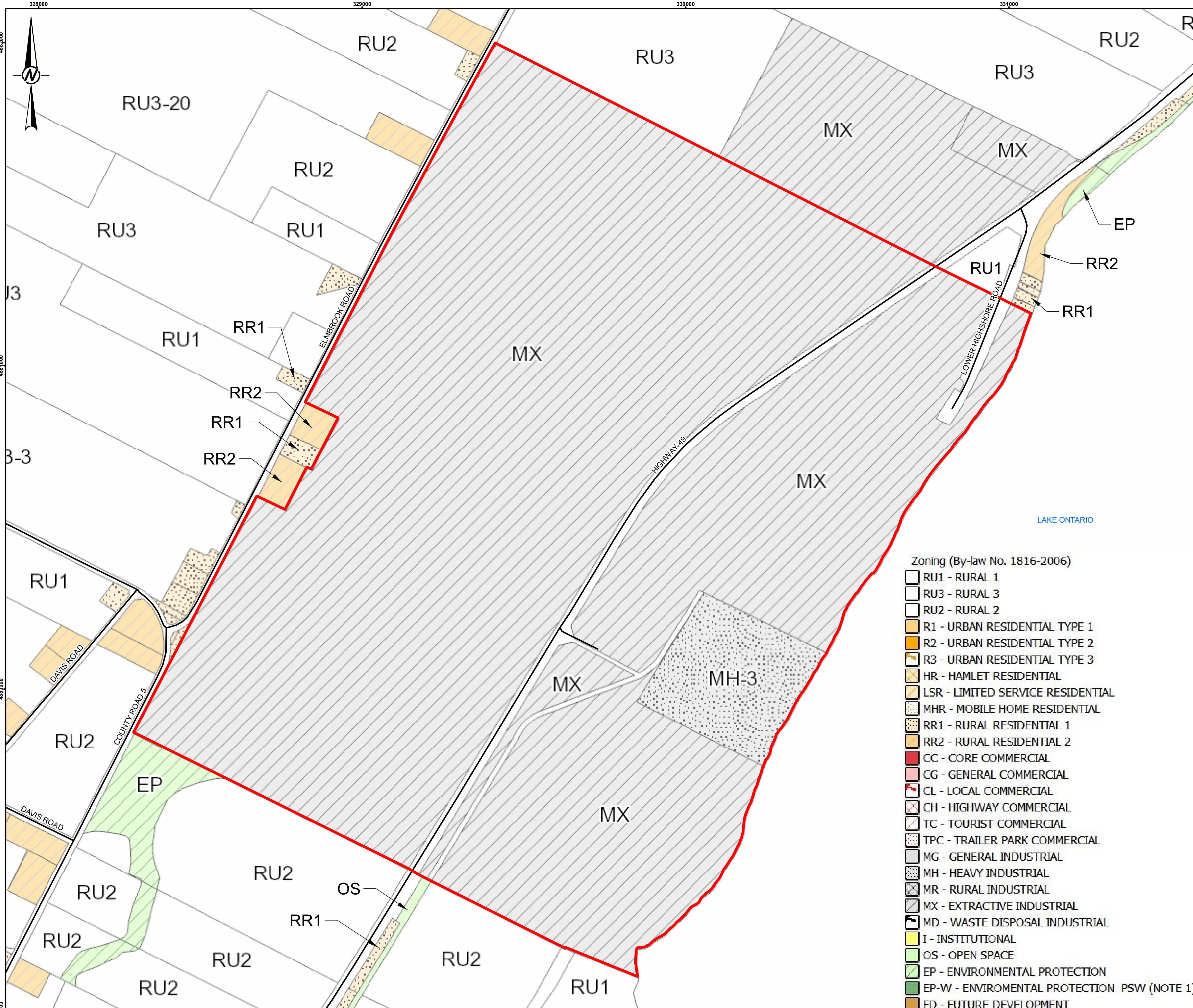

KEY MAP

SCALE 1:2,500,000

LEGEND

PROPERTY BOUNDARY

ROADWAY

NOTE(S)

1. ALL LOCATIONS ARE APPROXIMATE

REFERENCE(S)

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4. PROJECTION: TRANSVERSE MERCATOR, DATUM: NAD 83, COORDINATE SYSTEM: UTM ZONE 18, VERTICAL DATUM: CGVD28

0 125 250 500

1:12,000 METRES

CLIENT

LEHIGH HANSON MATERIALS LIMITED

PROJECT

EMISSION SUMMARY AND DISPERSION MODELLING REPORT
PICTON CEMENT PLANT, PICTON, ON

TITLE

LAND USE ZONING DESIGNATION PLAN

CONSULTANT

WSP GOLDER

YYYY-MM-DD	2022-11-24
DESIGNED	----
PREPARED	BR
REVIEWED	JJZ
APPROVED	JDM

PROJECT NO.	CONTROL	REV.	FIGURE
2148080301	0001	0	2

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM:

Date: June 2022

Project: 22515826

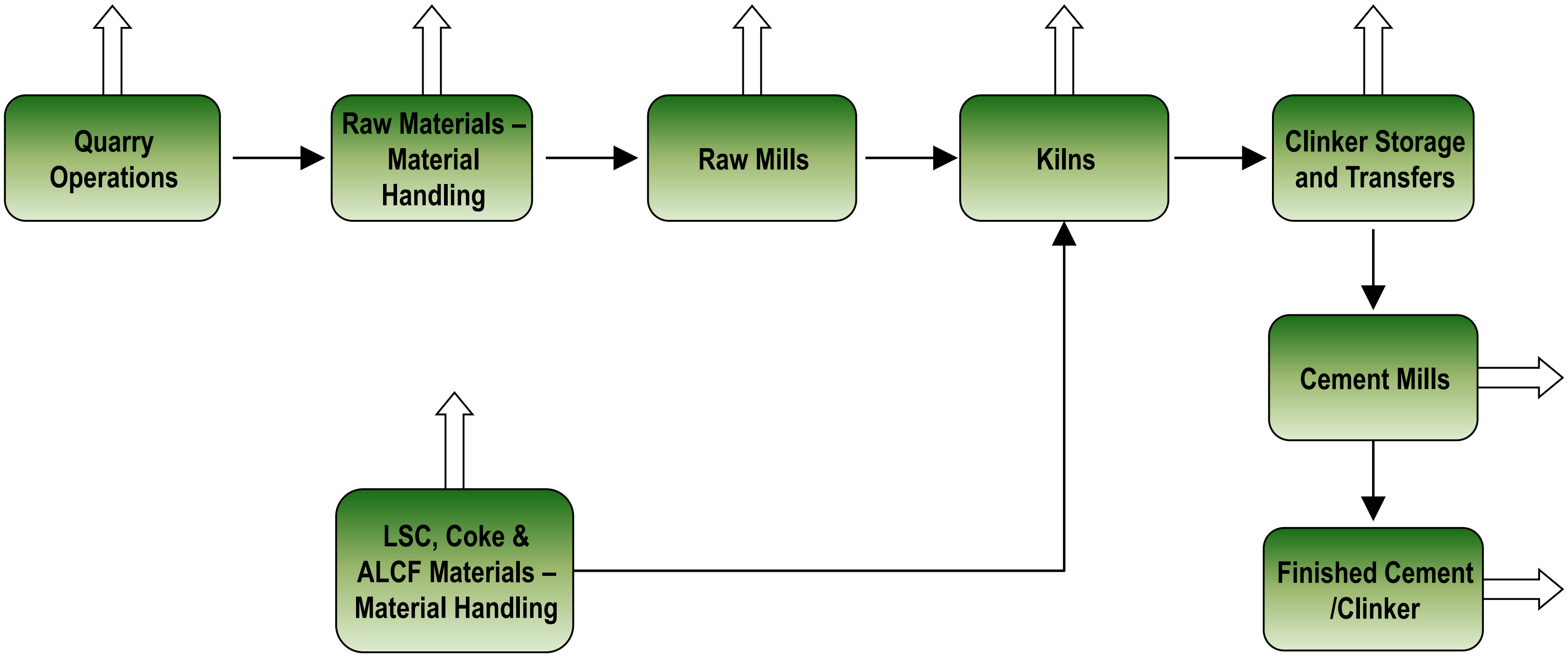
Golder Associates

SIMPLIFIED PROCESS FLOW DIAGRAM
Lehigh Hanson Picton Plant
Picton, Ontario

FIGURE 3a

Made By: JJZ

Checked By: JDM



NOTES:

This schematic represents the major processes taking place at the Facility. Simple processes such as maintenance activities have not been represented.

LEGEND

Material Flow

Emissions Release through Process Area

Process Area Name	Reference Figure
Quarry operations	3b
LSC, Coke & ALCF materials - material handling	3c
Raw materials – materials handling	3d
Raw mills	3d
Kiln 4	3e
Clinker storage & transfer	3e
Cement mills	3f
Finished cement/clinker	3f

\\golder.gds\gal\Ottawa\Active\2016\3 Proj\1670431 Lehigh Air Compliance Picton\Phase 1000 - ESDM Update and Noise Screening

Date: June 2022

Project: 22515826

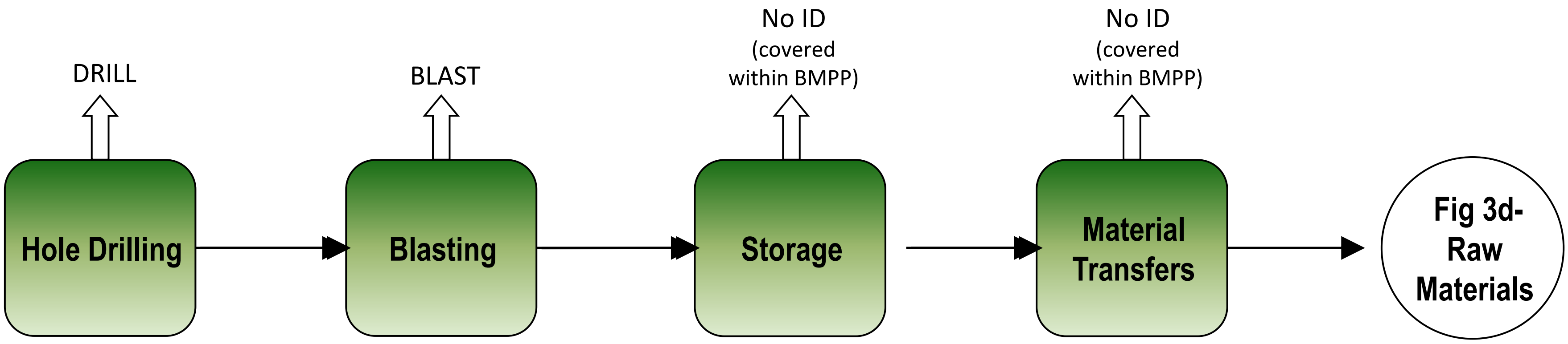
Golder Associates

PROCESS FLOW DIAGRAM – Quarry Operations
Lehigh Hanson Picton Plant
Picton, Ontario

FIGURE 3b

Made By: JJZ

Checked By: JDM



NOTES:

This schematic represents the major processes taking place at the Facility. Simple processes such as maintenance activities have not been represented.

LEGEND

→ Material Flow

⇨ Emissions Release through Process Area

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Date: June 2022

Project: 22515826

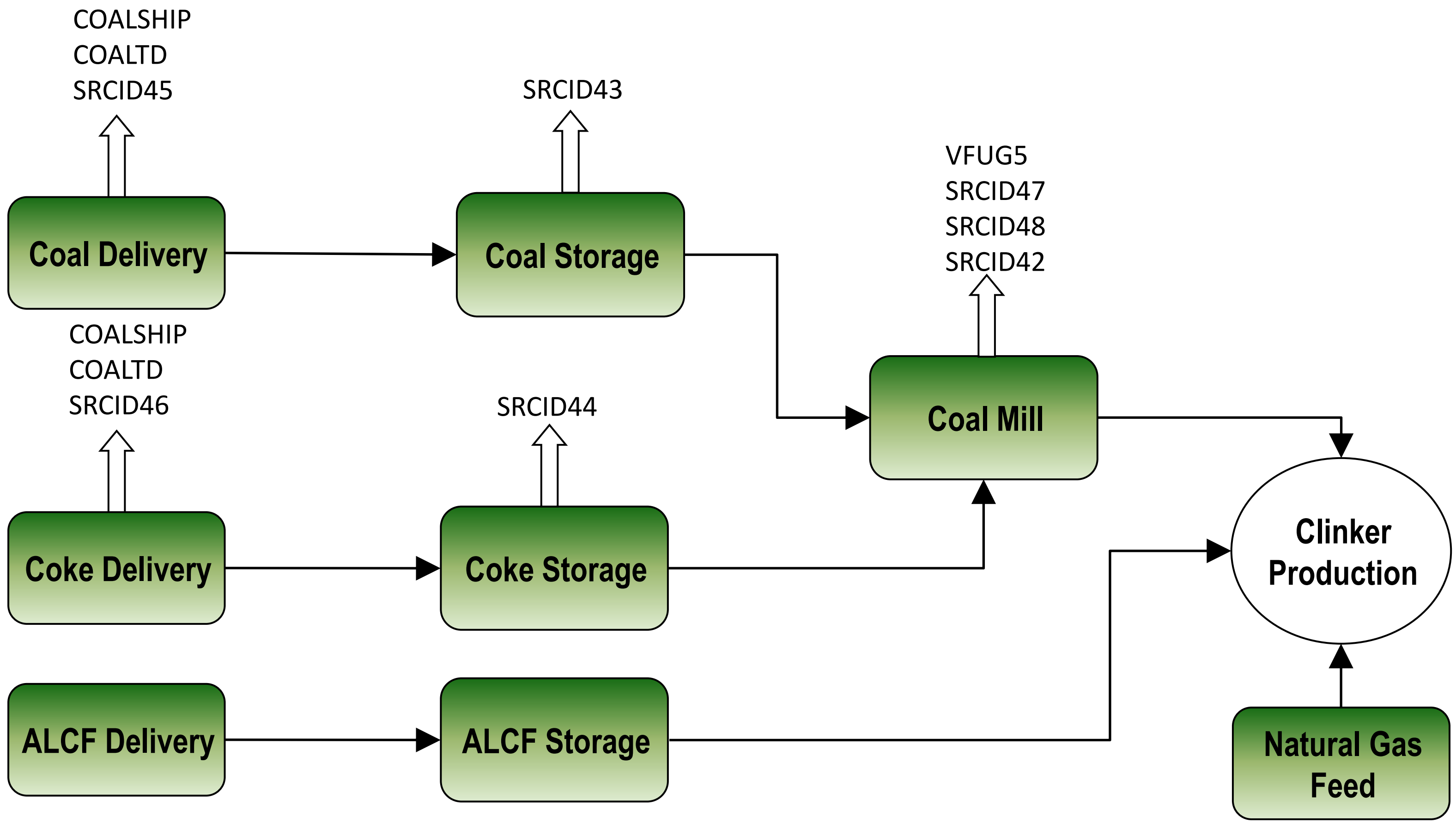
Golder Associates

PROCESS FLOW DIAGRAM – Fuel
Lehigh Hanson Picton Plant
Picton, Ontario

FIGURE 3c

Made By: JJZ

Checked By: JDM



LEGEND

Material Flow

Emissions Release through Process Area

NOTES:

This schematic represents the major processes taking place at the Facility. Simple processes such as maintenance activities have not been represented.

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Date: June 2022

Project: 22515826

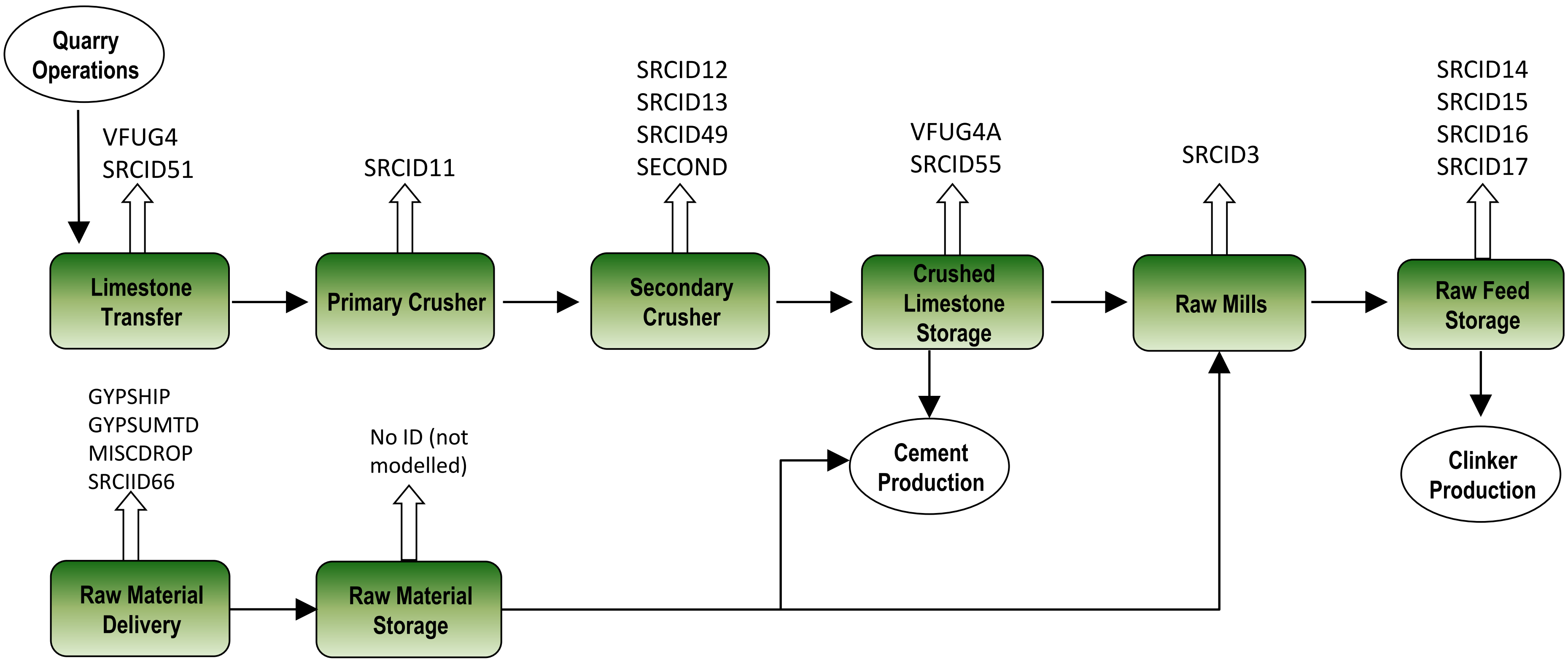
Golder Associates

PROCESS FLOW DIAGRAM – Raw Materials
Lehigh Hanson Picton Plant
Picton, Ontario

FIGURE 3d

Made By: JJZ

Checked By: JDM



LEGEND

Material Flow

Emissions Release through Process Area

NOTES:

This schematic represents the major processes taking place at the Facility. Simple processes such as maintenance activities have not been represented.

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Date: June 2022

Project: 22515826

Golder Associates

PROCESS FLOW DIAGRAM – Clinker Production

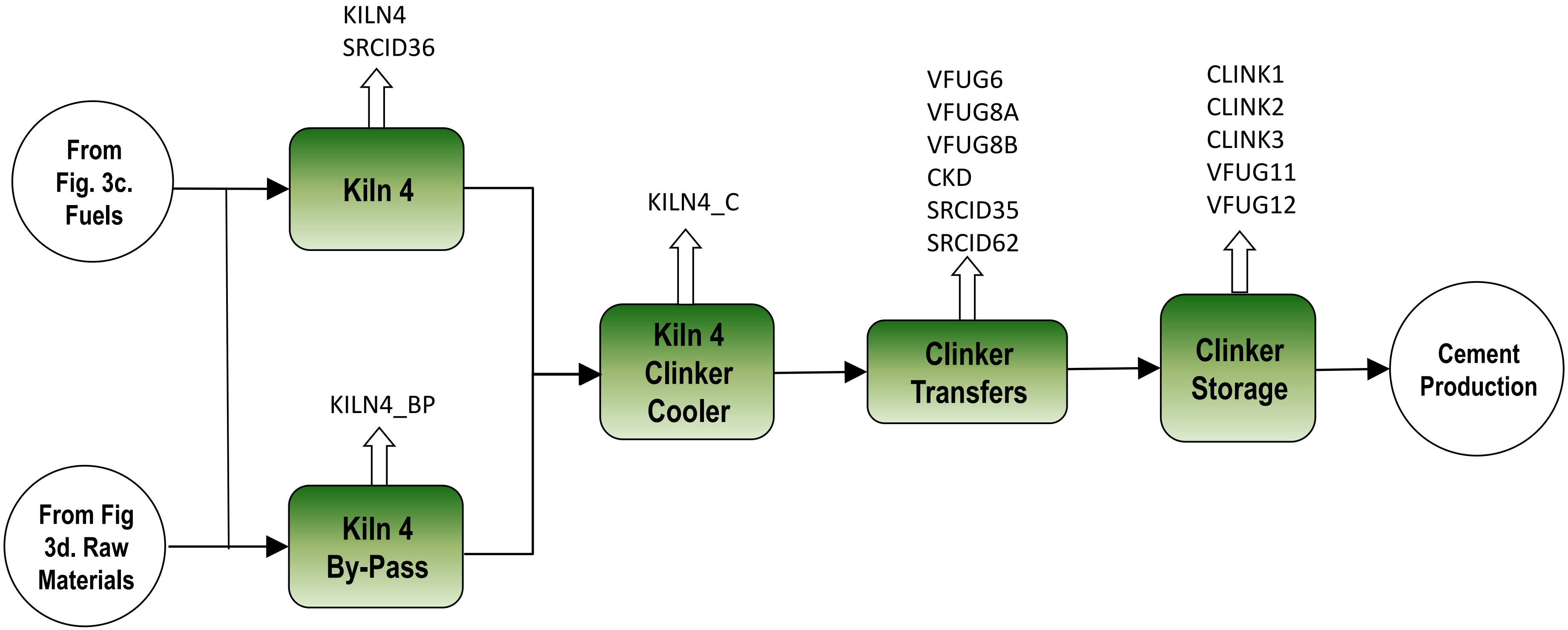
Lehigh Hanson Picton Plant

Picton, Ontario

FIGURE 3e

Made By: JJZ

Checked By: JDM



LEGEND

Material Flow

Emissions Release through Process Area

NOTES:

This schematic represents the major processes taking place at the Facility. Simple processes such as maintenance activities have not been represented.

\\golder.gds\gal\Ottawa\Active\2016\3 Proj\1670431 Lehigh Air Compliance Picton\Phase 1000 - ESDM Update and Noise Screening

Date: June 2022

Project: 22515826

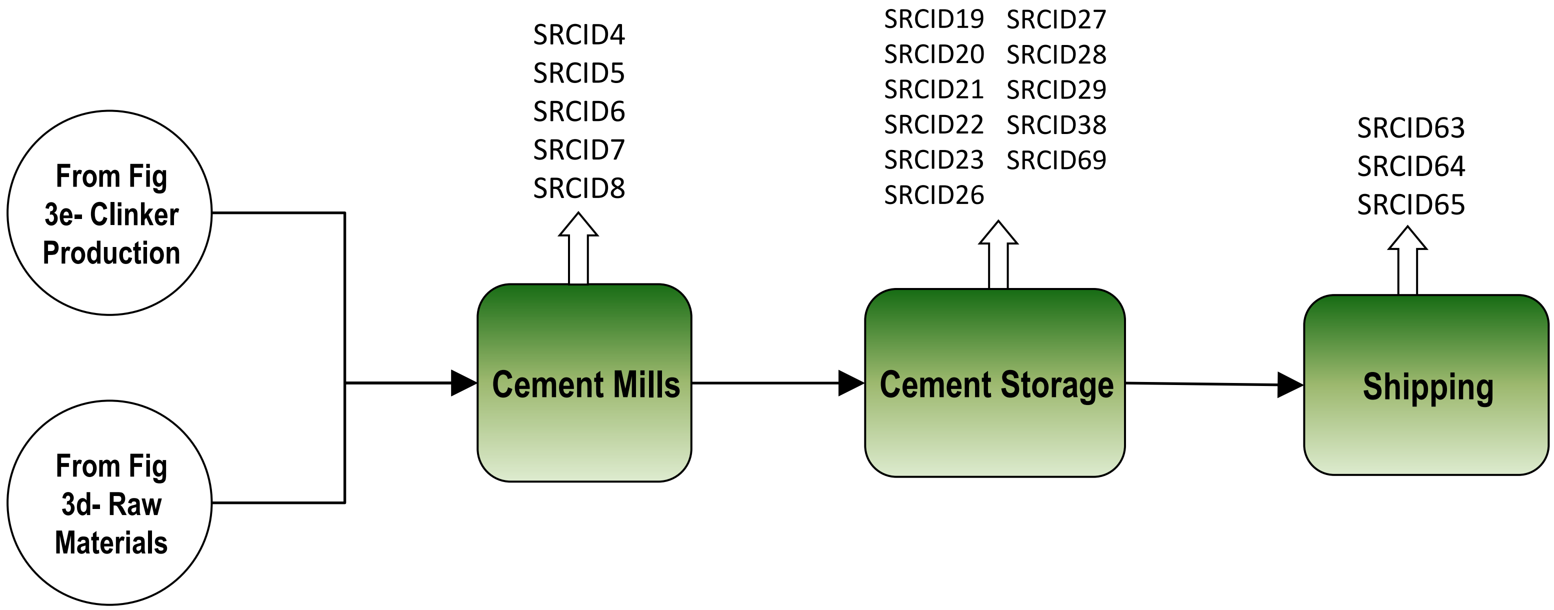
Golder Associates

PROCESS FLOW DIAGRAM – Cement Production
Lehigh Hanson Picton Plant
Picton, Ontario

FIGURE 3f

Made By: JJZ

Checked By: JDM



NOTES:

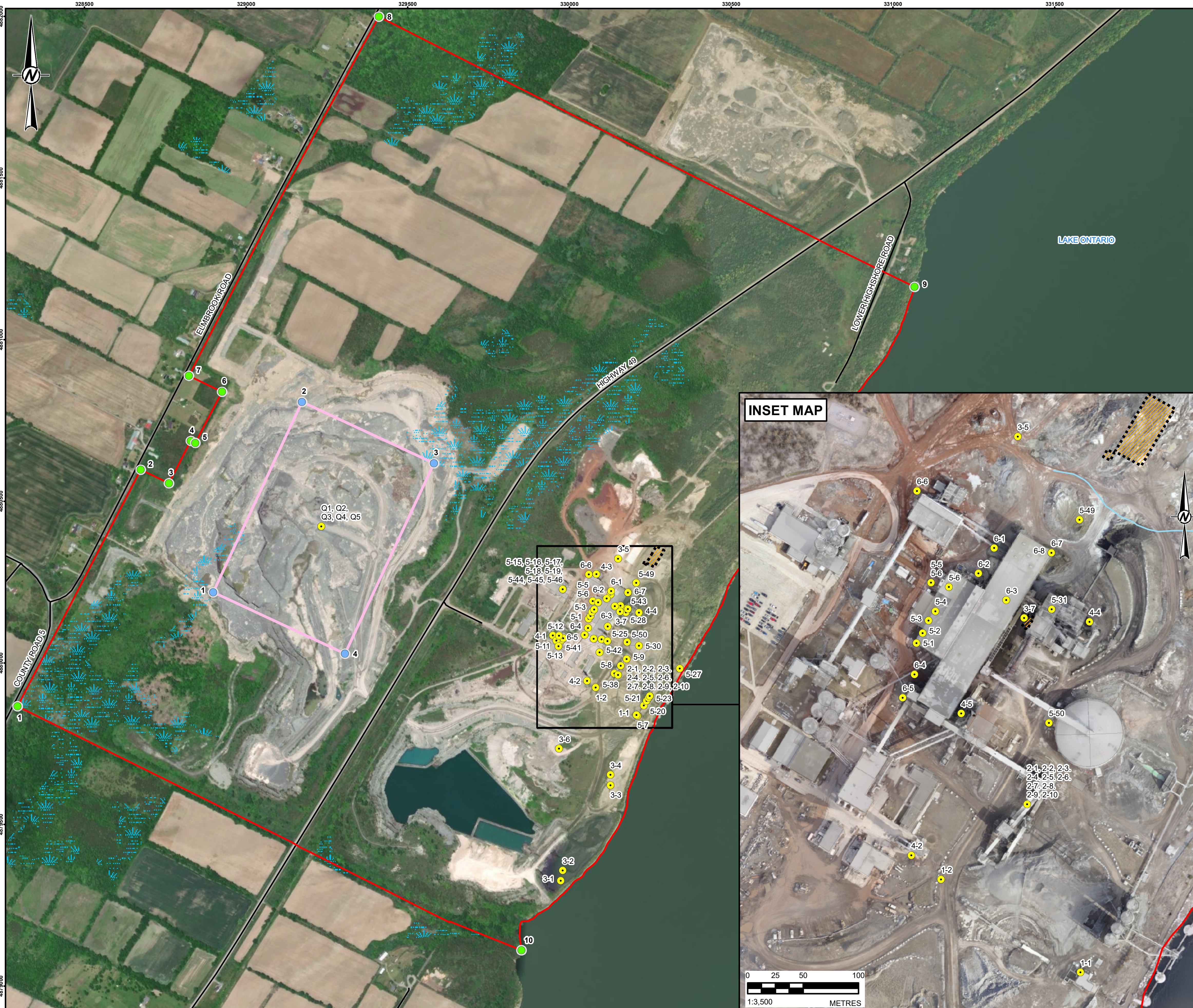
This schematic represents the major processes taking place at the Facility. Simple processes such as maintenance activities have not been represented.

LEGEND

Material Flow

Emissions Release through Process Area

\\golder.gds\gal\Ottawa\Active\2016\3 Proj\1670431 Lehigh Air Compliance Picton\Phase 1000 - ESDM Update and Noise Screening



KEY MAP

SCALE 1:2,500,000

LEGEND

- EMISSION SOURCE
- OPEN PIT BOUNDARY POINT
- PROPERTY BOUNDARY POINT
- OPEN PIT BOUNDARY
- PROPERTY BOUNDARY
- BUILDING
- PROPOSED ALCF BUILDINGS
- ROADWAY
- WATERCOURSE
- WETLAND

NOTE(S)

1. ALL LOCATIONS ARE APPROXIMATE

REFERENCE(S)

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SOURCE: ESRI, MAXAR, EARTHSTAR GEOGRAPHICS, AND THE GIS USER COMMUNITY
4. PROJECTION: TRANSVERSE MERCATOR, DATUM: NAD 83, COORDINATE SYSTEM: UTM ZONE 18, VERTICAL DATUM: CGVD28

0 125 250 500
1:12,000 METRES

CLIENT
LEHIGH HANSON MATERIALS LIMITED

PROJECT
EMISSION SUMMARY AND DISPERSION MODELLING REPORT
PICTON CEMENT PLANT, PICTON, ON

TITLE
EMISSION SOURCE AND EXHAUST LOCATION PLAN

CONSULTANT
WSP GOLDER

YYYY-MM-DD	2022-11-24
DESIGNED	----
PREPARED	BR
REVIEWED	JJZ
APPROVED	JDM

PROJECT NO.	CONTROL	REV.	FIGURE
2148080301	0001	0	4

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: 25mm

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KEY MAP

SCALE 1:2,500,000

LEGEND

POINT SOURCE LOCATION	ROADWAY
VOLUME SOURCE LOCATION	WATERCOURSE
BUILDING	WETLAND
PROPOSED ALCF BUILDINGS	PROPERTY BOUNDARY

NOTE(S)

1. ALL LOCATIONS ARE APPROXIMATE

REFERENCE(S)

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SOURCE: ESRI, MAXAR, EARTHSTAR GEOGRAPHICS, AND THE GIS USER COMMUNITY
4. PROJECTION: TRANSVERSE MERCATOR, DATUM: NAD 83, COORDINATE SYSTEM: UTM ZONE 18, VERTICAL DATUM: CGVD28

0 25 50 100

1:4,000 METRES

CLIENT

LEHIGH HANSON MATERIALS LIMITED

PROJECT

EMISSION SUMMARY AND DISPERSION MODELLING REPORT
PICTON CEMENT PLANT, PICTON, ON

TITLE

DISPERSION MODELLING PLAN

CONSULTANT

WSP GOLDER

YYYY-MM-DD	2022-11-24
DESIGNED	----
PREPARED	BR
REVIEWED	JJZ
APPROVED	JDM

PROJECT NO.	CONTROL	REV.	FIGURE
2148080301	0001	0	5

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: 25mm

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APPENDIX A

Modification Log

APPENDIX A – MODIFICATION LOG

The following table contains a summary of the changes that the ESDM Report has undergone since Version 1.0 of the ESDM Report completed in October 2017. The assessments provided in each respective ESDM Report Version demonstrate the Facility's compliance with the Performance Limits outlined in s.3.2.1 and s.3.2.2 of the Facility's ECA Number 0073-BHGQHC and therefore this Modification Log satisfies Conditions 4.1(b) and 4.1(c) of the ECA.

The ECA defines a "*Modification*" to be "any construction, alteration, extension or replacement of any plant, structure, equipment, apparatus, mechanism or thing, or alteration of a process rate of production at the Facility that may discharge or alter the rate or manner of discharge of a Compound of Concern to the air". This Modification Log may contain ESDM Report changes that do not fit this definition. Only those changes which meet this definition are required to be documented in the Written Summary required by Conditions 4.3 and 5.1 of the ECA.

ESDM Report Version	Description of Change	Emission Summary and Dispersion Modelling Report Changes	Does this Modification Meet the Definition of a "*Modification*" as defined by the ECA (i.e. must be included in the Annual Written Summary)
1.1	Refined emission inventory at the request of the MECP to use AP-42 emission factors from the Kilns, raw mills and primary and secondary crusher and CEMS data where applicable; accurate as of December 2018.	Emission inventory and model results documented in Table 2 and Tabled revised accordingly.	Yes
1.1	Updated AERMOD model to v.16216R and with site-specific meteorology; accurate as of December 2018		
1.1	Included an assessment of transitional operating conditions; accurate as of March 2019	Appendix G added to the ESDM report	No
1.2	ESP 9 Flow Optimization modification – Neundorfer project	N/A	No
1.2	Revised emission rates based on 2019 Continuous Emissions Monitoring System (CEMS) data for the Kiln 4 Bypass stack.	Table 2b and Table 5b added to ESDM Report. Transitional Operating Condition SO_2 is now the highest POI Concentration.	No
1.3	Updated AERMOD model to v.19191 and with site-specific meteorology; accurate as of December 2020.	Emission inventory and model results documented in Table 2 and Table 5 accordingly	Yes
	Revised TOC assessment to include update of 2020 CEMS data for nitrogen oxides and sulphur dioxide.		
1.3	Refined PM10 and crystalline silica emissions from QUARRY5, VFUG4 and VFUG4A, COALSHIP and COALGYP, COALTD and GYPTD, MISCDROP, CKD and VFUG5.		No

ESDM Report Version	Description of Change	Emission Summary and Dispersion Modelling Report Changes	Does this Modification Meet the Definition of a "*Modification*" as defined by the ECA (i.e. must be included in the Annual Written Summary)
1.3	Updated source testing emission rates, where applicable on Kiln 4 and Kiln 4 Bypass		No
1.3	Removed the following compounds from Kiln 3 as it did not operate in 2020: Ammonium, Chloride, Nitrate, Potassium, Sodium and Sulfate.		No
1.3	▪ Lime injection was trialed on Kiln 4 but this did not change the emission estimating methods or the modelling directly.	N/A - No changes to emission estimates or modelling	Yes
1.4	Revised TOC assessment to include update of 2021 CEMS data for carbon monoxide, nitrogen oxides and sulphur dioxide.	Emission inventory and model results documented in Table 2 and Table 5 accordingly	No
	Updated source testing emission rates, where applicable on Kiln 4 and Kiln 4 Bypass		No
	Added phosphorus and tin as contaminants from the updated source testing on Kiln 4 and Kiln 4 bypass		No
	Removed baghouses associated with the clinker dome that were decommissioned in 2021. Sources 5-24,25,29,30 (SRCID 30,32,37,38)		Yes
	Added ammonia injection control on Kiln 4 including emissions of ammonia slip.		Yes
2.0	Assessed the use of alternative low-carbon fuels to fuel the process kiln	Emission inventory and model results documented in Table 2 and Table 5 accordingly	Yes
2.0	Added magnesium and tungsten as contaminants from the ALCF assessment		No
2.0	Removed sources associated with Kiln 3 that does not operate Sources 4-1, 4-3, 5-15, 5-26 (SRCID KILN3, KILN3_C, 18, 33		Yes
2.0	Added a dust collector source associated with the cement dome conversion project Source 5-50 (SRCID69)		Yes

APPENDIX B

Emission Rate Calculations

Source ID	Q1	Source Description	Blasting - Hole Drilling

Process Description	Rock and stone are loosened by drilling and blasting the quarry face. Blasting occurs 2 days per week at 2:00 pm. There are 21 drill holes per blast. All holes are drilled for 1.5 days with 10-hour work shift per day. Blast hole drilling is currently managed following requirements under the Aggregate Resources Act. All BMPs are currently in place.

Operating Scenario	Wet drill is operating continuously for a 10-hour shift.	Limitations	Drilling cannot occur simultaneously with blasting

EMISSION CALCULATION

Drilling Details

Quantity Blasted **14000** tonnes per blast — Drill Holes Per Blast **21** — Drilling Time: **0.55** hour/hole

Methodology:	US EPA AP-42 Emission Factor
Source:	US EPA AP-42 Section 11.19.2 - Crushed Stone Processing and Pulverized Mineral Processing (8/04)

Percent of Crystalline Silica in PM4 13.7%
Reference: AWMA - PM4 Crystalline Silica Emission Factors and Ambient Concentrations at Aggregate-Producing Sources in California (Richards et al, 2012)

Uncontrolled Emission Factor

Source ID	Source	Contaminant	CAS	Controls	Emission Factor[1] [kg/Mg]	US EPA Quality Rating	MOECC Quality Rating
Q-1	Wet Drilling	SPM	N/A-1	None	4.00E-05	E	Marginal

1 - Emission factors for PM10 factor

Calculation Formula

Emission Rate [g/s] = Emission Factor [kg/Mg] x Activity Rate [Mg/blast] x 1000 [g/kg] x Time Factor [blasts/drilling hours] x 1/3600 [hrs/second]

Crystalline Silica Emission Rate = PM10 Emission Rate [g/s] X % Crysalline Silica in PM 10

Sample Calculation:

$$\text{Emission Rate [g/s]} = \frac{0.000040\ kg}{Mg} \times \frac{14{,}000\ Mg}{blast} \times \frac{1000\ g}{kg} \times \frac{1\ blast}{10\ drilling\ hrs/day} \times \frac{1\ drilling\ hr}{3600\ seconds} = \boxed{1.56E\text{-}02\ \frac{g}{s}}$$

$$\text{Crystalline Silica Emission Rate [g/s]} = \frac{1.56E\text{-}02\ g}{s} \times 13.70\% = \boxed{2.13E\text{-}03\ \frac{g}{s}}$$

Source ID	Source	Contaminant	CAS	Emission Factor [kg/Mg]	Emission Rate [g/s]
Q-1	Wet Drilling	SPM	N/A-1	4.00E-05	1.56E-02
	Wet Drilling	PM10		4.00E-05	1.56E-02
	Wet Drilling	Crystalline Silica	14808-60-7		2.13E-03

*maximum drilling time per day is 10 hours (7 am to 5 pm)

Source ID	Q2	Source Description	Blasting

Process Description	Rock and stone are loosened by drilling and blasting the quarry face. Blasting occurs 2 days per week at 2:00 pm. There are 2 blasts per day on days that have blasting. Blasting is managed following requirements under the Aggregate Resources Act. All BMPs are currently in place

Operating Scenario	Blasting occurs for 10 minutes, on 2 occasions between 2-3pm, 2 days a week. The SPM emissions are estimated to occur over a 24-hour averaging period for comparison with the 24-hr standard. The emissions of Carbon Monoxide, Nitrogen Oxides, and Sulphur Dioxide from the blast are estimated to occur over a 1-hr averaging period for comparison with the 1-hr standards. These 1-hr averaged emission rates are conservative when used in modelling for the 24-hr averaging period.	**Limitations**	Blasting cannot occur simultaneously with drilling, or truck hauling from quarry face to processing area.

EMISSION CALCULATION

Blasting Details

Explosive usage 2 tonnes per blast Blast Duration 600 seconds Horizontal Area [m^2]: 277.00

Methodology:	US EPA AP-42 Emission Factors
Source:	US EPA AP-42 Section 11.9 Western Surface Coal Mining (10/98) US EPA AP-42 Section 13.3 Explosives Detonation

Percent of Crystalline Silica in PM10 = 13.7%

Reference: AWMA - PM4 Crystalline Silica Emission Factors and Ambient Concentrations at Aggregate-Producing Sources in California (Richards et al, 2012)

Uncontrolled Emission Factor

Source ID	Source	Contaminant	CAS	Controls	Emission Factor	Emission Factor Units	US EPA Quality Rating	MOECC Quality Rating
Q-2	Blasting	SPM[1]	N/A-1	None	1.01	kg/blast	C	Average
		Carbon Monoxide	630-08-0	None	34	kg/Mg	D	Marginal
		Nitrogen Oxides	10102-44-0	None	8	kg/Mg	D	Marginal
		Sulphur Dioxide	7446-09-5	None	1	kg/Mg	D	Marginal

1 - SPM Emission factor based on EF [kg/blast] = 0.00022 $(A)^{1.5}$, where A = horizontal area (m^2)

Particle Size Distribution

Particle Size [µm]	Cumulative % Particle Distribution
SPM	—
PM10	50%

Calculation Formula

SPM Emission Rate [g/s] = Emission Factor [kg/blast] x Activity Rate [blast/second] x 1000 [g/kg] x time weighted conversion

$CO/NO_2/SO_2$ Emission Rate [g/s] = Emission Factor [kg/Mg] x Explosive usage [Mg/blast] x Activity Rate [blast/second] x 1000 [g/kg] x time weighted conversion

PM10 Emission Rate = SPM Emission Rate [g/s] x Cumulative % Particle Distribution of PM10

Crystalline Silica Emission Rate = PM10 Emission Rate [g/s] X % Crysalline Silica in PM 10

Sample Calculation:

SPM Emission Rate [g/s] = $\frac{1.01\ kg}{blast} \times \frac{2\ blast}{24\ hr} \times \frac{1000\ g}{kg} \times \frac{1\ hr}{3600\ s} = \boxed{\frac{2.35E\text{-}02\ g}{s}}$

CO Emission Rate [g/s] [1] = $\frac{34\ kg}{Mg} \times \frac{2\ Mg}{blast} \times \frac{2\ blast}{1\ hr} \times \frac{1000\ g}{kg} \times \frac{1\ hr}{3600\ s} = \boxed{\frac{3.78E\text{+}01\ g}{s}}$

PM10 Emission Rate [g/s] = $\frac{2.35E\text{-}02\ g}{s} \times 50.00\% = \frac{1.17E\text{-}02\ g}{s}$

Crystalline Silica Emission Rate [g/s] = $\frac{1.17E\text{-}02\ g}{s} \times 13.70\% = \frac{1.61E\text{-}03\ g}{s}$

[1]Calculation done for 1 hour opposed to 24 as the MOECC limit is 1/2 hour

Source	Contaminant	CAS	Emission [kg/blast]	Emission [kg/Mg]	Emission [g/s]
Blasting	SPM	N/A-1	1.01	—	2.35E-02
	Carbon Monoxide	630-08-0	—	34	3.78E+01
	Nitrogen Oxides	10102-44-0	—	8	8.89E+00
	Sulphur Dioxide	7446-09-5	—	1	1.11E+00
	PM10		—		1.17E-02
	Crystalline Silica	14808-60-7	—		1.61E-03

Made By: JDM
Checked By: JJZ

Source ID	Q5	Source Description	Miscellaneous Materials Handling

Process Description	Dust emission occur at several points in the process, such as material loadind onto piles, loadout from piles and other drops that move material from one surface to another

Operating Scenario	Maximum Processing Rates	Limitations	None

EMISSION CALCULATION

Methodology:	US EPA AP-42 Emission Factor
Source:	US EPA AP-42 Section 13.2.4 - Aggregate Handling and Storage Piles (11/06)

$$E = k(0.0016)\frac{\left(\frac{U}{2.2}\right)^{1.3}}{\left(\frac{M}{2}\right)^{1.4}} \text{ (kg/megagram [Mg])}$$

Where:

E = emission factor
k = particle size multiplier (dimensionless)
U = mean wind speed, metres per second (m/s)
M = material moisture content (%)

k value	k value	PM10 Fraction
SPM[1]	PM10	PM10
0.8	0.35	0.4375

1 - Emission factor represents Particulate Matter with diameter < 44 µm

Maximum Wind Speed (m/s): U = 17.00 Value based on maximum wind speed from five years of site specific MECP data set

Percent of Crystalline Silica in PM10 = 13.7%
Reference: AWMA - PM4 Crystalline Silica Emission Factors and Ambient Concentrations at Aggregate-Producing Sources in California (Richards et al, 2012)

Particle Size Distribution

Particle Size [µm]	Cumulative % Particle Distribution
SPM	—
PM10	50%

Emission Factors for Materials Handling

Material	Transfer Location	Moisture %	kg/tonne SPM	US EPA Quality Rating	MOECC Quality Rating	Data Source
Unfragmented Limestone	Outdoor	2.1	1.71E-02	B	Average	AP-42 13.2.4
Overburden	Outdoor	4.8 (1)	5.36E-03	B	Average	AP-42 13.2.4

(1) Actual moisture content greater than 4.8%, however, as per Section 13.2.4.3 of the AP-42 document, since the moisture content range that the equation was developed for is 0.25-4.8%, 4.8% was used in the emission factor equation.

Calculation Formula

Emission Rate SPM [g/s] = Emission Factor [kg/tonne] x Activity Rate [tonnes/hr] x 1000 [g/kg] x 1/3600 [hrs/second]

Emission rate PM10 [g/s] = Emission Rate SPM [g/s] x Cumulative % Partcile Distribution of PM10

Emission Rate Crystalline Silica [g/s] = Emission Rate PM10 [g/s] x % Crystalline Silica in PM10

Sample Calculation:

$$\text{Emission Rate SPM [g/s]} = 1.71E\text{-}02\ \frac{kg}{tonne} \times 390\ \frac{tonnes}{hr} \times 1000\ \frac{g}{kg} \times \frac{1}{3600}\ \frac{hr}{seconds} = \boxed{1.85\ \frac{g}{s}}$$

$$\text{PM10 Emission Rate [g/s]} = 1.85E+00\ \frac{g}{s} \times 43.75\% = 8.09E\text{-}01\ \frac{g}{s}$$

$$\text{Crystalline Silica Emission Rate [g/s]} = 8.09E\text{-}01\ \frac{g}{s} \times 13.70\% = 1.11E\text{-}01\ \frac{g}{s}$$

Source ID	Material Handling Location	Material	Amount of Material Transferred [tonne/hr]	Controls	Control Efficiency	EMISSION FACTOR SPM [kg/tonne]	EMISSION RATE SPM [g/s]	EMISSION RATE PM10 [g/s]	EMISSION RATE Crystalline Silica [g/s]
Q5-1	Blast Pile to Haul Truck	Unfragmented Limestone	390	None	0%	1.71E-02	1.85E+00	8.09E-01	1.11E-01
Q5-1A	Overburden to Haul Truck	Overburden	67	None	0%	5.36E-03	9.93E-02	4.34E-02	5.95E-03
3-1B	Overburden to Storage Piles	Overburden	67	None	0%	5.36E-03	9.93E-02	4.34E-02	5.95E-03
						TOTAL	**2.05E+00**	**8.95E-01**	**1.23E-01**

Variable Wind Speed Emissions

Source ID	Materials Handling Location	Material	Contaminant	Wind speed [m/s]:	1.54	3.09	5.14	8.23	10.80	17.00
Q5-1	Blast Pile to Haul Truck	Unfragmented Limestone	SPM	EF [kg/Mg]	7.52E-04	1.86E-03	3.60E-03	6.64E-03	9.46E-03	1.71E-02
				ER [g/s]:	8.15E-02	2.01E-01	3.90E-01	7.20E-01	1.02E+00	1.85E+00
				Fraction	0.04	0.11	0.21	0.39	0.55	1.00
			Crystalline Silica	EF [kg/Mg]	-	-	-	-	-	-
				ER [g/s]:	4.88E-03	1.21E-02	2.34E-02	4.31E-02	6.14E-02	1.11E-01
				Fraction	0.04	0.11	0.21	0.39	0.55	1.00
Q5-1A	Overburden to Haul Truck	Overburden	SPM	EF [kg/Mg]	2.36E-04	5.84E-04	1.13E-03	2.09E-03	2.97E-03	5.36E-03
				ER [g/s]:	4.38E-03	1.08E-02	2.10E-02	3.87E-02	5.51E-02	9.93E-02
				Fraction	0.04	0.11	0.21	0.39	0.55	1.00
			Crystalline Silica	EF [kg/Mg]	-	-	-	-	-	-
				ER [g/s]:	2.62E-04	6.49E-04	1.26E-03	2.32E-03	3.30E-03	5.95E-03
				Fraction	0.04	0.11	0.21	0.39	0.55	1.00
3-1B	Overburden to Storage Piles	Overburden	SPM	EF [kg/Mg]	2.36E-04	5.84E-04	1.13E-03	2.09E-03	2.97E-03	5.36E-03
				ER [g/s]:	4.38E-03	1.08E-02	2.10E-02	3.87E-02	5.51E-02	9.93E-02
				Fraction	0.04	0.11	0.21	0.39	0.55	1.00
			Crystalline Silica	EF [kg/Mg]	-	-	-	-	-	-
				ER [g/s]:	2.62E-04	6.49E-04	1.26E-03	2.32E-03	3.30E-03	5.95E-03
				Fraction	0.04	0.11	0.21	0.39	0.55	1.00

Source Group ID	1	**Source Description**	Primary Crushing

Process Description	The facility has a Primary Crushing Plant located above grade. Limestone is transferred from the Quarry via Haul trucks, and dropped into the Primary Crusher, crushed and transferred to an outdoor storage pile. The crusher is located below grade, and the hopper is enclosed using a 3-sided enclosure plus a roof. The crusher itself is controlled by a baghouse (refer to Baghouses calculations).

Operating Scenario	Crushing plant is operating at maximum capacity of primary crusher.	**Limitations**	None

EMISSION CALCULATION

Production Rates:

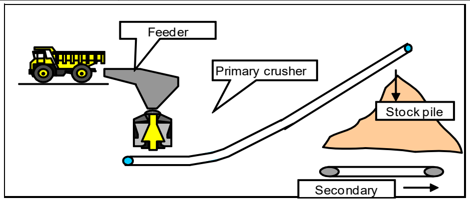
Primary Crusher 390 tonnes/hour

Haul Trucks to Crusher 390 tonnes/hour

k value SPM[1]	k value PM10	PM10 Fraction PM10
0.8	0.35	0.4375

1 - Emission factor represents Particulate Matter with diameter < 44 µm

Methodology:	US EPA AP-42 Emission Factors
Source:	US EPA AP-42 Section 13.2.4 - Aggregate Handling and Storage Piles (11/06)



Percent of Crystalline Silica in PM10 13.7%

Reference: AWMA - PM4 Crystalline Silica Emission Factors and Ambient Concentrations at Aggregate-Producing Sources in California (Richards et al, 2012)

Particle Size Distribution

Particle Size [µm]	Cumulative % Particle Distribution
SPM	—
PM10	50%

Calculation Formula

Emission Rate SPM [g/s] = Emission Factor [kg/tonne] x Activity Rate [tonnes/hr] x 1000 [g/kg] x 1/3600 [hrs/second]

Emission rate PM10 [g/s] = Emission Rate SPM [g/s] x Cumulative % Partcile Distribution of PM10

Emission Rate Crystalline Silica [g/s] = Emission Rate PM10 [g/s] x % Crystalline Silica in PM10

Sample Calculation:

Emission Rate [g/s] = 1.71E-02 *kg/tonne* | 390 *tonnes/hr* | 1000 *g/kg* | 1/3600 *hr/seconds* | (1-0.90) = 1.85E-01 *g/s*

PM10 Emission Rate [g/s] = 1.85E-01 *g/s* | 43.75% | 8.09E-02 *g/s*

Crystalline Silica Emission Rate [g/s] = 8.09E-02 *g/s* | 13.70% | *1.11E-02* *g/s*

Source ID	Equipment ID	Activity	Maximum Capacity [Mg/hr]	Controls: Primary Control Code	Controls: Primary Control Method	Controls: Secondary Control Code	Controls: Secondary Control Method	Control Efficiency	EMISSION FACTORS (uncontrolled)[1] SPM [kg/Mg]	EMISSION RATES (controlled) SPM [g/s]	EMISSION RATES (controlled) PM10 [g/s]	EMISSION RATES (controlled) Crystalline Silica [g/s]
Q5-1	Blast Pile to Haul Truck	Transfer Point	390	1	None	1	None	Emissions Included on Q5-Materials Handling Worksheet				
1-1	Haul Truck dump into Primary Crusher	Transfer Point	390	11	2-3 sided enclosure	1	None	90%	1.71E-02	1.85E-01	8.09E-02	1.11E-02
5-7	Primary Crusher	Crusher	390	14	Underground	5	Baghouse	Emissions Included on Baghouses Worksheet				
5-7	Primary Crusher onto Feeder	Transfer Point	390	14	Underground	5	Baghouse	Emissions Included on Baghouses Worksheet				
5-7	Feeder to S-1, S-2	Transfer Point	390	12	Enclosure (inside building)	5	Baghouse	Emissions Included on Baghouses Worksheet				
1-2	S-2 to Crushed Limestone Pile	Transfer Point	390	2	Water Spray - Point of App.	1	None	75%	1.71E-02	4.62E-01	2.02E-01	2.77E-02
									Total	**6.47E-01**	**2.83E-01**	**3.88E-02**

[1] Emission factor calculation for Unfragmented Limestone presented on Materials Handling Worksheet

WSP GOLDER

Made By: JDM
Checked By: JJZ

Source ID	2	Source Description	Secondary Crushing

Process Description	The facility has an at grade Secondary Crushing Plant to further reduce the limestone for clinker production. The Secondary Crushing Plant consists of Hammermill, New Secondary Crusher, Screen House, Loesche Mill Building and enclosed conveyors for aggregate transfer. Detailed equipment and transfer list is provided in the Table below.

Operating Scenario	Crushing plant is operating at maximum capacity of secondary crusher.	**Limitations**	The total emissions from secondary crushing of aggregate material are divided equally into 3 modelling sources that cover the secondary crushing plants.

EMISSION CALCULATION

Production Rates:

Secondary Crusher 370 tonnes/hour   Apron Feeder BC1 300 tonnes/hour

Methodology:	US EPA AP-42 Emission Factor
Source:	US EPA AP-42 Section 11.19.2 - Crushed Stone Processing and Pulverized Mineral Processing (8/04)

Source	Contaminant	CAS	Uncontrolled Emission Factor: Emission Factor	US EPA Quality Rating	MOECC Quality Rating	Controlled Emission Factor[1]: Emission Factor	US EPA Quality Rating	MOECC Quality Rating
Conveyor Drops	SPM	-	1.50E-03	E	Marginal	7.00E-05	E	Marginal

[1] For controlled sources that are part of the processing plant that employs current wet suppresion technology

Percent of Crystalline Silica in PM10 = 13.7%

Reference: AWMA - PM4 Crystalline Silica Emission Factors and Ambient Concentrations at Aggregate-Producing Sources in California (Richards et al, 2012)

Particle Size Distribution

Particle Size [µm]	Cumulative % Particle Distribution
SPM	—
PM10	53%

Reference: US EPA AP-42 Appendix B.2 - GENERALIZED PARTICLE SIZE Cumulative % Particle Distribution: Category 5

Calculation Formula

Emission Rate SPM [gs] = Emission Factor x Activity Rate x 1000 x 1/3600

Emission rate PM10 [g/s] = Emission Rate SPM [g/s] x Cumulative % Partcile Distribution of PM10

Emission Rate Crystalline Silica [g/s] = Emission Rate PM10 [g/s] x % Crystalline Silica in PM10

Sample Calculation:

$$\text{Emission Rate} = 7.00\text{E-}05\ \frac{kg}{tonne} \times 370\ \frac{tonnes}{hr} \times 1000\ \frac{g}{kg} \times \frac{1\ hr}{3600\ seconds} = 0.007\ \frac{g}{s}$$

$$\text{PM10 Emission Rate [g/s]} = 7.19\text{E-}03\ \frac{g}{s} \times 53.00\% = 3.81\text{E-}03\ \frac{g}{s}$$

$$\text{Crystalline Silica Emission Rate [g/s]} = 3.81\text{E-}03\ \frac{g}{s} \times 13.70\% = 5.22\text{E-}04\ \frac{g}{s}$$

Source ID	Equipment ID/ Description	Activity	Maximum Capacity [tonnes/hr]	Controls: Controlled	Control Method	Code	Control Efficiency	EMISSION FACTORS SPM [kg/Mg][1]	EMISSION RATES[2] SPM [g/s]	EMISSION RATES Crystalline Silica [g/s]
2-1	Apron feeder BC1A drop point	Transfer Point	370	Yes	Enclosed	12	90%	7.00E-05	7.19E-04	5.22E-05
2-2	Conveyor BC2A drop point	Transfer Point	370	Yes	Enclosed	12	90%	7.00E-05	7.19E-04	5.22E-05
2-3	Swing beam machine, drop point	Transfer Point	300	Yes	Enclosed	12	90%	7.00E-05	5.83E-04	4.24E-05
2-4	Conveyor BC5 drop point	Transfer Point	370	Yes	Enclosed	12	90%	7.00E-05	7.19E-04	5.22E-05
2-5	Conveyor C9 drop point	Transfer Point	370	Yes	Enclosed	12	90%	7.00E-05	7.19E-04	5.22E-05
2-6	Apron feeder BC1 drop point	Transfer Point	300	Yes	Enclosed	12	90%	7.00E-05	5.83E-04	4.24E-05
2-7	Screen hopper drop point	Transfer Point	300	Yes	Enclosed	12	90%	7.00E-05	5.83E-04	4.24E-05
2-8	Conveyor C4 drop point	Transfer Point	300	Yes	Enclosed	12	90%	7.00E-05	5.83E-04	4.24E-05
2-9	Conveyor 1786 drop point	Transfer Point	300	Yes	Enclosed	12	90%	7.00E-05	5.83E-04	4.24E-05
2-10	Conveyor MFB2 drop point	Transfer Point	300	Yes	Enclosed	12	90%	7.00E-05	5.83E-04	4.24E-05
5-38	Secondary Crusher	Crusher	300	Yes	Baghouse	5	Emissions Included on Baghouses Worksheet			
								Total	**6.38E-03**	**4.63E-04**

1 - Emission factor represents Particulate Matter with diameter < 100 µm from controlled sources (with wet suppresion)

2 - Emissions calculated using Materials Handling Calculation (See Worksheet 3-Materials Handling)

Source ID	3	Source Description	Miscellaneous Materials Handling

Process Description	Dust emissions occur at several points in the process, such as material loading onto piles, loadout from piles and other drops that move material from one surface to another. Only one ship can be unloaded at one time.

Operating Scenario	Maximum Processing Rates	Limitations	None

EMISSION CALCULATION

Methodology:	US EPA AP-42 Emission Factor
Source:	US EPA AP-42 Section 13.2.4 - Aggregate Handling and Storage Piles (11/06)

Percent of Crystalline Silica in PM10 = 13.7%

Reference: AWMA - PM4 Crystalline Silica Emission Factors and Ambient Concentrations at Aggregate-Producing Sources in California (Richards et al, 2012)

$$E = k(0.0016)\frac{\left(\frac{U}{2.2}\right)^{1.3}}{\left(\frac{M}{2}\right)^{1.4}} \text{ (kg/megagram [Mg])}$$

here:

E = emission factor
k = particle size multiplier (dimensionless)
U = mean wind speed, metres per second (m/s)
M = material moisture content (%)

k value SPM[1]	k value PM10	PM10 Fraction PM10
0.8	0.35	0.4375

1 - Emission factor represents Particulate Matter with diameter < 44 µm

Maximum Wind Speed (m/s): U = 17.00 Value based on maximum daily wind speed from five years of met data (1996-2000) from MOECC dataset

Emission Factors for Materials Handling

Material	Transfer Location	Moisture %	Maximum Wind Speed	Emission Factor, (kg/tonne) SPM	US EPA Quality Rating	MOECC Quality Rating	Data Source
Coal	Outdoor	4.8 (1)	17.0	5.36E-03	B	Average	AP-42 13.2.2
Coke	Outdoor	4.8 (1)	17.0	5.36E-03	B	Average	AP-42 13.2.3
Anhydride Gypsum	Outdoor	4.8 (1)	17.0	5.36E-03	B	Average	AP-42 13.2.4
Crude Gypsum	Outdoor	4.8 (1)	17.0	5.36E-03	B	Average	AP-42 13.2.4

(1) Actual moisture content greater than 4.8%, however, as per Section 13.2.4.3 of the AP-42 document, since the moisture content range that the equation was developed for is 0.25-4.8%, 4.8% was used in the emission factor equation.

Calculation Formula

Emission Rate [g/s] = Emission Factor [kg/tonne] x Activity Rate [tonnes/hr] x 1000 [g/kg] x 1/3600 [hrs/second]

Emission rate PM10 [g/s] = Emission Rate SPM [g/s] x Cumulative % Partcile Distribution of PM10

Emission Rate Crystalline Silica [g/s] = Emission Rate PM10 [g/s] x % Crystalline Silica in PM10

Sample Calculation:

$$\text{Emission Rate SPM [g/s]} = 0.005362\ \frac{kg}{tonne} \times 1{,}083\ \frac{tonnes}{hr} \times 1000\ \frac{g}{kg} \times 0.5 \times \frac{1\ hr}{3600\ seconds} = 0.807\ \frac{g}{s}$$

$$\text{PM10 Emission Rate [g/s]} = 8.07\text{E-}01\ \frac{g}{s} \times 43.75\% = 3.53\text{E-}01\ \frac{g}{s}$$

$$\text{Crystalline Silica Emission Rate [g/s]} = 3.53\text{E-}01\ \frac{g}{s} \times 13.70\% = 4.84\text{E-}02\ \frac{g}{s}$$

Source ID	Material Handling Location	Material	Amount of Material Transferred [tonne/hr]	EMISSION FACTORS SPM [kg/tonne]	PRIMARY CONTROLS Code	PRIMARY CONTROLS Description	SECONDARY CONTROLS Code	SECONDARY CONTROLS Description	CONTROL EFFICIENCY	EMISSION RATES SPM [g/s]	EMISSION RATES BY SOURCE SPM [g/s]	EMISSION RATES Crystalline Silica [g/s]	EMISSION RATES BY SOURCE Crystalline Silica [g/s]
3-1	LSC unloading from ship	Coal	1,083	5.36E-03	16	Water Spray (general)	1	None	50%	8.07E-01	1.936E+00	4.84E-02	1.161E-01
	Coke unloading from ship	Coke	2,600	5.36E-03	16	Water Spray (general)	1	None	50%	1.94E+00		1.16E-01	
3-3	Anhydride gypsum unloading from ship	Anhydride Gypsum	2,800	5.36E-03	16	Water Spray (general)	1	None	50%	2.09E+00	2.085E+00	1.25E-01	1.250E-01
	Crude gypsum unloading from ship	Crude Gypsum	2,800	5.36E-03	16	Water Spray (general)	1	None	50%	2.09E+00		1.25E-01	

Variable Wind Speed Emissions: SPM -3-1

Source ID	Source Description	Material	Contaminant	Wind Speed [m/s]	1.54	3.09	5.14	8.23	10.80	17.00
3-1	LSC unloading from ship	Coal	SPM	EF [kg/Mg]	2.36E-04	5.84E-04	1.13E-03	2.09E-03	2.97E-03	5.36E-03
				ER [g/s]:	3.56E-02	8.79E-02	1.70E-01	3.14E-01	4.47E-01	8.07E-01
				Fraction	0.04	0.11	0.21	0.39	0.55	1.00

Source ID	3	Source Description	Miscellaneous Materials Handling

Process Description	Dust emission occur at several points in the process, such as material loading onto piles, loadout from piles and other drops that move material from one surface to another

Operating Scenario	Maximum Processing Rates	Limitations	None

EMISSION CALCULATION

Methodology	US EPA AP-42 Emission Factor
Source:	US EPA AP-42 Section 13.2.4 - Aggregate Handling and Storage Piles (11/06)

Percent of Crystalline Silica in PM10 = 13.7%
Reference: AWMA - PM4 Crystalline Silica Emission Factors and Ambient Concentrations at Aggregate-Producing Sources in California (Richards et al, 2012)

$$E = k(0.0016)\frac{\left(\frac{U}{2.2}\right)^{1.3}}{\left(\frac{M}{2}\right)^{1.4}} \text{ (kg/megagram [Mg])}$$

Where:
E = emission factor
k = particle size multiplier (dimensionless)
U = mean wind speed, metres per second (m/s)
M = material moisture content (%)

k value SPM[1]	k value PM10	PM10 Fraction PM10
0.8	0.35	0.4375

1 - Emission factor represents Particulate Matter with diameter < 44 µm

Maximum Wind Speed (m/s): U = 17.00 Value based on maximum wind speed from five years of site specific MECP data set

Emission Factors for Materials Handling

Material	Transfer Location	Moisture %	Max Wind Speed, (m/s)	Emission Factor, (kg/tonne) SPM	US EPA Quality	MOECC Quality	Data Source
Coal	Outdoor	4.8 (1)	17.0	5.36E-03	B	Average	AP-42 13.2-2
Coke	Outdoor	4.8 (1)	17.0	5.36E-03	B	Average	AP-42 13.2-3
Anhydride Gypsum	Outdoor	4.8 (1)	17.0	5.36E-03	B	Average	AP-42 13.2-4
Crude Gypsum	Outdoor	4.8 (1)	17.0	5.36E-03	B	Average	AP-42 13.2-4
Additives	Outdoor	4.8 (1)	17.0	5.36E-03	B	Average	AP-42 13.2-4
CKD	Outdoor	0.92	17.0	5.42E-02	B	Average	AP-42 13.2-5
Clinker	Outdoor	0.05	17.0	3.20E+00	A	Above-Average	Lehigh
Weathered Clinker	Outdoor	0.5	17.0	1.27E-01	A	Above-Average	Lehigh
Unfragmented Limestone	Outdoor	2.1	17.0	1.71E-02	B	Average	AP-42 13.2-4
Crushed Limestone	Outdoor	0.7	17.0	7.94E-02	B	Average	AP-42 13.2-4
Overburden	Outdoor	4.8 (1)	17.0	5.36E-03	A	Above-Average	Lehigh

(1) Actual moisture content greater than 4.8%, however, as per Section 13.2.4.3 of the AP-42 document, since the moisture content range that the equation was developed for is 0.25-4.8%, 4.8% was used in the emission factor equation.

Calculation Formula

Emission Rate [g/s] = Emission Factor [kg/tonne] x Activity Rate [tonnes/hr] x 1000 [g/kg] x 1/3600 [hrs/second]

Sample Calculation:

Emission Rate [g/s] = 0.005362 *kg/tonne* × 29 *tonnes/hr* × 1000 *g/kg* × 1/3600 *hr/seconds* = 0.0434 *g/s*

PM10 Emission Rate [g/s] = 4.34E-02 *g/s* × 43.75% = 1.90E-02 *g/s*

Crystalline Silica Emission Rate [g/s] = 1.90E-02 *g/s* × 13.70% = *2.60E-03 g/s*

Source ID	Material Handling Location	Material	Amount of Material Transferred [tonne/hr]	EMISSION FACTOR SPM [kg/tonne]	PRIMARY CONTROLS Code	PRIMARY CONTROLS Description	SECONDARY CONTROLS Code	SECONDARY CONTROLS Description	CONTROL EFFICIENCY	EMISSION RATES SPM [g/s]	EMISSION RATES BY SOURCE SPM [g/s]	EMISSION RATES PM10 [g/s]	EMISSION RATES BY SOURCE PM10 [g/s]	EMISSION RATES Crystalline Silica [g/s]	EMISSION RATES BY SOURCE Crystalline Silica [g/s]
3-2	LSC shore pile outloading	Coal	29	5.36E-03	1	None	1	None	0%	4.34E-02	4.34E-02	1.90E-02	1.90E-02	2.60E-03	2.60E-03
	Coke shore pile outloading	Coke	29	5.36E-03	1	None	1	None	0%	4.34E-02		1.90E-02		2.60E-03	
3-4	Anhydride gypsum shore pile outloading	Anhydride Gypsum	65	5.36E-03	1	None	1	None	0%	9.68E-02	9.68E-02	4.24E-02	4.24E-02	5.80E-03	5.80E-03
	Crude gypsum shore pile outloading	Crude Gypsum	65	5.36E-03	1	None	1	None	0%	9.68E-02		4.24E-02		5.80E-03	
3-5	Silica additive drop to pile	Additives	80	5.36E-03	1	None	1	None	0%	1.19E-01	3.873E-01	5.21E-02	1.694E-01	7.14E-03	2.321E-02
	Iron additive drop to pile	Additives	80	5.36E-03	1	None	1	None	0%	1.19E-01		5.21E-02		7.14E-03	
	Alumina additive drop to pile	Additives	80	5.36E-03	1	None	1	None	0%	1.19E-01		5.21E-02		7.14E-03	
	Additives Drop to Storage Hall	Additives	200	5.36E-03	11	2-3 sided enclosure	1	None	90%	2.98E-02		1.30E-02		1.79E-03	
3-6	CKD drop to pile	CKD	3	5.42E-02	1	None	1	None	0%	5.02E-02	3.724E-01	2.19E-02	1.629E-01	3.01E-03	2.232E-02
	CKD outloading to sales	CKD	21	5.42E-02	1	None	1	None	0%	3.22E-01		1.41E-01		1.93E-02	
3-7	Fuel drop into feed hopper	Coal	17	5.36E-03	1	None	1	None	0%	2.48E-02	2.48E-02	1.09E-02	1.09E-02	1.49E-03	1.49E-03
									TOTAL	1.07E+00		4.66E-01		6.38E-02	

Variable Wind Speed Emissions

Source ID	Material Handling Location	Material	Contaminant	Wind speed [m/s]:	1.54	3.09	5.14	8.23	10.80	17.00
3-2	LSC shore pile outloading	Coal	SPM	EF [kg/Mg]	2.36E-04	5.84E-04	1.13E-03	2.09E-03	2.97E-03	5.36E-03
				ER [g/s]:	1.91E-03	4.73E-03	9.17E-03	1.69E-02	2.41E-02	4.34E-02
				Fraction	0.04	0.11	0.21	0.39	0.55	1.00
			Crystalline Silica	EF [kg/Mg]	-	-	-	-	-	-
				ER [g/s]:	1.15E-04	2.84E-04	5.50E-04	1.01E-03	1.44E-03	2.60E-03
				Fraction	0.04	0.11	0.21	0.39	0.55	1.00
	Coke shore pile outloading	Coke	SPM	EF [kg/Mg]	2.36E-04	5.84E-04	1.13E-03	2.09E-03	2.97E-03	5.36E-03
				ER [g/s]:	1.91E-03	4.73E-03	9.17E-03	1.69E-02	2.41E-02	4.34E-02
				Fraction	0.04	0.11	0.21	0.39	0.55	1.00
			Crystalline Silica	EF [kg/Mg]	-	-	-	-	-	-
				ER [g/s]:	1.15E-04	2.84E-04	5.50E-04	1.01E-03	1.44E-03	2.60E-03
				Fraction	0.04	0.11	0.21	0.39	0.55	1.00

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Checked By: JJZ

Source ID	4	**Source Description**	Kiln Stacks

Process Description	There is one dry process kiln (KILN4) operating at the facility, which has a kiln and a clinker cooler stack. KILN4 has a by-pass. There 2 are Loesche Mills with emissions directed to the Kiln 4 ESP. Emission rates for KILN4 source include the contribution from the Loesche Mills.

Operating Scenario	Both Kilns operating at maximum capacity	**Limitations**	**For Kiln 4 :**US EPA AP-42 Chapter 11.6 Portland Cement Manufacturing emission factors are not available for every contaminant. For contaminants that are not listed within the AP42 document but were measured within the source testing, the source testing values were used for the emission rate. Methodology for assessing contaminants from ALCFs presented in Appendix H **For Kiln 4 By-pass:** Source tested values were primarily used as the AP42 emission factors from a kiln are not representative. For contaminants that were not source tested, AP42 EFs (kiln) were used. Methodology for assessing contaminants from ALCFs presented in Appendix H

EMISSION CALCULATION

Methodology:	US EPA AP-42 Emission Factors (Chapter 11.6 - Portland Cement Manufacturing) Source Testing ALCF Assessment Methodology - Appendix H
Source:	2021 Source Testing, November 2021 2020 Source Testing, November 2020 2016 Stage 2 Source Testing Program, Amec Foster Wheeler, January 2017 US EPA AP-42 Chapter 11.6 Portland Cement Manufacturing (1/95) ALCF Lab Analysis

Source ID	Activity	Model ID	Clinker Production during 2016 Testing (tonne/hour)	Production during 2020 Source Testing (tonne/hour)	Production during 2021 Source Testing (tonne/hour)	Maximum Hourly Production (tonne/hour)
4-2	Kiln 4	KILN4	89	124	114	163
	Loesche Mill (emissions through Kiln 4 ESP)		—	—	—	95
	Loesche Mill (emissions through Kiln 4 ESP)		—	—	—	95
4-5	Kiln 4 By-Pass	KILN4_BP	100	117	105	163

Conversion Factors

1 kg =	1000	g
1 hr =	3600	s

Percent of Crystalline Silica in PM10 =		13.7%

Reference: AWMA - PM4 Crystalline Silica Emission Factors and Ambient Concentrations at Aggregate-Producing Sources in California (Richards et al, 2012)

Calculation Formula

AP42 Method

Emission Rate = Maximum Hourly Production [tonne/hour] x Emission Factor [kg/Mg] x Conversion Factors

SPM Emission Rate Kiln4 = Emission Rate 2 Loesche Mills + Emission Rate Kiln 4

SPM Emission Rate Kiln4 = [Maximum Hourly Production Loesche Mills [tonne/hour] x Emission Factor [kg/Mg]] + [Maximum Hourly Production Kiln 4 [tonne/hour] x Emission Factor [kg/Mg]] x Conversion Factors

$$\text{SPM Emission Rate Kiln4} = \left[190\ \frac{tonne}{hour}\ \ 6.20\text{E-}03\ \frac{kg}{Mg} + 163\ \frac{tonne}{hour}\ \ 1.30\text{E-}01\ \frac{kg]}{Mg}\ \ \frac{1000}{1}\ \frac{g}{kg}\ \ \frac{1}{3600}\ \frac{hr}{s} = \boxed{6.21\text{E+}00\ \frac{g}{s}}\right.$$

Source Testing Method

Emission Rate = Source Testing Emission Rate [g/s] x (Maximum Production / Clinker Production at the time of Source Testing)

$$\text{Ammonia Emission Rate Kiln4} = 2.89\text{E+}00\ \frac{g}{s}\ \ 163\ \frac{tonne}{hour}\ \ \frac{1}{114}\ \frac{hour}{tonne} = \boxed{4.14\text{E+}00\ \frac{g}{s}}$$

Sample Calculation for Kiln 4-Bypass Calcium Oxide (CaO):

*CaO Emission Rate for Kiln4 BP = Emission Rate $SPM_{FF,StackTest}$ [g/s] x (Emission Factor CaO_{ESP} [kg/tonne] / Emission Factor SPM_{ESP} [kg/tonne])

$$\text{CaO Emission Rate} = 4.56\text{E-}01\ \frac{g\ SPM}{hour}\ \ \frac{1.20\text{E-}01\ kg/tonne}{1.30\text{E-}01\ kg/tonne} = \boxed{4.21\text{E-}01\ \frac{g}{s}}$$

*Note: CaO emission factors for fabric filters do not exist in the AP-42 source used, relationships between the CaO ESP and SPM ESP emission factors were used and multiplied by the known SPM fabric filter stack testes emission rate to estimate the CaO Emission rate from the by-pass

Sample Calculation for Kiln 4 Cobalt (Co) from ALCF

Co Emission Rate for Kiln4 from ALCF = Source Testing Emission Rate [g/s] x (Maximum Production / Clinker Production at the time of Source Testing) x % Increase from ALCF

$$\text{Co Emission Rate for Kiln4 from ALCF} = 1.48\text{E-}04\ \frac{g}{s}\ \ 163\ \frac{tonne}{hour}\ \ \frac{1}{114}\ \frac{hour}{tonne}\ \ 5828\%\ Increase = \boxed{1.23\text{E-}02\ \frac{g}{s}}$$

			AP -42 Chapter 11.6			Source Testing		Comparison		ALCF	Modelled			
MODEL ID	Contaminant	CAS	Emission Factor[1,3] [kg/Mg]	Maximum Throughput [Mg/hr]	AP-42 EF Emission Rate [g/s]	Source Testing Emission Rate[2] [g/s]	Scaled Source Testing Emission Rate [g/s]	% Difference	Is the Emission Factor Less than Source Testing	% Increase from ALCF	Modelled Emission Rate [g/s]	MECP Data Quality Rating	Emission Estimating Technique	Emission Estimate Source
KilN4- Emissions from 2 Loesche Mills														
	SPM	N/A-1	6.20E-03	190	3.27E-01	—	—	—	—		3.27E-01	Marginal	EF	AP-42: Raw Mill with FF
	PM10	N/A-2	—	—	2.78E-01	—	—	—	—		2.78E-01	Marginal	EF	Percent composition of SPM
	Crystalline Silica	14808-60-7	—	—	3.81E-02	—	—	—	—		3.81E-02	Marginal	EF	Percent composition of PM10
KilN4- Emissions from KILN4														
	SPM	N/A-1	1.30E-01	163	5.89E+00	—	—	—	—		5.89E+00	Marginal	EF	AP-42: Preheater kiln with ESP
	PM10	N/A-2	—	—	5.00E+00	—	—	—	—		5.00E+00	Marginal	EF	Percent composition of SPM
	Crystalline Silica	14808-60-7	—	—	6.85E-01	—	—	—	—		6.85E-01	Marginal	EF	Percent composition of PM10

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MODEL ID	Contaminant	CAS	Emission Factor[1,3] [kg/Mg]	Maximum Throughput [Mg/hr]	AP-42 EF Emission Rate [g/s]	Source Testing Emission Rate[2] [g/s]	Scaled Source Testing Emission Rate [g/s]	% Difference	Is the Emission Factor Less than Source Testing	% Increase from ALCF	Modelled Emission Rate [g/s]	MECP Data Quality Rating	Emission Estimating Technique	Emission Estimate Source
KILN4- Kiln 4 Emissions + Two Loesche Mills emissions (directed to Kiln 4's ESP)														
KILN4	SPM	N/A-1	—	—	6.21E+00	3.22E+00	4.61E+00	26%	no		6.21E+00	Marginal	EF	AP-42: Preheater kiln with ESP + AP-42 Raw Mill with FF
KILN4	PM10	N/A-2	—	—	5.28E+00	5.42E+00	—	—	—		5.28E+00	Marginal	EF	Percent composition of SPM
KILN4	Crystalline Silica	14808-60-7	—	—	7.24E-01	—	—	—	—		7.24E-01	Marginal	EF	Percent composition of PM10
KILN4	Carbon Monoxide	630-08-0	4.90E-01	163	2.22E+01	6.97E+01	9.98E+01	78%	yes		2.22E+01	Marginal	EF	AP-42: Preheater Process Kiln
KILN4	Carbon Dioxide	124-38-9	9.00E+02	163	4.08E+04	—	—	—	—		4.08E+04	Average	EF	AP-42: Preheater Process Kiln
KILN4	Nitrogen Oxides	10102-44-0	2.40E+00	163	1.09E+02	6.50E+01	9.31E+01	-17%	no		1.09E+02	Marginal	EF	AP-42: Preheater Process Kiln
KILN4	Sulphur dioxide	7446-09-5	2.70E-01	163	1.22E+01	6.68E+01	9.56E+01	87%	yes		1.22E+01	Marginal	EF	AP-42: Preheater Process Kiln
KILN4	Ammonia	7664-41-7	—	163	—	2.89E+00	4.14E+00	—	—		4.14E+00	Uncertain	ST	2016 Stage 2 Source Testing Program
KILN4	Aluminum	7429-90-5	6.50E-03	163	2.94E-01	—	—	—	—		2.94E-01	Marginal	EF	AP-42: ESP
KILN4	Ammonium	N/A-6	5.40E-02	163	2.45E+00	—	—	—	—		2.45E+00	Marginal	EF	AP-42: ESP
KILN4	Antimony	7440-36-0	—	163	—	9.41E-05	1.35E-04	—	—		1.35E-04	Uncertain	ST	2021 Source Testing
KILN4	Arsenic	7440-38-2	6.50E-06	163	2.94E-04	7.23E-03	1.04E-02	97%	yes		2.94E-04	Marginal	EF	AP-42: ESP
KILN4	Barium	7440-39-3	1.80E-04	163	8.15E-03	—	—	—	—		8.15E-03	Marginal	EF	AP-42: ESP
KILN4	Beryllium	7440-41-7	3.30E-07	163	1.49E-05	9.76E-06	1.29E-05	-16%	no		1.49E-05	Marginal	EF	AP-42: Fabric Filter
KILN4	Cadmium	7440-43-9	4.20E-06	163	1.90E-04	1.54E-04	2.20E-04	14%	yes		1.90E-04	Marginal	EF	AP-42: ESP
KILN4	Calcium Oxide	1305-78-8	1.20E-01	163	5.43E+00	1.19E-02	1.70E-02	-31793%	no		5.43E+00	Marginal	EF	AP-42: ESP - Calcium emission factor
KILN4	Chloride	N/A-5	3.40E-01	163	1.54E+01	—	—	—	—		1.54E+01	Marginal	EF	AP-42: ESP
KILN4	Chromium	7440-47-3	3.90E-06	163	1.77E-04	5.66E-04	8.10E-04	78%	yes		1.77E-04	Marginal	EF	AP-42: ESP
KILN4	Cobalt	7440-48-4	—	163	—	1.48E-04	2.12E-04	—	—	5828%	1.23E-02	Uncertain	ST	2021 Source Testing & ALCF Increase
KILN4	Copper	7440-50-8	2.60E-03	163	1.18E-01	1.04E-03	1.49E-03	-7807%	no		1.18E-01	Marginal	EF	AP-42: Fabric Filter
KILN4	Hydrogen Fluoride	7664-39-3	4.50E-04	163	2.04E-02	4.56E-02	6.53E-02	69%	yes		2.04E-02	Marginal	EF	AP-42: ESP - Fluoride emission factor
KILN4	Hydrogen Chloride	7647-01-0	2.50E-02	163	1.13E+00	1.12E-01	1.60E-01	-606%	no	903%	1.02E+01	Marginal	EF	AP-42: ESP & ALCF Increase
KILN4	Iron	15438-31-0	8.50E-03	163	3.85E-01	—	—	—	—		3.85E-01	Marginal	EF	AP-42: ESP
KILN4	Lead	7439-92-1	3.60E-04	163	1.63E-02	1.71E-03	2.45E-03	-566%	no		1.63E-02	Marginal	EF	AP-42: ESP
KILN4	Manganese	7439-96-5	4.30E-04	163	1.95E-02	2.27E-03	3.25E-03	-499%	no		1.95E-02	Marginal	EF	AP-42: ESP
KILN4	Mercury	7439-97-6	1.10E-04	163	4.98E-03	5.54E-04	7.93E-04	-528%	no	897%	4.47E-02	Marginal	EF	AP-42: ESP & ALCF Increase
KILN4	Nickel	7440-02-0	—	163	—	3.34E-03	4.78E-03	—	—		4.78E-03	Uncertain	ST	2021 Source Testing
KILN4	Nitrate	N/A-7	2.30E-03	163	1.04E-01	—	—	—	—		1.04E-01	Marginal	EF	AP-42: ESP
KILN4	Phosphorus	7723-14-0	—	163	—	4.49E-03	6.43E-03	—	—	1873%	1.20E-01	Uncertain	ST	2021 Source Testing & ALCF Increase
KILN4	Potassium	7440-09-7	9.00E-03	163	4.08E-01	—	—	—	—		4.08E-01	Marginal	EF	AP-42: ESP
KILN4	Selenium	7782-49-2	7.50E-05	163	3.40E-03	—	—	—	—		3.40E-03	Marginal	EF	AP-42: ESP
KILN4	Silicon	7440-21-3	—	163	—	1.45E+00	2.08E+00	—	—		6.21E+00	Uncertain	ST	ALCF Increase - 100% SPM ER
KILN4	Silver	7440-22-4	3.10E-07	163	1.40E-05	—	—	—	—		1.40E-05	Marginal	EF	AP-42: Fabric Filter
KILN4	Sodium	7440-23-5	2.00E-02	163	9.06E-01	—	—	—	—		9.06E-01	Marginal	EF	AP-42: ESP
KILN4	Sulfate	N/A-8	1.00E-01	163	4.53E+00	—	—	—	—		4.53E+00	Marginal	EF	AP-42: ESP
KILN4	Sulfur trioxide	N/A-9	4.20E-02	163	1.90E+00	—	—	—	—		1.90E+00	Marginal	EF	AP-42: ESP
KILN4	Thallium	7440-28-0	2.70E-06	163	1.22E-04	1.02E-04	1.46E-04	16%	yes		1.22E-04	Marginal	EF	AP-42: Fabric Filter
KILN4	Tin	7440-31-5	—	163	—	5.28E-03	7.56E-03	—	—	1626%	1.23E-01	Uncertain	ST	2021 Source Testing & ALCF Increase
KILN4	Titanium	7440-32-6	1.90E-04	163	8.60E-03	—	—	—	—		8.60E-03	Marginal	EF	AP-42: ESP
KILN4	Vanadium	7440-62-2	—	163	—	1.13E-04	1.62E-04	—	—		1.62E-04	Uncertain	ST	2021 Source Testing
KILN4	Zinc	7440-66-6	2.70E-04	163	1.22E-02	6.16E-03	8.82E-03	-39%	no		1.22E-02	Marginal	EF	AP-42: ESP
KILN4	C3 benzenes	N/A-10	1.3E-6	163	5.89E-05	—	—	—	—		5.89E-05	Marginal	EF	AP-42: ESP
KILN4	C4 benzenes	N/A-11	3.0E-6	163	1.36E-04	—	—	—	—		1.36E-04	Marginal	EF	AP-42: ESP
KILN4	C6 benzenes	N/A-12	4.6E-7	163	2.08E-05	—	—	—	—		2.08E-05	Marginal	EF	AP-42: ESP
KILN4	Acenaphthylene	208-96-8	5.90E-05	163	2.67E-03	3.05E-05	5.58E-05	-4685%	no		2.67E-03	Marginal	EF	AP-42: Fabric Filter
KILN4	Acetone	67-64-1	1.90E-04	163	8.60E-03	—	—	—	—		8.60E-03	Marginal	EF	AP-42: ESP
KILN4	Benzaldehyde	100-52-7	1.2E-5	163	5.43E-04	—	—	—	—		5.43E-04	Marginal	EF	AP-42: ESP
KILN4	Benzene	71-43-2	1.60E-03	163	7.24E-02	5.06E-02	7.24E-02	0%	no		7.24E-02	Marginal	EF	AP-42: ESP
KILN4	Benzo(a)anthracene	56-55-3	2.10E-08	163	9.51E-07	2.81E-07	5.14E-07	-85%	no		9.51E-07	Marginal	EF	AP-42: Fabric Filter
KILN4	Benzo(a)pyrene	50-32-8	6.50E-08	163	2.94E-06	1.14E-07	2.09E-07	-1310%	no		2.94E-06	Marginal	EF	AP-42: Fabric Filter
KILN4	Benzo(b)fluoranthene	205-99-2	2.80E-07	163	1.27E-05	2.87E-07	5.25E-07	-2313%	no		1.27E-05	Marginal	EF	AP-42: Fabric Filter
KILN4	Benzo(g,h,i)perylene	191-24-2	3.90E-08	163	1.77E-06	6.64E-07	1.22E-06	-45%	no		1.77E-06	Marginal	EF	AP-42: Fabric Filter
KILN4	Benzo(k)fluoranthene	207-08-9	7.70E-08	163	3.49E-06	2.87E-07	5.25E-07	-564%	no		3.49E-06	Marginal	EF	AP-42: Fabric Filter
KILN4	Benzoic acid	65-85-0	1.80E-03	163	8.15E-02	—	—	—	—		8.15E-02	Marginal	EF	AP-42: ESP
KILN4	Biphenyl	92-52-4	3.1E-6	163	1.40E-04	—	—	—	—		1.40E-04	Marginal	EF	AP-42: ESP
KILN4	Bis(2-ethylhexyl)phthalate	117-81-7	4.8E-5	163	2.17E-03	—	—	—	—		2.17E-03	Marginal	EF	AP-42: ESP
KILN4	Bromomethane	74-83-9	2.2E-5	163	9.96E-04	—	—	—	—		9.96E-04	Marginal	EF	AP-42: ESP
KILN4	Carbon disulfide	75-15-0	5.5E-5	163	2.49E-03	—	—	—	—		2.49E-03	Marginal	EF	AP-42: ESP
KILN4	Chlorobenzene	108-90-7	8.0E-6	163	3.62E-04	—	—	—	—		3.62E-04	Marginal	EF	AP-42: ESP
KILN4	Chloromethane	74-87-3	1.90E-04	163	8.60E-03	—	—	—	—		8.60E-03	Marginal	EF	AP-42: ESP
KILN4	Chrysene	218-01-9	8.10E-08	163	3.67E-06	1.55E-07	2.84E-07	-1193%	no		3.67E-06	Marginal	EF	AP-42: Fabric Filter
KILN4	Di-n-butylphthalate	84-74-2	2.1E-5	163	9.51E-04	—	—	—	—		9.51E-04	Marginal	EF	AP-42: ESP
KILN4	Dibenz(a,h)anthracene	53-70-3	3.10E-07	163	1.40E-05	2.01E-07	3.68E-07	-3715%	no		1.40E-05	Marginal	EF	AP-42: Fabric Filter
KILN4	Ethylbenzene	100-41-4	9.5E-6	163	4.30E-04	5.27E-03	7.54E-03	94%	yes		4.30E-04	Marginal	EF	AP-42: ESP
KILN4	Fluoranthene	206-44-0	4.40E-06	163	1.99E-04	2.16E-06	3.95E-06	-4939%	no		1.99E-04	Marginal	EF	AP-42: Fabric Filter
KILN4	Fluorene	86-73-7	9.4E-6	163	4.26E-04	1.22E-05	2.23E-05	-1806%	no		4.26E-04	Marginal	EF	AP-42: Fabric Filter
KILN4	Formaldehyde	50-00-0	2.30E-04	163	1.04E-02	—	—	—	—		1.04E-02	Marginal	EF	AP-42: Fabric Filter
KILN4	Freon 113	76-13-1	2.5E-5	163	1.13E-03	—	—	—	—		1.13E-03	Marginal	EF	AP-42: ESP
KILN4	Indeno(1,2,3-cd)pyrene	193-39-5	4.30E-08	163	1.95E-06	1.81E-07	3.31E-07	-488%	no		1.95E-06	Marginal	EF	AP-42: Fabric Filter
KILN4	Methyl ethyl ketone	78-93-3	1.5E-5	163	6.79E-04	7.34E-03	1.05E-02	94%	yes		6.79E-04	Marginal	EF	AP-42: ESP
KILN4	Methylene chloride	75-09-2	2.50E-04	163	1.13E-02	—	—	—	—		1.13E-02	Marginal	EF	AP-42: ESP
KILN4	Methylnaphthalene	90-12-0	2.1E-6	163	9.51E-05	—	—	—	—		9.51E-05	Marginal	EF	AP-42: ESP
KILN4	Naphthalene	91-20-3	1.10E-04	163	4.98E-03	8.20E-05	1.50E-04	-3218%	no		4.98E-03	Marginal	EF	AP-42: ESP
KILN4	Phenanthrene	85-01-8	2.00E-04	163	9.06E-03	5.70E-05	1.04E-04	-8579%	no		9.06E-03	Marginal	EF	AP-42: Fabric Filter
KILN4	Phenol	108-95-2	5.5E-5	163	2.49E-03	—	—	—	—		2.49E-03	Marginal	EF	AP-42: ESP
KILN4	Pyrene	129-00-0	2.2E-6	163	9.96E-05	1.41E-06	2.58E-06	-3759%	no		9.96E-05	Marginal	EF	AP-42: Fabric Filter
KILN4	Styrene	100-42-5	7.5E-7	163	3.40E-05	5.25E-03	7.52E-03	100%	yes		3.40E-05	Marginal	EF	AP-42: ESP
KILN4	Toluene	108-88-3	1.00E-04	163	4.53E-03	2.30E-02	3.29E-02	86%	yes		4.53E-03	Marginal	EF	AP-42: ESP
KILN4	Xylenes	1330-20-7	6.5E-5	163	2.94E-03	1.88E-02	2.70E-02	89%	yes		2.94E-03	Marginal	EF	AP-42: ESP
KILN4	PCBs	1336-36-3	—	163	—	9.63E-05	1.76E-04	—	—		1.76E-04	Uncertain	ST	2016 Stage 2 Source Testing Program

Made By: LL
Checked By: JJZ

MODEL ID	Contaminant	CAS	Emission Factor[1,3] [kg/Mg]	Maximum Throughput [Mg/hr]	AP-42 EF Emission Rate [g/s]	Source Testing Emission Rate[2] [g/s]	Scaled Source Testing Emission Rate [g/s]	% Difference	Is the Emission Factor Less than Source Testing	% Increase from ALCF	Modelled Emission Rate [g/s]	MECP Data Quality Rating	Emission Estimating Technique	Emission Estimate Source
Kiln 4 Cooler with baghouse														
KILN4_C	SPM	N/A-1	6.80E-02	163	3.08E+00	—	—	—	—		3.08E+00	Marginal	EF	AP-42: Clinker cooler with fabric filter
KILN4_C	PM10	N/A-2	—	—	2.62E+00	—	—	—	—		2.62E+00	Marginal	EF	Percent composition of SPM
KILN4_C	Crystalline Silica	14808-60-7	—	—	3.59E-01	—	—	—	—		3.59E-01	Marginal	EF	Percent composition of PM10
KIlN4_BP- Kiln 4ByPass Stack with Baghouse														
KILN4_BP	SPM	N/A-1	—	—	4.56E-01	3.59E-01	5.57E-01	-22%	yes		4.56E-01	Average	EF	MOECC EF 20 mg/m^3 (as previously submitted)
KILN4_BP	PM10	N/A-2	—	—	3.88E-01	8.85E-02	4.73E-01	—	—		3.88E-01	Marginal	EF	Percent composition of SPM
KILN4_BP	Crystalline Silica	14808-60-7	—	—	5.31E-02	—	6.48E-02	—	—		5.31E-02	Marginal	EF	Percent composition of PM10
KILN4_BP	Carbon Monoxide	630-08-0	4.90E-01	163	2.22E+01	8.56E-02	1.33E-01	99%	no		1.33E-01	Uncertain	ST	2021 Source Testing
KILN4_BP	Carbon Dioxide	124-38-9	9.00E+02	163	4.08E+04	—	—	—	—		4.08E+04	Average	EF	AP-42: Preheater Process Kiln
KILN4_BP	Nitrogen Oxides	10102-44-0	2.40E+00	163	1.09E+02	9.57E-01	1.48E+00	99%	no		1.48E+00	Uncertain	ST	2021 Source Testing
KILN4_BP	Sulphur dioxide	7446-09-5	2.70E-01	163	1.22E+01	1.59E-01	2.47E-01	98%	no		2.47E-01	Uncertain	ST	2021 Source Testing
KILN4_BP	Ammonia	7664-41-7	5.10E-03	163	2.31E-01	1.01E-03	1.57E-03	99%	no		1.57E-03	Uncertain	ST	2021 Source Testing
KILN4_BP	Aluminum	7429-90-5	6.50E-03	163	2.94E-01	—	—	—	—		2.94E-01	Marginal	EF	AP-42: ESP
KILN4_BP	Ammonium	N/A-6	5.40E-02	163	2.45E+00	—	—	—	—		2.45E+00	Marginal	EF	AP-42: ESP
KILN4_BP	Antimony	7440-36-0	—	163	—	7.68E-06	1.19E-05	—	—	9071%	1.08E-03	Uncertain	ST	2021 Source Testing & ALCF Increase
KILN4_BP	Arsenic	7440-38-2	6.00E-06	163	2.72E-04	2.68E-05	4.16E-05	85%	no	216%	8.98E-05	Uncertain	ST	2021 Source Testing & ALCF Increase
KILN4_BP	Barium	7440-39-3	2.30E-04	163	1.04E-02	—	—	—	—	193%	2.01E-02	Marginal	EF	AP-42: Fabric Filter & ALCF Increase
KILN4_BP	Beryllium	7440-41-7	3.30E-07	163	1.49E-05	7.26E-07	1.01E-06	93%	no		1.01E-06	Uncertain	ST	2020 Source Testing
KILN4_BP	Bismuth	7440-69-9	—	—	4.56E-01	—	—	—	—		4.56E-01	Average	MB	ALCF Increase - 100% SPM ER
KILN4_BP	Cadmium	7440-43-9	1.10E-06	163	4.98E-05	8.26E-06	1.28E-05	74%	no	3580%	4.58E-04	Uncertain	ST	2021 Source Testing & ALCF Increase
KILN4_BP	Calcium Oxide	1305-78-8	1.20E-01	163	4.21E-01	1.60E-03	2.48E-03	99%	no	3093%	7.67E-02	Uncertain	ST	2021 Source Testing & ALCF Increase
KILN4_BP	Chloride	N/A-5	1.10E-03	163	4.98E-02	—	—	—	—		4.98E-02	Marginal	EF	AP-42: Fabric Filter
KILN4_BP	Chromium	7440-47-3	7.00E-05	163	3.17E-03	3.23E-04	5.01E-04	84%	no	221%	1.11E-03	Uncertain	ST	2021 Source Testing & ALCF Increase
KILN4_BP	Cobalt	7440-48-4	—	163	—	1.04E-05	1.61E-05	—	—	5828%	9.40E-04	Uncertain	ST	2021 Source Testing & ALCF Increase
KILN4_BP	Copper	7440-50-8	2.60E-03	163	1.18E-01	4.69E-05	7.27E-05	100%	no	4528%	3.29E-03	Uncertain	ST	2021 Source Testing & ALCF Increase
KILN4_BP	Hydrogen Fluoride	7664-39-3	4.50E-04	163	2.04E-02	1.56E-03	2.42E-03	88%	no		2.42E-03	Uncertain	ST	2021 Source Testing
KILN4_BP	Hydrogen Chloride	7647-01-0	7.30E-02	163	3.31E+00	1.55E-02	2.40E-02	99%	no	903%	2.17E-01	Uncertain	ST	2021 Source Testing & ALCF Increase
KILN4_BP	Iron	15438-31-0	8.50E-03	163	3.85E-01	—	—	—	—		4.56E-01	Marginal	EF	ALCF Increase - 100% SPM ER
KILN4_BP	Lead	7439-92-1	3.80E-05	163	1.72E-03	3.06E-04	4.75E-04	72%	no	576%	2.73E-03	Uncertain	ST	2021 Source Testing & ALCF Increase
KILN4_BP	Magnesium	7439-95-4	—	—	4.56E-01	—	—	—	—		4.56E-01	Average	MB	ALCF Increase - 100% SPM ER
KILN4_BP	Manganese	7439-96-5	4.30E-04	163	1.95E-02	1.82E-04	2.82E-04	99%	no	1029%	2.90E-03	Uncertain	ST	2021 Source Testing & ALCF Increase
KILN4_BP	Mercury	7439-97-6	1.20E-05	163	5.43E-04	7.42E-06	1.15E-05	98%	no	897%	1.03E-04	Uncertain	ST	2021 Source Testing & ALCF Increase
KILN4_BP	Nickel	7440-02-0	—	163	—	3.17E-04	4.92E-04	—	—		4.92E-04	Uncertain	ST	2021 Source Testing
KILN4_BP	Nitrate	N/A-7	2.30E-03	163	1.04E-01	—	—	—	—		1.04E-01	Marginal	EF	AP-42: ESP
KILN4_BP	Phosphorus	7723-14-0	—	163	—	3.07E-04	4.76E-04	—	—	1873%	8.92E-03	Uncertain	ST	2021 Source Testing & ALCF Increase
KILN4_BP	Potassium	7440-09-7	9.00E-03	163	4.08E-01	—	—	—	—		4.08E-01	Marginal	EF	AP-42: ESP
KILN4_BP	Selenium	7782-49-2	1.00E-04	163	4.53E-03	—	—	—	—		4.53E-03	Marginal	EF	AP-42: Fabric Filter
KILN4_BP	Silicon	7440-21-3	—	163	—	9.82E-02	1.52E-01	—	—		4.56E-01	Uncertain	ST	ALCF Increase - 100% SPM ER
KILN4_BP	Silver	7440-22-4	3.10E-07	163	1.40E-05	—	—	—	—	151%	2.12E-05	Marginal	EF	AP-42: Fabric Filter & ALCF Increase
KILN4_BP	Sodium	7440-23-5	2.00E-02	163	9.06E-01	—	—	—	—		4.56E-01	Marginal	EF	ALCF Increase - 100% SPM ER
KILN4_BP	Sulfate	N/A-8	3.60E-03	163	1.63E-01	—	—	—	—		1.63E-01	Marginal	EF	AP-42: Fabric Filter
KILN4_BP	Sulfur trioxide	N/A-9	7.30E-03	163	3.31E-01	—	—	—	—		3.31E-01	Marginal	EF	AP-42: Fabric Filter
KILN4_BP	Thallium	7440-28-0	2.70E-06	163	1.22E-04	5.80E-06	8.99E-06	93%	no		8.99E-06	Uncertain	ST	2021 Source Testing
KILN4_BP	Tin	7440-31-5	—	163	—	2.47E-04	3.83E-04	—	—	1626%	6.23E-03	Uncertain	ST	2021 Source Testing & ALCF Increase
KILN4_BP	Titanium	7440-32-6	1.90E-04	163	8.60E-03	—	—	—	—	151%	1.30E-02	Marginal	EF	AP-42: ESP & ALCF Increase
KILN4_BP	Tungsten	7440-33-7	—	—	4.56E-01	—	—	—	—		4.56E-01	Average	MB	ALCF Increase - 100% SPM ER
KILN4_BP	Vanadium	7440-62-2	—	163	—	9.91E-06	1.54E-05	—	—		1.54E-05	Uncertain	ST	2021 Source Testing
KILN4_BP	Zinc	7440-66-6	1.70E-04	163	7.70E-03	2.46E-04	3.81E-04	95%	no		4.56E-01	Uncertain	ST	2021 Source Testing

MODEL ID	Contaminant	CAS	Emission Factor[1,3] [kg/Mg]	Maximum Throughput [Mg/hr]	AP-42 EF Emission Rate [g/s]	Source Testing Emission Rate[2] [g/s]	Scaled Source Testing Emission Rate [g/s]	% Difference	Is the Emission Factor Less than Source Testing	% Increase from ALCF	Modelled Emission Rate [g/s]	MECP Data Quality Rating	Emission Estimating Technique	Emission Estimate Source
KILN4_BP	C3 benzenes	N/A-10	1.3E-6	163	5.89E-05	—	—	—	—		5.89E-05	Marginal	EF	AP-42: ESP
KILN4_BP	C4 benzenes	N/A-11	3.0E-6	163	1.36E-04	—	—	—	—		1.36E-04	Marginal	EF	AP-42: ESP
KILN4_BP	C6 benzenes	N/A-12	4.6E-7	163	2.08E-05	—	—	—	—		2.08E-05	Marginal	EF	AP-42: ESP
KILN4_BP	Acenaphthylene	208-96-8	5.9E-5	163	2.67E-03	4.39E-08	7.19E-08	100%	no		7.19E-08	Uncertain	ST	2016 Stage 2 Source Testing Program
KILN4_BP	Acetone	67-64-1	1.90E-04	163	8.60E-03	—	—	—	—		8.60E-03	Marginal	EF	AP-42: ESP
KILN4_BP	Benzaldehyde	100-52-7	1.2E-5	163	5.43E-04	—	—	—	—		5.43E-04	Marginal	EF	AP-42: ESP
KILN4_BP	Benzene	71-43-2	8.00E-03	163	3.62E-01	9.54E-05	1.48E-04	100%	no		1.48E-04	Uncertain	ST	2021 Source Testing
KILN4_BP	Benzo(a)anthracene	56-55-3	2.1E-8	163	9.51E-07	2.60E-08	4.26E-08	96%	no		4.26E-08	Uncertain	ST	2016 Stage 2 Source Testing Program
KILN4_BP	Benzo(a)pyrene	50-32-8	6.5E-8	163	2.94E-06	1.43E-08	2.34E-08	99%	no		2.34E-08	Uncertain	ST	2016 Stage 2 Source Testing Program
KILN4_BP	Benzo(b)fluoranthene	205-99-2	2.8E-7	163	1.27E-05	1.67E-08	2.73E-08	100%	no		2.73E-08	Uncertain	ST	2016 Stage 2 Source Testing Program
KILN4_BP	Benzo(g,h,i)perylene	191-24-2	3.9E-8	163	1.77E-06	4.76E-08	7.79E-08	96%	no		7.79E-08	Uncertain	ST	2016 Stage 2 Source Testing Program
KILN4_BP	Benzo(k)fluoranthene	207-08-9	7.7E-8	163	3.49E-06	1.67E-08	2.73E-08	99%	no		2.73E-08	Uncertain	ST	2016 Stage 2 Source Testing Program
KILN4_BP	Benzoic acid	65-85-0	1.80E-03	163	8.15E-02	—	—	—	—		8.15E-02	Marginal	EF	AP-42: ESP
KILN4_BP	Biphenyl	92-52-4	3.1E-6	163	1.40E-04	—	—	—	—		1.40E-04	Marginal	EF	AP-42: ESP
KILN4_BP	Bis(2-ethylhexyl)phthalate	117-81-7	4.8E-5	163	2.17E-03	—	—	—	—		2.17E-03	Marginal	EF	AP-42: ESP
KILN4_BP	Bromomethane	74-83-9	2.2E-5	163	9.96E-04	—	—	—	—		9.96E-04	Marginal	EF	AP-42: ESP
KILN4_BP	Carbon disulfide	75-15-0	5.5E-5	163	2.49E-03	—	—	—	—		2.49E-03	Marginal	EF	AP-42: ESP
KILN4_BP	Chlorobenzene	108-90-7	8.0E-6	163	3.62E-04	—	—	—	—		3.62E-04	Marginal	EF	AP-42: ESP
KILN4_BP	Chloromethane	74-87-3	1.90E-04	163	8.60E-03	—	—	—	—		8.60E-03	Marginal	EF	AP-42: ESP
KILN4_BP	Chrysene	218-01-9	8.1E-8	163	3.67E-06	1.26E-08	2.06E-08	99%	no		2.06E-08	Uncertain	ST	2016 Stage 2 Source Testing Program
KILN4_BP	Di-n-butylphthalate	84-74-2	2.1E-5	163	9.51E-04	—	—	—	—		9.51E-04	Marginal	EF	AP-42: ESP
KILN4_BP	Dibenz(a,h)anthracene	53-70-3	3.1E-7	163	1.40E-05	2.60E-08	4.26E-08	100%	no		4.26E-08	Uncertain	ST	2016 Stage 2 Source Testing Program
KILN4_BP	Ethylbenzene	100-41-4	9.5E-6	163	4.30E-04	9.54E-05	1.48E-04	66%	no		1.48E-04	Uncertain	ST	2021 Source Testing
KILN4_BP	Fluoranthene	206-44-0	4.4E-6	163	1.99E-04	8.27E-08	1.35E-07	100%	no		1.35E-07	Uncertain	ST	2016 Stage 2 Source Testing Program
KILN4_BP	Fluorene	86-73-7	9.4E-6	163	4.26E-04	1.71E-07	2.80E-07	100%	no		2.80E-07	Uncertain	ST	2016 Stage 2 Source Testing Program
KILN4_BP	Formaldehyde	50-00-0	2.30E-04	163	1.04E-02	—	—	—	—		1.04E-02	Uncertain	ST	AP-42: Fabric Filter
KILN4_BP	Freon 113	76-13-1	2.5E-5	163	1.13E-03	—	—	—	—		1.13E-03	Marginal	EF	AP-42: ESP
KILN4_BP	Indeno(1,2,3-cd)pyrene	193-39-5	4.3E-8	163	1.95E-06	1.67E-08	2.73E-08	99%	no		2.73E-08	Uncertain	ST	2016 Stage 2 Source Testing Program
KILN4_BP	Methyl ethyl ketone	78-93-3	1.5E-5	163	6.79E-04	9.54E-05	1.48E-04	78%	no		1.48E-04	Uncertain	ST	2021 Source Testing
KILN4_BP	Methylene chloride	75-09-2	2.50E-04	163	1.13E-02	—	—	—	—		1.13E-02	Marginal	EF	AP-42: ESP
KILN4_BP	Methylnaphthalene	90-12-0	2.1E-6	163	9.51E-05	—	—	—	—		9.51E-05	Marginal	EF	AP-42: ESP
KILN4_BP	Naphthalene	91-20-3	8.50E-04	163	3.85E-02	4.72E-06	7.73E-06	100%	no		7.73E-06	Uncertain	ST	2016 Stage 2 Source Testing Program
KILN4_BP	Phenanthrene	85-01-8	2.00E-04	163	9.06E-03	3.17E-07	5.19E-07	100%	no		5.19E-07	Uncertain	ST	2016 Stage 2 Source Testing Program
KILN4_BP	Phenol	108-95-2	5.5E-5	163	2.49E-03	—	—	—	—		2.49E-03	Marginal	EF	AP-42: ESP
KILN4_BP	Pyrene	129-00-0	2.2E-6	163	9.96E-05	7.28E-08	1.19E-07	100%	no		1.19E-07	Uncertain	ST	2016 Stage 2 Source Testing Program
KILN4_BP	Styrene	100-42-5	7.5E-7	163	3.40E-05	9.54E-05	1.48E-04	-336%	yes		1.48E-04	Uncertain	ST	2021 Source Testing
KILN4_BP	Toluene	108-88-3	1.00E-04	163	4.53E-03	1.02E-04	1.58E-04	97%	no		1.58E-04	Uncertain	ST	2021 Source Testing
KILN4_BP	Xylenes	1330-20-7	6.5E-5	163	2.94E-03	2.86E-04	4.44E-04	85%	no		4.44E-04	Uncertain	ST	2021 Source Testing
KILN4_BP	PCBs	1336-36-3	—	163	—	8.82E-08	1.44E-07	—	—		1.44E-07	Uncertain	ST	2016 Stage 2 Source Testing Program

[1] US EPA AP-42 Chapter 11.6 Portland Cement Manufacturing (1/95)
[2] 2020 Source Testing, November 2020; 2021 Source Testing, November 2021 & 2016 Stage 2 Source Testing, January 2017
[3] Assumed 85% of SPM is PM10, estimated based off AP-42 Table 11.6-5

Source ID	4	Source Description	Kiln ByPass Stack SPM

Process Description	Kiln 4 ByPass Stack

Operating Scenario	Kiln operating at maximum capacity	Limitations	Kiln 4 bypass stack emission rates are based on the MECP default emission factor, as this emission rate is more conservative.

EMISSION CALCULATION

KILN 4 Bypass Stack

Methodology:	Ontario MECP Emission Factor
Source:	Procedure for Preparing an ESDM Report, March 2018 Source Testing 2020, November 2020

Source	Contaminant	CAS	Emission Factor [mg/m³]	Quality Rating	MOECC Quality Rating
Baghouse	SPM	-	20	-	Average
	PM10[1]	-	17	-	Average

1 Assuming PM10 represents 85% of SPM

Calculation Formula

Emission Rate = Emission Factor x Volumetric Flow Rate x 1/1000

Sample Calculation:

$$\text{Emission Rate} = \frac{20\ mg}{m^3} \times \frac{22.80\ Am^3}{s} \times \frac{1\ g}{1000\ mg} = \boxed{0.46\ \frac{g}{s}}$$

Source ID	Equipment ID/ Description	Volumetric Flow Rate [Am³/s]	EMISSION FACTOR SPM [mg/Am³]	MECP Emission Factor Quality	EMISSION RATES SPM [g/s]	PM10 [g/s]
4-5	Kiln 4 By-pass	22.80	20	Average	4.56E-01	3.88E-01
				TOTAL	**4.56E-01**	**3.88E-01**

Source ID	4	Source Description	Kiln Stacks

Process Description	There is one kiln (Kiln 4) operating at the facility which has its individual kiln and clinker cooler stacks.
Operating Scenario	Kiln 4 operating at maximum capacity

EMISSION CALCULATION

Methodology:	Source Testing
Source:	2021 Source Testing, November 2021

Source ID	Source Description	Maximum Hourly Production (tonne/hour)
4-2	Kiln 4 Stack	163

Source ID	Source Description	In-stack Concentration [ng/DRm^3]	In-stack Concentration [ng/WNm^3]	In-stack Concentration [ng/DNm^3@ 10% O2]	Dioxins and Furans Emission Rate [TEQ g/s]
4-2	Kiln 4 Stack	1.34E-02	1.32E-02	2.08E-02	1.81E-09
4-5	Kiln 4 Bypass Stack	6.97E-03	7.55E-03	1.69E-01	6.13E-11

Made By: LL
Checked By: JJZ

Source ID	4

Process Description	Selective non-catalytic reduction (SNCR) is used on the Kiln 4 stack to reduce nitrogen oxide emissions via injection of ammonia. Unreacted ammonia emitted from the Kiln as ammonia is known as "ammonia slip".

Operating Scenario	Kiln 4 operating at maximum capacity

EMISSION CALCULATION

Methodology:	Best Available Techniques (BAT) Reference Document for the Production of Cement, Lime and Magnesium Oxide Emission Factor
Source:	Best Available Techniques (BAT) Reference Document for the Production of Cement, Lime and Magnesium Oxide, 2013

Ammonia Slip Emission Factor	50	mg/Nm^3
Ammonia Slip Emission Factor	34.74	mg/Am^3

Calculation Formula

Emission Rate = Emission Factor x Volumetric Flow Rate x 1/1000

Sample Calculation:

$$\text{Emission Rate} = \frac{50\ mg}{Nm^3} \times \frac{207.00\ Am^3}{s} \times \frac{1\ g}{1000\ mg}$$

$$\text{Emission Rate} = \frac{10.35\ g}{s}$$

Source ID	Equipment ID/ Description	Volumetric Flow Rate [Am^3/s]	EMISSION FACTOR Ammonia [mg/Am^3]	EMISSION FACTOR MECP Emission Factor Quality	EMISSION RATE Ammonia [g/s]
4-2	Kiln 4 Stack	207.00	35	Uncertain	7.19E+00
				TOTAL	**7.19E+00**

WSP GOLDER

Made By: LL
Checked By: JJZ

Source ID	5	Source Description	Baghouse Stacks

Process Description The facility has numerous baghouses serving crushing equipment, mills and transfer points.

Operating Scenario	All baghouses are operating simultaneously at maximum capacity.	Limitations	US EPA AP-42 Chapter 11.6 Portland Cement Manufacturing emission factors are not available for every source type. Remaining baghouses used an emission factor of 20 mg/m^3 for the large dust collectors (>5 m^3/s) and 10 mg/m^3 for small dust collectors (<5 m^3/s), as per Table C-2 of the MOECC ESDM Procedure Document.

EMISSION CALCULATION

Methodology:	US EPA AP-42 Emission Factors (Chapter 11.6 - Portland Cement Manufacturing) Ontario MOECC Emission Factor
Source:	US EPA AP-42 Chapter 11.6 Portaland Cement Manufacturing (1/95) Procedure for Preparing an ESDM Report, PIBs # 3614e04, February 2017

Percent of Crystalline Silica in PM10 = 13.7%

Reference: AWMA - PM4 Crystalline Silica Emission Factors and Ambient Concentrations at Aggregate-Producing Sources in California (Richards et al, 2012)

Sample Calculation:

MOECC Method

SPM Emission Rate = Emission Factor x Volumetric Flow Rate x 1/1000

$$\text{SPM Emission Rate (SRCID14)} = 10\ \frac{mg}{m^3} \times 0.90\ \frac{Am^3}{s} \times \frac{1\ g}{1000\ mg} = \boxed{0.009\ \frac{g}{s}}$$

AP42 Method

SPM Emission Rate = Emission Factor x Maximum Throughput x Conversion

$$\text{SPM Emission Rate (SRCID3)} = 0.006\ \frac{kg}{Mg} \times 80.00\ \frac{Mg}{hour} \times \frac{1000\ g}{1\ kg} \times \frac{1\ g}{3600\ mg} \times \frac{hour}{seconds} = \boxed{1.38E-01\ \frac{g}{s}}$$

						AP-42 Chapter 11.6					MOECC			Modelled				
Source ID	Model ID	Equipment ID/ Description	Dust Collector / Passive Vent	Process	Volumetric Flow Rate [Am³/s]	Maximum Throughput [Mg/hr]	SPM Emission Factor (kg/Mg)	Unit	SPM Emission Rate [g/s]	MOECC Quality Rating	SPM Emission Factor (mg/Am^3)	SPM Emission Rate [g/s]	MOECC Quality Rating	Emission Estimate Source	SPM Modelled Emission Rate [g/s]	PM10 Emission Rate [g/s][1]	Crystalline Silica Emission Rate [g/s]	MOECC Quality Rating
5-1	SRCID3	#1 Mill Stack with Baghouse equipped with dust collector	Dust Collector	Raw Mill for Kiln 4	20.20	80.00	0.0062	kg/Mg	1.38E-01	Marginal	—	—	—	AP42: Raw mill with fabric filter	1.38E-01	1.17E-01	1.60E-02	Marginal
5-2	SRCID4	#2 Mill Stack equipped with dust collector	Dust Collector	Grinding Mill - Slag	18.70	80.00	0.0062	kg/Mg	1.38E-01	Marginal	—	—	—	AP42: Raw mill with fabric filter	1.38E-01	1.17E-01	1.60E-02	Marginal
5-3	SRCID5	#3 Mill Stack equipped with dust collector	Dust Collector	Cement Mill	20.20	45.00	0.0042	kg/Mg	5.25E-02	Marginal	—	—	—	AP42: Finish grinding mill with fabric filter	5.25E-02	4.46E-02	6.11E-03	Marginal
5-4	SRCID6	#4 Mill Stack equipped with dust collector	Dust Collector	Cement Mill	20.20	45.00	0.0042	kg/Mg	5.25E-02	Marginal	—	—	—	AP42: Finish grinding mill with fabric filter	5.25E-02	4.46E-02	6.11E-03	Marginal
5-5	SRCID7	#5 Mill Stack equipped with dust collector	Dust Collector	Cement Mill	30.80	55.00	0.0042	kg/Mg	6.42E-02	Marginal	—	—	—	AP42: Finish grinding mill with fabric filter	6.42E-02	5.45E-02	7.47E-03	Marginal
5-6	SRCID8	#6 & #7 Mill Stack equipped with dust collector	Dust Collector	Cement Mill	60.70	80.00	0.0042	kg/Mg	9.33E-02	Marginal	—	—	—	AP42: Finish grinding mill with fabric filter	9.33E-02	7.93E-02	1.09E-02	Marginal
5-7	SRCID11	Primary Crusher equipped with dust collector	Dust Collector	Primary Crusher	3.20	550.00	0.0005	kg/Mg	7.64E-02	Marginal	—	—	—	AP42: Primary limestone crushing with fabric filter	7.64E-02	6.49E-02	8.90E-03	Marginal
5-8	SRCID12	Hammermill equipped with dust collector	Dust Collector	Primary Crusher	4.30	350.00	0.0005	kg/Mg	4.86E-02	Marginal	—	—	—	AP42: Primary limestone crushing with fabric filter	4.86E-02	4.13E-02	5.66E-03	Marginal
5-9	SRCID13	Screen House equipped with dust collector	Dust Collector	Primary Screener	9.00	350.00	0.0001	kg/Mg	1.07E-02	Marginal	—	—	—	AP42: Primary limestone screening with fabric filter	1.07E-02	9.09E-03	1.25E-03	Marginal
5-10	SRCID14	Blend Silo 2 equipped with dust collector	Dust Collector	—	0.90	—	—	mg/m3	—	—	10	9.00E-03	Average	MOECC Small Baghouse	9.00E-03	7.65E-03	1.05E-03	Average
5-11	SRCID15	Blend Silo 3 equipped with dust collector	Dust Collector	—	6.60	—	—	mg/m3	—	—	20	1.32E-01	Average	MOECC Large Baghouse	1.32E-01	1.12E-01	1.54E-02	Average
5-12	SRCID16	Blend Silo 4(#3 Kiln Feed) equipped with dust collector	Dust Collector	—	4.50	—	—	mg/m3	—	—	10	4.50E-02	Average	MOECC Small Baghouse	4.50E-02	3.83E-02	5.24E-03	Average
5-13	SRCID17	Blend Silo 6 equipped with dust collector	Dust Collector	—	5.20	—	—	mg/m3	—	—	10	5.20E-02	Average	MOECC Small Baghouse	5.20E-02	4.42E-02	6.06E-03	Average
5-15	SRCID19	Packhouse Truck #1 equipped with dust collector	Dust Collector	—	0.42	—	—	mg/m3	—	—	10	4.20E-03	Average	MOECC Small Baghouse	4.20E-03	3.57E-03	4.89E-04	Average
5-16	SRCID20	Packhouse North Packer equipped with dust collector	Dust Collector	—	5.19	—	—	mg/m3	—	—	20	1.04E-01	Average	MOECC Large Baghouse	1.04E-01	8.82E-02	1.21E-02	Average
5-17	SRCID21	Packhouse South Packer equipped with dust collector	Dust Collector	—	2.90	—	—	mg/m3	—	—	10	2.90E-02	Average	MOECC Small Baghouse	2.90E-02	2.47E-02	3.38E-03	Average
5-18	SRCID22	Packhouse Masonary equipped with dust collector	Dust Collector	—	1.20	—	—	mg/m3	—	—	10	1.20E-02	Average	MOECC Small Baghouse	1.20E-02	1.02E-02	1.40E-03	Average
5-19	SRCID23	Silo #4 equipped with dust collector	Dust Collector	—	6.60	—	—	mg/m3	—	—	20	1.32E-01	Average	MOECC Large Baghouse	1.32E-01	1.12E-01	1.54E-02	Average
5-20	SRCID26	Dock Silo 1 equipped with dust collector	Dust Collector	—	4.50	—	—	mg/m3	—	—	10	4.50E-02	Average	MOECC Small Baghouse	4.50E-02	3.83E-02	5.24E-03	Average
5-21	SRCID27	Dock Silo 2 equipped with dust collector	Dust Collector	—	4.50	—	—	mg/m3	—	—	10	4.50E-02	Average	MOECC Small Baghouse	4.50E-02	3.83E-02	5.24E-03	Average
5-22	SRCID28	Dock Silo 3 equipped with dust collector	Dust Collector	—	4.50	—	—	mg/m3	—	—	10	4.50E-02	Average	MOECC Small Baghouse	4.50E-02	3.83E-02	5.24E-03	Average
5-23	SRCID29	Dock Silo 4 equipped with dust collector	Dust Collector	—	4.50	—	—	mg/m3	—	—	10	4.50E-02	Average	MOECC Small Baghouse	4.50E-02	3.83E-02	5.24E-03	Average
5-27	SRCID35	Clinker Ship Loading equipped with dust collector	Dust Collector	—	2.40	—	—	mg/m3	—	—	10	2.40E-02	Average	MOECC Small Baghouse	2.40E-02	2.04E-02	2.79E-03	Average
5-28	SRCID36	Brick Saw K-4 equipped with dust collector	Dust Collector	—	0.99	—	—	mg/m3	—	—	10	9.90E-03	Average	MOECC Small Baghouse	9.90E-03	8.42E-03	1.15E-03	Average
5-31	SRCID42	Coal Mill Dust Collector equipped with dust collector	Dust Collector	—	23.60	—	—	mg/m3	—	—	20	4.72E-01	Average	MOECC Large Baghouse	4.72E-01	4.01E-01	5.50E-02	Average
5-32	SRCID43	Indirect Firing - Coal Silo equipped with passive fabric filter	Passive Vent	—	1.40	—	—	mg/m3	—	—	10	1.40E-02	Average	MOECC Small Baghouse	1.40E-02	1.19E-02	1.63E-03	Average
5-33	SRCID44	Indirect Firing - Coke Silo equipped with passive fabric filter	Passive Vent	—	1.40	—	—	mg/m3	—	—	10	1.40E-02	Average	MOECC Small Baghouse	1.40E-02	1.19E-02	1.63E-03	Average
5-34	SRCID45	Ind. Firing - Weigh Feeder equipped with dust collector	Dust Collector	—	0.25	—	—	mg/m3	—	—	10	2.50E-03	Average	MOECC Small Baghouse	2.50E-03	2.13E-03	2.91E-04	Average
5-35	SRCID46	Ind. Firing - Weigh Feeder equipped with dust collector	Dust Collector	—	0.25	—	—	mg/m3	—	—	10	2.50E-03	Average	MOECC Small Baghouse	2.50E-03	2.13E-03	2.91E-04	Average
5-36	SRCID47	Coal Handling equipped with dust collector	Dust Collector	—	0.09	—	—	mg/m3	—	—	10	9.00E-04	Average	MOECC Small Baghouse	9.00E-04	7.65E-04	1.05E-04	Average
5-37	SRCID48	Coal Handling equipped with dust collector	Dust Collector	—	0.09	—	—	mg/m3	—	—	10	9.00E-04	Average	MOECC Small Baghouse	9.00E-04	7.65E-04	1.05E-04	Average
5-38	SRCID49	New Secondary Crusher equipped with dust collector	Dust Collector	Secondary Crusher	5.20	350.00	1.60E-04	kg/Mg	1.56E-02	Marginal	—	—	—	AP42: Secondary limestone screening and crushing with fabric filter	1.56E-02	1.32E-02	1.81E-03	Marginal
5-39	SRCID51	Expansion - Limestone Storage 105-1 equipped with dust collector	Dust Collector	—	3.00	—	—	mg/m3	—	—	10	3.00E-02	Average	MOECC Small Baghouse	3.00E-02	2.55E-02	3.49E-03	Average
5-40	SRCID55	Expansion - Bucket Elev. Dedust. 105-5 equipped with dust collector	Dust Collector	—	1.50	—	—	mg/m3	—	—	10	1.50E-02	Average	MOECC Small Baghouse	1.50E-02	1.28E-02	1.75E-03	Average
5-41	SRCID58	Blend Silo 5 equipped with dust collector	Dust Collector	—	2.50	—	—	mg/m3	—	—	10	2.50E-02	Average	MOECC Small Baghouse	2.50E-02	2.13E-02	2.91E-03	Average
5-42	SRCID61	Lime addition silo equipped with dust collector	Dust Collector	—	0.56	—	—	mg/m3	—	—	10	5.60E-03	Average	MOECC Small Baghouse	5.60E-03	4.76E-03	6.52E-04	Average
5-43	SRCID62	Pan conveyor equipped with dust collector	Dust Collector	—	3.30	—	—	mg/m3	—	—	10	3.30E-02	Average	MOECC Small Baghouse	3.30E-02	2.81E-02	3.84E-03	Average

Source ID	Model ID	Equipment ID/ Description	Dust Collector / Passive Vent	Process	Volumetric Flow Rate [Am^3/s]	Maximum Throughput [Mg/hr]	SPM Emission Factor (kg/Mg)	Unit	SPM Emission Rate [g/s]	MOECC Quality Rating	SPM Emission Factor (mg/Am^3)	SPM Emission Rate [g/s]	MOECC Quality Rating	Emission Estimate Source	SPM Modelled Emission Rate [g/s]	PM10 Emission Rate [g/s][1]	Crystalline Silica Emission Rate [g/s]	MOECC Quality Rating
5-44	SRCID63	Truck load dust collector 2 equipped with dust collector- South scale	Dust Collector	—	0.94	—	—	mg/m3	—	—	10	9.40E-03	Average	MOECC Small Baghouse	9.40E-03	7.99E-03	1.09E-03	Average
5-45	SRCID64	Truck load dust collector 4 equipped with dust collector - South scale	Dust Collector	—	0.94	—	—	mg/m3	—	—	10	9.40E-03	Average	MOECC Small Baghouse	9.40E-03	7.99E-03	1.09E-03	Average
5-46	SRCID65	Truck Load dust collector 3 equipped with dust collector - East	Dust Collector	—	1.30	—	—	mg/m3	—	—	10	1.30E-02	Average	MOECC Small Baghouse	1.30E-02	1.11E-02	1.51E-03	Average
5-47	SRCID66	Expansion - Hopper Feedoweights equipped with dust collector	Dust Collector	—	6.00	—	—	mg/m3	—	—	20	1.20E-01	Average	MOECC Large Baghouse	1.20E-01	1.02E-01	1.40E-02	Average
5-48	SRCID67	Slag dryer equipped with dust collector	Dust Collector	—	9.20	—	—	mg/m3	—	—	20	1.84E-01	Average	MOECC Large Baghouse	1.84E-01	1.56E-01	2.14E-02	Average
5-49	SRCID68	#10 Mill Stack equipped with dust collector	Dust Collector	Cement Mill	10.40	85.00	0.0042	kg/Mg	9.92E-02	Marginal	—	—	—	AP42: Finish grinding mill with fabric filter	9.92E-02	8.43E-02	1.15E-02	Marginal
5-50	SRCID69	Cement Dome dust collector	Dust Collector	—	6.1	—	—	mg/m3	—	—	20	1.23E-01	Average	MOECC Large Baghouse	1.23E-01	1.04E-01	1.43E-02	Average

[1] Assuming PM10 represents 85% of SPM

Source ID	6	Source Description	Clinker Transfers

Process Description: Transfer of ready clinker from the kiln through conveyor system to clinker storage

Operating Scenario: Clinker transferred at maximum operating capacity. **Limitations**: None

EMISSION CALCULATION

Production Rates:

Product drop into open conveyor C-11: 162.5 tonnes/hour

Conveyor S-9 (weathered clinker): 187.5 tonnes/hour

Open conveyor C-11 drop point (from K3): 45.83 tonnes/hour

Methodology:	US EPA AP-42 Emission Factor
Source:	US EPA AP-42 Section 11.19.2 - Crushed Stone Processing and Pulverized Mineral Processing (8/04)

Source	Contaminant	CAS	Uncontrolled Emission Factor: Emission Factor	US EPA Quality Rating	MOECC Quality Rating
Conveyor Drops	SPM	-	1.50E-03	E	Marginal

Percent of Crystalline Silica in PM10 = 13.7%

Reference: AWMA - PM4 Crystalline Silica Emission Factors and Ambient Concentrations at Aggregate-Producing Sources in California (Richards et al, 2012)

Particle Size Distribution

Particle Size [µm]	Cumulative
SPM	—
PM10	50%

Calculation Formula

Emission Rate = Emission Factor x Activity Rate x 1000 x 1/3600

Sample Calculation:

$$\text{Emission Rate} = 1.50\text{E-}03 \frac{kg}{tonne} \times 163 \frac{tonnes}{hr} \times 1000 \frac{g}{kg} \times \frac{1}{3600} \frac{hr}{seconds} \times (1-0.75) = 6.77\text{E-}03 \frac{g}{s}$$

Source ID	Equipment ID/ Description	Activity	Controlled	Control Method	Code	Maximum Capacity, [tonne/hr]	EMISSION FACTORS: SPM [kg/Mg][1]	Control Efficiency	EMISSION RATES: SPM [g/s]	Crystalline Silica [g/s]
6-1	Clinker Storage Hall Left (Src 60 & 62)	Transfer Point	Yes	Building Enclosure	12	9	1.50E-03	90%	3.82E-04	2.62E-05
6-2	Clinker Storage Hall Middle (Src 60 & 62)	Transfer Point	Yes	Building Enclosure	12	9	1.50E-03	90%	3.82E-04	2.62E-05
6-3	Clinker Storage Hall Right (Src 60 & 62)	Transfer Point	Yes	Building Enclosure	12	9	1.50E-03	90%	3.82E-04	2.62E-05
6-4	Clinker Storage Hall East Right (Src 60 & 62)	Transfer Point	Yes	Building Enclosure	12	9	1.50E-03	90%	3.819E-04	2.62E-05
6-5	Clinker Storage Hall East Left (Src 60 & 62)	Transfer Point	Yes	Building Enclosure	12	9	1.50E-03	90%	3.819E-04	2.62E-05
6-6	K3 Clinker Handling (Src 52) (Product drop into open conveyor C-11)	Transfer Point	Yes	Building Enclosure	12	163	1.50E-03	90%	6.771E-03	4.64E-04
6-7	Clinker Screening S-9 (Src 58) Clinker (Conveyor S-9 product drops)	Transfer Point	Yes	Building Enclosure	12	163	1.50E-03	90%	6.77E-03	4.64E-04
6-8	Clinker Screening S-9 (Src 58) Weathered Clinker (Conveyor S-9 product drops)	Transfer Point	Yes	Building Enclosure	12	188	1.50E-03	90%	7.81E-03	5.35E-04
6-9	Outside Clinker Storage	Transfer Point	No	—	—	163	1.50E-03	0%	6.77E-02	4.64E-03
								Total	**9.10E-02**	**6.23E-03**

[1] Emission factor represents Particulate Matter with diameter < 100 µm

Made By: LL
Checked By: JJZ

Source ID	NEG2	Source Description	Maintenance Welding

Process Description	The facility uses 1555 lb (705.34 kg) yearly of 7018 rod, in which there is an exhaust fan in the welding shop that accounts for ~70% of the welding, the rest is throughout the plant

Operating Scenario	70% within welding shop, rest throughout plant	Limitations	

EMISSION CALCULATION

Methodology:	Emission Factor
Source:	1) Emission factor was obtained from U.S. EPA AP-42 Section 12.19 2) Safety Data Sheet for Easyarc 7018 MR, created by Lincoln Electric (2017)

Emissions using MOECC EF

Welding Process	Elecrode Type	Annual Welding Rod Consumed [kg]*	Controls	Contaminant	CAS	Factor [g/kg]	Emissions [g/s]
SMAW	E7018	705.34	None	SPM	N/A	18.4	6.17E-04
				Chromium	7440-47-3	0.006	2.01E-07
				Hexavalent Chromium	N/A	ND	0.00E+00
				Cobalt	7440-48-4	0.001	3.35E-08
				Manganese	7439-96-5	1.03	3.46E-05
				Nickel	7440-02-0	0.002	6.71E-08
				Lead	7439-92-1	ND	ND

Emissions using EC from Safety Data Sheet provided from manufacturer

Welding Process	Elecrode Type	Annual Welding Rod Consumed [kg]*	Contaminant	CAS	% of SPM	Emissions [g/s]
SMAW	E7018	705.34	Iron	7439-89-6	100.00%	6.17E-04
			Limestone	1317-65-3	10.00%	6.17E-05
			Fluorides	16984-48-8	5.00%	3.09E-05
			Titanium Dioxide	13463-67-7	5.00%	3.09E-05
			Manganese	7439-96-5	5.00%	3.09E-05
			Sodium Silicate	1344-09-8	5.00%	3.09E-05
			Potassium Silicate	1312-76-1	5.00%	3.09E-05
			Feldspar	68476-25-5	1.00%	6.17E-06
			Silicon	7440-21-3	1.00%	6.17E-06
			Ferric Oxide	1309-37-1	1.00%	6.17E-06
			Carboxymethyl cellulous, sodium salt	9004-32-4	1.00%	6.17E-06
			Quartz	14808-60-7	1.00%	6.17E-06
			Hydroxyethyl cellulous	9004-62-0	1.00%	6.17E-06

*Note that the provided mass was given in lb (1550 lb), conversion was applied to obtain kg units
** For conservatism, the higher range of percent content was used

Made By: LL
Checked By: JJZ

Calculation Formula

Welding Usage Rate [kg/yr] x Emission Factor [g/kg] x Conversion [g/s] x (1-control)

Sample Calculation:

Emission Rate Chromium =	705.3356 *kg*	0.006 *g*	1 *year*	1 *day*	1 *hour*	1	2.01294E-07 *g*
	year	*kg*	365 *day*	16 hour	3600 *s*		*s*

Made By: LL
Checked By: JJZ

Source ID	NEG1	Source Description	Comfort Heating

Process Description	The facility has both oil and gas fired furnaces for the purpose of comfort heating		
Operating Scenario	Assume 24/7 operation of furnaces	Limitations	As per table B-3B Ontario Guideline 10 (ESDM), heating units can only be considered negligible if they have less than 10 MJ/h

EMISSION CALCULATION

Methodology	US EPA AP-42 Emission Factor
Source (natural gas):	[US EPA AP-42 Section 1.4 -Natural Gas Combustion (1998)]
Source (Fuel Oil):	[US EPA AP-42 Section 1.3 -Fuel Oil Combustion]

*Note it is being assumed that the fuel oil in use is No. 2 Field Oil (diesel)

				Uncontrolled Emission Factor			
Source	Contaminant	CAS	Controls	Emission Factor	Emission Factor Unit	US EPA Quality Rating	MOECC Quality Rating
Comfort Heating (Small, uncontrolled) Natural Gas	NOx	10102-44-0	None	104.00	(lb/10^6 scf)	B	Above average
Comfort Heating (Distillate Oil)	NOx	10102-44-0	None	20.00	(lb/10^3 gal)	A	Excellent

Calculation Formula

Emission Rate = Emission Factor x Heating Capacity x Usage x Conversion

Sample Calculation:

Emission Rate Unit 18 (natural gas)= $\frac{104.00 \ lb}{10^6 \ scf} \times \frac{3.50E-04 \ 10^6 \ scf}{h} \times \frac{24 \ h}{86400 \ s} \times \frac{453.59 \ g}{lb} = \boxed{\frac{4.59E-03 \ g}{s}}$

Emission Rate Unit 21 (oil)= $\frac{20.00 \ lb}{10^3 \ gal} \times \frac{1.48E-03 \ 10^3 \ gal}{h} \times \frac{24 \ h}{86400 \ s} \times \frac{453.59 \ g}{lb} = \boxed{\frac{3.73E-03 \ g}{s}}$

UNIT #	LOCATION	SAP EQUIP. #	Suggested description	Functional Location	UNIT (BRAND MODEL)	Serial #	Fuel Type	VOLTAGE	COOLING CAPACITY	HEATING CAPACITY (BTU)	Heating Capacity (MJ/H)	Heating Capacity (10^6 scf)*	Heating Capacity (10^3 gal)*	Emission Rate (g/s) NOx
UNIT 11	KILN 4 Pre Heater Bypass		A/C PHTWR BYPASS	U132-40-03810-01130	Comfort Air SMA18SA	NA		208/1/60	18000 CFM 410A, 1.5 Ton					
UNIT 18	Mobile Maintenance Shop		HEATER MOBILE MAINTENANCE SHOP 1	U132-40-03810-01130	Reznor UDAP350	BMB7943N088213X	Natural Gas	115V	NA	350,000	369.2695953	0.00035	0.0028	4.59E-03
UNIT 19	Mobile Maintenance Shop		HEATER MOBILE MAINTENANCE SHOP 2	U132-40-03810-01130	Reznor UDAP350	BMH79Y3N38990	Natural Gas	115V	NA	350,000	369.2695953	0.00035	0.0028	4.59E-03
UNIT 20	Mobile Maintenance Shop		HEATER MOBILE MAINTENANCE SHOP 3	U132-40-03810-01130	Reznor UDAP350	BMI79Y3N45767X	Natural Gas	115V	NA	350,000	369.2695953	0.00035	0.0028	4.59E-03
UNIT 21	Mobile Maintenance Shop		HEATER MOBILE MAINTENANCE SHOP 4	U132-40-03810-01130	Powrmatic Oil Fired Unit Heater - CH180	AR565321	Oil	115V	NA	185,000	195.1853575	0.00019	0.00148	3.73E-03
UNIT 22	Mobile Maintenance Shop		HEATER MOBILE MAINTENANCE SHOP 5	U132-40-03810-01130	Powrmatic Oil Fired Unit Heater - CH180	AR565322	Oil	115V	NA	184,000	194.1303015	0.00018	0.00147	3.71E-03
UNIT 23	Wash Bay		HEATER WASH BAY	U132-40-03810-01130	Internation Comfort - 2105E-2	D110500295		115V	NA	175,000	184.6347976	0.00018	0.0014	3.53E-03
UNIT 24	Oiler Shop		HEATER OILER SHOP 1	U132-40-03810-01130	International Comfort BMF125	239661		115V	NA	127,000	133.9921103	0.00013	0.00102	2.56E-03
UNIT 25	Oiler Shop		HEATER OILER SHOP 2	U132-40-03810-01130	Jackson & Church OL280-519	OL280-519		115V	NA	175,000	184.6347976	0.00018	0.0014	3.53E-03
UNIT 27	Maintenance Shop		HEATER MAINTENANCE SHOP	U132-40-03810-01130	Reflecto Ray 2700-24-17	16219		24VAC		120,000	126.6067184	0.00012	0.00096	2.42E-03
UNIT 29	Change Room	36642	HEATER CHANGEHOUSE (2535)	U132-40-03810-01130	Lincoln Barriere BOL169A	971227840	Oil	120		169000	178.3044617	0.00017	0.00135	3.41E-03
UNIT 33	Lab Furnace	36637	HEATER CHG/HSE FURNACE ROOM (472(	U132-40-03810-01130	Lincoln BOL-225A	9806 48829	Oil	115V		225,000	237.387597	0.00023	0.0018	4.54E-03
UNIT 34	Mobile Maintenance Shop		HEATER MOBILE MAINTENANCE SHOP 6	U132-40-03810-01130	Reznor UDAP350	BMI79Y3N4560Y	Natural Gas	115V		350,000	369.2695953	0.00035	0.0028	4.59E-03
UNIT 35	Store			U132-40-03810-01130	Modine PD 200AA0111	30011024797-6208	Natural Gas	120V		250000	263.7639966	0.00025	0.002	3.28E-03
													Total NOx emissions comfort heating:	4.91E-02
									Total (BTU)	3,010,000				

*Note that btu was converted to scf off the approximation that 1 scf (standard cubic foot) is 1000 BTU (British thermal units), and BTU was converted to gallon off the approximation that a gallon is 124884.4 BTU

APPENDIX C

Supporting Information for Assessment of Negligibility

Table C1
Screening for Negligibility Summary

Contaminant	CAS No.	Total Facility Emission Rate [g/s]	Averaging Period	MECP POI Limit [µg/m³]	Regulation Schedule	Source	Emission Threshold [g/s]	Negligibility Assessment
Acenaphthylene	208-96-8	2.67E-03	24-hour	0.1	—	De Minimus	4.348E-05	Not Negligible
Acetone	67-64-1	1.72E-02	24-hour	11880	Sch. 3	Standard	5.165E+00	Negligible
Aluminum	7429-90-5	5.89E-01	24-hour	12	Sch. 3	SL-JSL	5.217E-03	Not Negligible
Ammonia	7664-41-7	7.19E+00	24-hour	100	Sch. 3	Standard	4.348E-02	Not Negligible
Ammonium	14798-03-9	4.89E+00	24-hour	14.5	—	Previously Approved MAXGLC	6.304E-03	Not Negligible
Antimony	7440-36-0	1.21E-03	24-hour	25	Sch. 3	Standard	1.087E-02	Negligible
Arsenic	7440-38-2	3.84E-04	24-hour	0.3	Sch. 3	Guideline	1.304E-04	Not Negligible
Barium	7440-39-3	2.82E-02	24-hour	10	Sch. 3	Guideline	4.348E-03	Not Negligible
Benzaldehyde	100-52-7	1.09E-03	24-hour	2	Sch. 3	SL-JSL	8.696E-04	Not Negligible
Benzene	71-43-2	7.26E-02	Annual	0.45	Sch. 3	Standard	1.021E-03	Not Negligible
Benzene	71-43-2	7.26E-02	24-hour	100	Sch. 6	DAV	4.348E-02	—
Benzene	71-43-2	7.26E-02	Annual	4.5	—	AAV	1.021E-02	—
Benzo(a)anthracene	56-55-3	9.93E-07	24-hour	0.1	—	De Minimus	4.348E-05	Negligible
Benzo(a)pyrene	50-32-8	2.97E-06	Annual	0.00001	Sch. 3	Standard	2.268E-08	Not Negligible
Benzo(a)pyrene	50-32-8	2.97E-06	24-hour	0.005	Sch. 6	DAV	2.174E-06	—
Benzo(a)pyrene	50-32-8	2.97E-06	Annual	0.0001	—	AAV	2.268E-07	—
Benzo(b)fluoranthene	205-99-2	1.27E-05	24-hour	0.1	—	De Minimus	4.348E-05	Negligible
Benzo(g,h,i)perylene	191-24-2	1.84E-06	24-hour	0.1	—	De Minimus	4.348E-05	Negligible
Benzo(k)fluoranthene	207-08-9	3.51E-06	24-hour	0.1	—	De Minimus	4.348E-05	Negligible
Benzoic acid	65-85-0	1.63E-01	24-hour	700	Sch. 3	Guideline	3.043E-01	Negligible
Beryllium	7440-41-7	1.60E-05	24-hour	0.01	Sch. 3	Standard	4.348E-06	Not Negligible
Biphenyl	92-52-4	2.81E-04	1-hour	60	Sch. 3	Guideline	1.071E-02	Negligible
Bis(2-ethylhexyl)phthalate	117-81-7	4.35E-03	24-hour	50	Sch. 3	Standard	2.174E-02	Negligible
Bismuth	7440-69-9	4.56E-01	24-hour	2.5	Sch. 3	SL-JSL	1.087E-03	Not Negligible
Bromomethane	74-83-9	1.99E-03	24-hour	1350	Sch. 3	Guideline	5.870E-01	Negligible
C3 benzenes	N/A-10	1.18E-04	24-hour	0.1	—	De Minimus	4.348E-05	Not Negligible
C4 benzenes	N/A-11	2.72E-04	24-hour	0.1	—	De Minimus	4.348E-05	Not Negligible
C6 benzenes	N/A-12	4.17E-05	24-hour	0.1	—	De Minimus	4.348E-05	Negligible
Cadmium	7440-43-9	6.49E-04	24-hour	0.025	Sch. 3	Standard	1.087E-05	Not Negligible
Calcium Carbonate	1317-65-3	6.17E-05	24-hour	15	Sch. 3	SL-JSL	6.522E-03	Negligible
Calcium Oxide	1305-78-8	5.51E+00	24-hour	10	Sch. 3	Standard	4.348E-03	Not Negligible
Carbon Dioxide	124-38-9	8.15E+04	24-hour	255800	Sch. 3	SL-PA	1.112E+02	Not Negligible
Carbon disulfide	75-15-0	4.98E-03	24-hour	330	Sch. 3	Guideline	1.435E-01	Negligible
Carbon Monoxide	630-08-0	6.01E+01	1/2-hour	6000	Sch. 3	Standard	8.824E-01	Not Negligible
Carboxymethyl cellulous, sodium salt	9004-32-4	6.17E-06	24-hour	120	Sch. 3	SL-MD	5.217E-02	Negligible
Chloride	N/A-5	1.54E+01	24-hour	15.458	—	Previously Approved MAXGLC	6.721E-03	Not Negligible
Chlorobenzene	108-90-7	7.24E-04	1-hour	3500	Sch. 3	Guideline	6.250E-01	Negligible
Chlorobenzene	108-90-7	7.24E-04	10-minute	4500	Sch. 3	Guideline	4.866E-01	Negligible
Chloromethane	74-87-3	1.72E-02	24-hour	320	Sch. 3	Standard	1.391E-01	Negligible
Chromium	7440-47-3	1.28E-03	24-hour	0.5	Sch. 3	Standard	2.174E-04	Not Negligible
Chrysene	218-01-9	3.69E-06	24-hour	0.1	—	De Minimus	4.348E-05	Negligible
Cobalt	7440-48-4	1.33E-02	24-hour	0.1	Sch. 3	Guideline	4.348E-05	Not Negligible
Copper	7440-50-8	1.21E-01	24-hour	50	Sch. 3	Standard	2.174E-02	Not Negligible
Crystalline Silica	14808-60-7	1.91E+00	24-hour	5	Sch. 3	Guideline	2.174E-03	Not Negligible
Dibenz(a,h)anthracene	53-70-3	1.41E-05	24-hour	0.1	—	De Minimus	4.348E-05	Negligible
Di-n-butylphthalate	84-74-2	1.90E-03	24-hour	50	Sch. 3	Guideline	2.174E-02	Negligible
Dioxins and Furans (TEQ)	N/A-4	1.87E-09	24-hour	0.0000001	Sch. 3	Standard	4.348E-11	Not Negligible
Ethylbenzene	100-41-4	5.78E-04	24-hour	1000	Sch. 3	Standard	4.348E-01	Negligible
Ethylbenzene	100-41-4	5.78E-04	10-minute	1900	Sch. 3	Guideline	2.054E-01	Negligible
Feldspar	68476-25-5	6.17E-06	24-hour	2.5	Sch. 3	SL-JSL	1.087E-03	Negligible
Ferric Oxide	1309-37-1	6.17E-06	24-hour	25	Sch. 3	Standard	1.087E-02	Negligible
Fluoranthene	206-44-0	1.99E-04	24-hour	0.1	—	De Minimus	4.348E-05	Not Negligible
Fluorene	86-73-7	4.26E-04	24-hour	0.1	—	De Minimus	4.348E-05	Not Negligible
Fluorides	16984-48-8	3.09E-05	24-hour	0.1	—	De Minimus	4.348E-05	Negligible
Formaldehyde	50-00-0	2.08E-02	24-hour	65	Sch. 3	Standard	2.826E-02	Negligible
Freon 113	76-13-1	2.26E-03	24-hour	800000	Sch. 3	Standard	3.478E+02	Negligible
Hydrogen chloride	7647-01-0	1.04E+01	24-hour	20	Sch. 3	Standard	8.696E-03	Not Negligible
Hydrogen Fluoride	7664-39-3	2.28E-02	24-hour	1.72	Sch. 3	Standard	7.478E-04	Not Negligible
Hydrogen Fluoride	7664-39-3	2.28E-02	30-day	0.69	Sch. 3	Standard	7.775E-04	Not Negligible
Hydroxyethyl cellulous	9004-62-0	6.17E-06	24-hour	15	Sch. 3	SL-JSL	6.522E-03	Negligible
Indeno(1,2,3-cd)pyrene	193-39-5	1.97E-06	24-hour	0.1	—	De Minimus	4.348E-05	Negligible
Iron	7439-89-6	8.41E-01	24-hour	4	Sch. 3	Standard	1.739E-03	Not Negligible
Lead	7439-92-1	1.90E-02	24-hour	0.5	Sch. 3	Standard	2.174E-04	Not Negligible
Lead	7439-92-1	1.90E-02	30-day	0.2	Sch. 3	Standard	2.254E-04	Not Negligible
Manganese	7439-96-5	2.24E-02	24-hour	0.4	Sch. 3	Standard	1.739E-04	Not Negligible
Magnesium	7439-95-4	4.56E-01	24-hour	72	—	SL-MD	3.130E-02	Not Negligible
Mercury	7439-97-6	4.48E-02	24-hour	2	Sch. 3	Standard	8.696E-04	Not Negligible
Methyl ethyl ketone	78-93-3	8.27E-04	24-hour	1000	Sch. 3	Standard	4.348E-01	Negligible
Methylene chloride	75-09-2	2.26E-02	24-hour	220	Sch. 3	Standard	9.565E-02	Negligible
Methylnaphthalene	90-12-0	1.90E-04	24-hour	35.5	Sch. 3	SL-JSL	1.543E-02	Negligible
Naphthalene	91-20-3	4.99E-03	24-hour	22.5	Sch. 3	Guideline	9.783E-03	Negligible
Naphthalene	91-20-3	4.99E-03	10-minute	50	Sch. 3	Guideline	5.406E-03	Negligible
Nickel	7440-02-0	5.27E-03	Annual	0.04	Sch. 3	Standard	9.073E-05	Not Negligible
Nickel	7440-02-0	5.27E-03	24-hour	2	Sch. 6	DAV	8.696E-04	—
Nickel	7440-02-0	5.27E-03	Annual	0.4	—	AAV	9.073E-04	—
Nitrate	14797-55-8	2.08E-01	24-hour	0.238	—	Previously Approved MAXGLC	1.033E-04	Not Negligible
Nitrogen Oxides	10102-44-0	1.19E+02	24-hour	200	Sch. 3	Standard	8.696E-02	Not Negligible
Nitrogen Oxides	10102-44-0	1.19E+02	1-hour	400	Sch. 3	Standard	7.143E-02	Not Negligible
PCBs	1336-36-3	1.76E-04	24-hour	0.15	Sch. 3	Guideline	6.522E-05	Not Negligible
Phenanthrene	85-01-8	9.06E-03	24-hour	0.1	—	De Minimus	4.348E-05	Not Negligible
Phenol	108-95-2	4.98E-03	24-hour	30	Sch. 3	Standard	1.304E-02	Negligible
Phosphorus	7723-14-0	1.29E-01	24-hour	0.5	Sch. 3	SL-MD	2.174E-04	Not Negligible
Potassium	7440-09-7	8.15E-01	24-hour	1	Sch. 3	SL-JSL	4.348E-04	Not Negligible
Potassium Silicate	1312-76-1	3.09E-05	24-hour	5	Sch. 3	SL-MD	2.174E-03	Negligible
Pyrene	129-00-0	9.97E-05	24-hour	0.1	—	De Minimus	4.348E-05	Not Negligible
Selenium	7782-49-2	7.92E-03	24-hour	10	Sch. 3	Guideline	4.348E-03	Not Negligible
Silicon	7440-21-3	6.67E+00	24-hour	27	Sch. 3	SL-PA	1.174E-02	Not Negligible
Silver	7440-22-4	3.52E-05	24-hour	1	Sch. 3	Standard	4.348E-04	Negligible
Sodium	7440-23-5	1.36E+00	24-hour	2.067	—	Previously Approved MAXGLC	8.985E-04	Not Negligible
Sodium Silicate	1344-09-8	3.09E-05	24-hour	15	Sch. 3	SL-JSL	6.522E-03	Negligible
Styrene	100-42-5	1.82E-04	24-hour	400	Sch. 3	Standard	1.739E-01	Negligible
Sulfate	14808-79-8	4.69E+00	24-hour	4.737	—	Previously Approved MAXGLC	2.059E-03	Not Negligible
Sulfur trioxide	7446-11-9	2.23E+00	24-hour	5	Sch. 3	SL-JSL	2.174E-03	Not Negligible
Sulphur dioxide	7446-09-5	1.36E+01	24-hour	275	Sch. 3	Standard	1.196E-01	Not Negligible
Sulphur dioxide	7446-09-5	1.36E+01	1-hour	690	Sch. 3	Standard	1.232E-01	Not Negligible
SPM	N/A	2.01E+01	24-hour	120	Sch. 3	Standard	5.217E-02	Not Negligible
Thallium	7440-28-0	1.31E-04	24-hour	0.5	Sch. 3	SL-JSL	2.174E-04	Negligible
Tin	7440-31-5	1.29E-01	24-hour	10	Sch. 3	Standard	4.348E-03	Not Negligible
Titanium	7440-32-6	2.16E-02	24-hour	120	Sch. 3	Standard	5.217E-02	Negligible
Titanium Dioxide	13463-67-7	3.09E-05	24-hour	34	Sch. 3	Guideline	1.478E-02	Negligible
Toluene	108-88-3	4.69E-03	24-hour	2000	Sch. 3	Guideline	8.696E-01	Negligible
Tungsten	7440-33-7	4.56E-01	24-hour	5	—	SL-JSL	2.174E-03	Not Negligible
Vanadium	7440-62-2	1.77E-04	24-hour	2	Sch. 3	Standard	8.696E-04	Negligible
Xylenes	1330-20-7	3.39E-03	24-hour	730	Sch. 3	Standard	3.174E-01	Negligible
Xylenes	1330-20-7	3.39E-03	10-minute	3000	Sch. 3	Guideline	3.244E-01	Negligible
Zinc	7440-66-6	4.68E-01	24-hour	120	Sch. 3	Standard	5.217E-02	Not Negligible

Made by: LL
Checked by: JJZ

Geographic Area Type	Rural
Distance from Source (m)	200

Averaging Period	Dispersion Factor (µg/m³ per g/s)
1-hour	2,800
10-minute	4,624
1/2-hour	3,400
24-hour	1,150
Annual	220
30-day	444

Distance from Source (m)	Dispersion Factor (µg/m³ per g/s)	
	Urban	**Rural**
20	8,700	10,000
40	6,300	8,100
60	4,600	5,900
80	3,400	5,100
100	2,600	4,500
150	1,400	3,500
200	900	2,800
250	600	2,300
300	450	1,900
350	350	1,700
400	300	1,500
450	250	1,300
500	200	1,150
600	150	950
700	120	800
800	90	650
900	80	575
1000	70	500

ref: Table B-1 Procedure for Preparing an ESDM Report

Emission Threshold [g/s] =
0.5 × MECP POI Limit [µg/m³] / Dispersion Factor [µg/m³ per g/s]

Notes:
The Emission Threshold Calculation is in accordance with Section 7.1.2 of MECP's Procedure for Preparing an ESDM Report (March 2018).
The negligibility assessment compares the calculated emission rate with the emission threshold.

APPENDIX D

Supporting Information for Emission Rate Calculations

Supporting Information for Emission Rate Calculations

In addition to the published emission factors used to estimate the emission rates in ESDM Report v.2.0, the following sources were used to estimate the emissions. These documents will be provided to the Ministry with the ECA Amendment Application:

1. Essroc 2016 Stage 2 Source Testing Report, AMEC Foster Wheeler, January 2017
2. Lehigh 2020 Source Testing Report, Wood, December 2020.
3. Lehigh 2021 Source Testing Report, Wood, November 2021.
4. 7018 Welding Rod SDS

APPENDIX E

Supporting Information for Dispersion Source Parameters

Appendix E - Supporting Information for Dispersion Model Source Parameters

This appendix provides supporting information and sample calculations for the estimation of volume source parameters used in the AERMOD dispersion model.

Notes:
"NSSGA" = National Stone, Sand and Gravel Association "Modeling Fugitive Dust Sources" guidance document (2004)
"ADMGO" = Ministry of Environment and Climate Change "Air Dispersion Modelling Guideline for Ontario", Version 3.0 (February 2017)
"Picton TBR" = 2010 Technology Benchmark Report for Facility

Model ID	Source ID	Physical Description of Source	Release Height Above Grade [m]	Length of Side [m]	Volume Source Height [m]	Initial Lateral Dimension of Volume [m] (all single volume sources)	Initial Vertical Dimension of Volume [m]
VFUG4	1-1	Haul Truck dump into Primary Crusher	1.5	3.05	15.01	0.71	6.98
			Lehigh	Based off of width of truck	Height of Crusher	NSSGA, 5.3.7.6: lateral dimension equals average width/4.3	NSSGA, 5.3.7.6: vertical dimension equals height of source/2.15
VFUG4A	1-2	S-2 to Crushed Limestone Pile	13	1	13	0.23	0.47
			Lehigh	Based on width of conveyer	Picton TBR	NSSGA, 5.3.7.6: lateral dimension equals average width/4.3	2m drop to pile ADMGO, initial vertical dimension calculation for Elevated source not on or adjacent to a building. Vertical dimension = vertical source dimension/4.3
COALSHIP	3-1	LSC and coke unloading from ship	13	1	5	0.23	0.47
			Lehigh	Based on width of conveyer	Picton TBR	NSSGA, 5.3.7.6: lateral dimension equals average width/4.3	2m drop to pile ADMGO, initial vertical dimension calculation for Elevated source not on or adjacent to a building. Vertical dimension = vertical source dimension/4.3
COALTD	3-2	LSC and coke shore pile outloading (truck filling)	1.52	5	5	1.16	2.33
			Height of Truck	Truck Length	Picton TBR	NSSGA, 5.3.7.6: lateral dimension equals average width/4.3	NSSGA, 5.3.7.6: vertical dimension equals height of source/2.15
GYPSHIP	00-Jan	Anhydride and crude gypsum unloading from ship	13	1	5	0.23	0.47
			Lehigh	Based on width of conveyer	Picton TBR	NSSGA, 5.3.7.6: lateral dimension equals average width/4.3	2m drop to pile ADMGO, initial vertical dimension calculation for Elevated source not on or adjacent to a building. Vertical dimension = vertical source dimension/4.3
GYPSUMTD	3-4	Anhydride and crude gypsum shore pile outloading	1.52	5	5	1.16	2.33
			Height of Truck	Truck Length	Picton TBR	NSSGA, 5.3.7.6: lateral dimension equals average width/4.3	NSSGA, 5.3.7.6: vertical dimension equals height of source/2.15
MISCDROP	3-5	Silica, iron, and and alumina additive drop to pile and drop to storage hall	1.5	3.05	5	0.71	2.33
			Height of Truck	Based off of width of truck	Picton TBR	NSSGA, 5.3.7.6: lateral dimension equals average width/4.3	NSSGA, 5.3.7.6: vertical dimension equals height of source/2.15
CDK	3-6	CKD drop to pile and outloading to sales (truck filling)	1.5	5	5	1.16	2.33
			Height of Truck	Truck Length	Picton TBR	NSSGA, 5.3.7.6: lateral dimension equals average width/4.3	NSSGA, 5.3.7.6: vertical dimension equals height of source/2.15

Model ID	Source ID	Physical Description of Source	Release Height Above Grade [m]	Length of Side [m]	Volume Source Height [m]	Initial Lateral Dimension of Volume [m] (all single volume sources)	Initial Vertical Dimension of Volume [m]
VFUG5	3-7	Fuel drop into feed hopper	1.5	3.05	5	0.71	2.33
			Height of Truck	Based off of width of truck	Picton TBR	NSSGA, 5.3.7.6: lateral dimension equals average width/4.3	NSSGA, 5.3.7.6: vertical dimension equals height of source/2.15
CLINK1	6-1	Clinker Storage Hall Left (Src 60 & 62)	13.5	25	27	5.81	12.56
			Half of height of clinker storage hall	Width of Clinker Storage Hall	Height of Clinker Storage Hall	Lehigh	Lehigh
CLINK2	6-2	Clinker Storage Hall Middle (Src 60 & 62)	13.5	25	27	5.81	12.56
			Half of height of clinker storage hall	Width of Clinker Storage Hall	Height of Clinker Storage Hall	Lehigh	Lehigh
CLINK3	6-3	Clinker Storage Hall Right (Src 60 & 62)	13.5	25	27	5.81	12.56
			Half of height of clinker storage hall	Width of Clinker Storage Hall	Height of Clinker Storage Hall	Lehigh	Lehigh
VFUG11	6-4	Clinker Storage Hall East Right (Src 60 & 62)	13.5	25	27	5.81	12.56
			Half of height of clinker storage hall	Width of Clinker Storage Hall	Height of Clinker Storage Hall	Lehigh	Lehigh
VFUG12	6-5	Clinker Storage Hall East Left (Src 60 & 62)	13.5	25	27	5.81	12.56
			Half of height of clinker storage hall	Width of Clinker Storage Hall	Height of Clinker Storage Hall	Lehigh	Lehigh
VFUG6	6-6	K3 Clinker Handling (Src 52) (Product drop into open conveyor C-11)	7.5	16	15	3.72	6.98
			Lehigh	Lehigh	Lehigh	NSSGA, 5.3.7.6: lateral dimension equals average width/4.3	NSSGA, 5.3.7.6: vertical dimension equals height of source/2.15
VFUG8A	6-7	Clinker Screening S-9 (Src 58) Clinker (Conveyor S-9 product drops)	22	1.5	1.5	0.35	0.70
			Lehigh	Based on width of conveyer	Picton TBR	NSSGA, 5.3.7.6: lateral dimension equals average width/4.3	NSSGA, 5.3.7.6: vertical dimension equals height of source/2.15
VFUG8B	6-8	Clinker Screening S-9 (Src 58) Weathered Clinker (Conveyor S-9 product drops)	22	1.5	1.5	0.35	0.70
			Lehigh	Based on width of conveyer	Picton TBR	NSSGA, 5.3.7.6: lateral dimension equals average width/4.3	NSSGA, 5.3.7.6: vertical dimension equals height of source/2.15

Sample calculations (for VFUG8a)

Initial lateral dimension (m) = $\frac{\text{Average width of conveyer}}{4.3}$

Initial lateral dimension (m) = $\frac{1.5}{4.3}$ m

Initial lateral dimension (m) = 0.35 m

Initial vertical dimension (m) = $\frac{\text{vertical source dimension}}{2.15}$

Initial vertical dimension (m) = $\frac{1.5}{2.15}$ m

Initial vertical dimension (m) = 0.70 m

Appendix E.2 Contaminant Screening and Modelling Assessment

Contaminant	CAS#	Averaging Period	Emission Rates [g/s]			Modelling Run	Averaging Period	KILN4	KILN4_BP	Maximum POI Concentration [μg/m^3]
							1-hr	1.84786	12.52407	
							24-hr	0.3195	3.38137	
			KILN4	KILN4_BP	Total		Annual	0.03452	0.29122	
SPM	N/A-1	24	6.21E+00	4.56E-01	6.67E+00	SPM		—	—	—
Acenaphthylene	208-96-8	24	2.67E-03	7.19E-08	2.67E-03	Unit Run		0.001	0.000	8.54E-04
Aluminum	7429-90-5	24	2.94E-01	2.94E-01	5.89E-01	Unit Run		0.094	0.995	1.09E+00
Ammonium	N/A-6	24	2.45E+00	2.45E+00	4.89E+00	Unit Run		0.781	8.267	9.05E+00
Ammonia	7664-41-7	24	7.19E+00	1.57E-03	7.19E+00	Unit Run		2.297	0.005	2.30E+00
Arsenic	7440-38-2	24	2.94E-04	8.98E-05	3.84E-04	Unit Run		0.000	0.000	3.98E-04
Barium	7440-39-3	24	8.15E-03	2.01E-02	2.82E-02	Unit Run		0.003	0.068	7.06E-02
Beryllium	7440-41-7	24	1.49E-05	1.01E-06	1.60E-05	Unit Run		0.000	0.000	8.19E-06
Benzaldehyde	100-52-7	24	5.43E-04	5.43E-04	1.09E-03	Unit Run		0.000	0.002	2.01E-03
Benzene	71-43-2	24	7.24E-02	1.48E-04	7.26E-02	Unit Run		0.023	0.001	2.36E-02
Benzene	71-43-2	Annual	7.24E-02	1.48E-04	7.26E-02	Unit Run		0.003	0.000	2.54E-03
Benzene	71-43-2	Annual	7.24E-02	1.48E-04	7.26E-02	Unit Run		0.003	0.000	2.54E-03
Benzo(a)pyrene	50-32-8	24	2.94E-06	2.34E-08	2.97E-06	Unit Run		0.000	0.000	1.02E-06
Benzo(a)pyrene	50-32-8	Annual	2.94E-06	2.34E-08	2.97E-06	Unit Run		0.000	0.000	1.08E-07
Bismuth	7440-69-9	24	—	4.56E-01	4.56E-01	Unit Run		—	1.542	1.54E+00
C3 benzenes	N/A-10	24	5.89E-05	5.89E-05	1.18E-04	Unit Run		0.000	0.000	2.18E-04
C4 benzenes	N/A-11	24	1.36E-04	1.36E-04	2.72E-04	Unit Run		0.000	0.000	5.03E-04
Cadmium	7440-43-9	24	1.90E-04	4.58E-04	6.49E-04	Unit Run		0.000	0.002	1.61E-03
Calcium Oxide	1305-78-8	24	5.43E+00	7.67E-02	5.51E+00	Calcium Oxide		—	—	—
Carbon Dioxide	124-38-9	24	4.08E+04	4.08E+04	8.15E+04	Carbon Dioxide		—	—	—
Carbon Monoxide	630-08-0	½	2.22E+01	1.33E-01	2.23E+01	Carbon Monoxide		—	—	—
Chloride	N/A-5	24	1.54E+01	4.98E-02	1.54E+01	Unit Run		4.919	0.168	5.09E+00
Chromium	7440-47-3	24	1.77E-04	1.11E-03	1.28E-03	Unit Run		0.000	0.004	3.80E-03
Cobalt	7440-48-4	24	1.23E-02	9.40E-04	1.33E-02	Unit Run		0.004	0.003	7.12E-03
Copper	7440-50-8	24	1.18E-01	3.29E-03	1.21E-01	Unit Run		0.038	0.011	4.87E-02
Crystalline Silica	14808-60-7	24	7.24E-01	5.31E-02	7.77E-01	Crystalline Silica		—	—	—
Dioxins and Furans (TEQ)	N/A-4	24	1.81E-09	6.13E-11	1.87E-09	Dioxins and Furans (TEQ)		—	—	—
Fluoranthene	206-44-0	24	1.99E-04	1.35E-07	1.99E-04	Unit Run		0.000	0.000	6.41E-05
Fluorene	86-73-7	24	4.26E-04	2.80E-07	4.26E-04	Unit Run		0.000	0.000	1.37E-04
Hydrogen chloride	7647-01-0	24	1.02E+01	2.17E-01	1.04E+01	Hydrogen chloride		—	—	—
Hydrogen Fluoride	7664-39-3	24	2.04E-02	2.42E-03	2.28E-02	Unit Run		0.007	0.008	1.47E-02
Hydrogen Fluoride	7664-39-3	30-day	2.04E-02	2.42E-03	2.28E-02	Unit Run		0.003	0.003	5.73E-03
Iron	7439-89-6	24	3.85E-01	4.56E-01	8.41E-01	Iron		—	—	—
Lead	7439-92-1	24	1.63E-02	2.73E-03	1.90E-02	Unit Run		0.005	0.009	1.45E-02
Lead	7439-92-1	30-day	1.63E-02	2.73E-03	1.90E-02	Unit Run		0.002	0.004	5.64E-03
Magnesium	7439-95-4	24	—	4.56E-01	4.56E-01	Unit Run		—	1.542	1.54E+00
Manganese	7439-96-5	24	1.95E-02	2.90E-03	2.24E-02	Unit Run		0.006	0.010	1.60E-02
Mercury	7439-97-6	24	4.47E-02	1.03E-04	4.48E-02	Unit Run		0.014	0.000	1.46E-02
Nickel	7440-02-0	24	4.78E-03	4.92E-04	5.27E-03	Unit Run		0.002	0.002	3.19E-03
Nickel	7440-02-0	Annual	4.78E-03	4.92E-04	5.27E-03	Unit Run		0.000	0.000	3.08E-04
Nickel	7440-02-0	Annual	4.78E-03	4.92E-04	5.27E-03	Unit Run		0.000	0.000	3.08E-04
Nitrate	14797-55-8	24	1.04E-01	1.04E-01	2.08E-01	Unit Run		0.033	0.352	3.85E-01
Nitrogen Oxides	10102-44-0	24	1.09E+02	1.48E+00	1.10E+02	Nitrogen Oxides		—	—	—
Nitrogen Oxides	10102-44-0	1	1.09E+02	1.48E+00	1.10E+02	Nitrogen Oxides		—	—	—
PCBs	1336-36-3	24	1.76E-04	1.44E-07	1.76E-04	Unit Run		0.000	0.000	5.68E-05
Phenanthrene	85-01-8	24	9.06E-03	5.19E-07	9.06E-03	Unit Run		0.003	0.000	2.90E-03
Phosphorus	7723-14-0	24	1.20E-01	8.92E-03	1.29E-01	Unit Run		0.038	0.030	6.86E-02
Potassium	7440-09-7	24	4.08E-01	4.08E-01	8.15E-01	Unit Run		0.130	1.378	1.51E+00
Pyrene	129-00-0	24	9.96E-05	1.19E-07	9.97E-05	Unit Run		0.000	0.000	3.22E-05
Selenium	7782-49-2	24	3.40E-03	4.53E-03	7.92E-03	Unit Run		0.001	0.015	1.64E-02
Silicon	7440-21-3	24	6.21E+00	4.56E-01	6.67E+00	Unit Run		1.985	1.542	3.53E+00
Sodium	7440-23-5	24	9.06E-01	4.56E-01	1.36E+00	Unit Run		0.289	1.542	1.83E+00
Sulfate	14808-79-8	24	4.53E+00	1.63E-01	4.69E+00	Unit Run		1.447	0.551	2.00E+00
Sulphur dioxide	7446-09-5	24	1.22E+01	2.47E-01	1.25E+01	Sulphur dioxide		—	—	—
Sulphur dioxide	7446-09-5	1	1.22E+01	2.47E-01	1.25E+01	Sulphur dioxide		—	—	—
Sulfur trioxide	7446-11-9	24	1.90E+00	3.31E-01	2.23E+00	Sulfur trioxide		—	—	—
Tin	7440-31-5	24	1.23E-01	6.23E-03	1.29E-01	Unit Run		0.039	0.021	6.03E-02
Tungsten	7440-33-7	24	—	4.56E-01	4.56E-01	Unit Run		—	1.542	1.54E+00
Zinc	7440-66-6	24	1.22E-02	4.56E-01	4.68E-01	Unit Run		0.004	1.542	1.55E+00

Sample Calculation

Acenaphthylene POI Concentration=	KILN4 ER [g/s]	x	KILN4 DF [μg/m^3 per g/s])	+	KILN4BP ER [g/s]	x	KILN4BP DF [μg/m^3 per g/s])
Acenaphthylene POI Concentration=	2.67E-03	x	0.31949	+	7.19E-08	x	4.77321
Acenaphthylene POI Concentration=	8.53E-04	ug/m3					

APPENDIX F

Dispersion Modelling Files (provided as electronic zipped files)

APPENDIX G

Transitional Operating Conditions

Transitional operating conditions – Summary

The following appendix includes the following documents:

1. **18107307 Lehigh Picton ESDM Mar2019 - Appendix G - TOC Assessment:** This document was prepared as the first transitional operating conditions assessment and describes how the scenario is assessed.
2. **2019 CEMS Emissions Rates:** An update of the assessment based on the 2019 CEMS data was completed. NOx and SO_2 were updated and the maximum emissions from 2019 were carried forward to Table 2b and Table 5b for ESDM v.1.2.
3. **2020 CEMS Emissions Rates:** An update of the assessment based on the 2020 CEMS data was completed. NOx and SO_2 were updated and the maximum emissions from 2020 were carried forward to Table 2b and Table 5b for ESDM v.1.3.
4. **2021 CEMS Emissions Rates:** An update of the assessment based on the 2021 CEMS data was completed. CO, NOx and SO_2 were updated and the maximum emissions from 2021 were carried forward to Table 2b and Table 5b for ESDM v.1.4 and v2.0.

GOLDER

TECHNICAL MEMORANDUM

DATE April 2, 2019 **Project No.** 18107307 (3000)

TO Mr. Nick Papanicolaou, Lehigh Hanson Materials Limited

CC Ms. Camille Taylor

FROM Mr. Jamie McEvoy **EMAIL** jmcevoy@golder.com

APPENDIX G TO THE EMISSION SUMMARY AND DISPERSION MODELLING REPORT–: TRANSITIONAL OPERATING CONDITIONS ASSESSMENT

To assess compliance with section 10 of Ontario Regulation 419/05 which came into effect April 1, 2018, the following appendix has been prepared to complete the Emission Summary and Dispersion Modelling (ESDM) Report for Lehigh Hanson Materials Limited (Lehigh).

The assessment of the transitional operating conditions (TOC) is based on the Kiln 4 and Kiln4_BP Continuous Emission Monitoring System (CEMS) data that was provided by Lehigh on 14 Dec 2018. TOC is defined as follows (https://ero.ontario.ca/notice/013-0903):

Transitional operating conditions (TOC)

TOC is an operating scenario that would result in the highest concentration of a contaminant at a point of impingement that results from a facility's emission to air. With this regulatory change, Lehigh is required to assess emissions of all contaminants during normal operations (including operating at maximum design capacity), start-up operating conditions, and shutdown operating conditions.

This TOC assessment was limited to the emissions monitored by the CEMS on Kiln 4 and Kiln4_BP:

- nitrogen oxides (NOx);
- sulphur dioxide (SO_2);
- carbon monoxide (CO);
- suspended particulate matter (SPM), measured as opacity.

At this time, there is no data to assess TOC from Kiln 3. The emissions from Kiln 3 were estimated using the AP-42 Chapter 11.6 emission factors. The use of the AP-42 emission factors for the emissions estimates in the Environmental Compliance Approval (ECA) amendment application, was completed at the request of the Ontario Ministry of the Environment, Conservation and Parks (Ministry) during the review of the ECA amendment application. It should be noted that in general the CEMS data presented in this TOC assessment has higher emissions rates than the ones calculated using the AP-42 emission factors.

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The estimated maximum TOC emissions are presented in Table G1 and the results of modeling the TOC emissions using the latest Lehigh Facility AERMOD models in Table G2. The contaminants assessed remain below the current point of impingement (POI) limits (ACB list, April 2018). The 1-hour SO_2 POI is 73% of the 1-hour limit of 690 ug/m3 during TOC, compared to 59% during normal operations. As a reminder, the concentration results are highly influenced by Kiln 3, which has much poorer dispersion than Kiln 4. Based on the CEMS data provided for this assessment, the Facility can demonstrate compliance with s.10 O. Reg. 419/05.

JDM/CST/lc

https://golderassociates.sharepoint.com/sites/31534g/technical work/p3000 - toc assessment/18107307 lehigh picton esdm mar2019 - appendix g - toc assessment.docx

Attachments: G1 – Source Summary Table – TOC
G2 – Emission Summary Table - TOC
G3 - CEMS data (provided by Lehigh)

Table G1
Source Summary Table - TOC

Source ID	Model Source ID	Lehigh ID	Source Description	Source Parameters								Emission Data						
				Stack Volumetric Flow Rate [Am³/s]	Stack Velocity [m/s]	Stack Exit Gas Temperature [°C]	Stack Inner Diameter [m]	Stack Height Above Grade [m]	Stack Height Above Roof [m]	Source Location [X Coordinate]	Source Location [Y Coordinate]	Contaminant	CAS No.	Averaging Period [hours]	Maximum Emission Rate [g/s]	Emission Estimating Technique	Emissions Data Quality	Percentage of Overall Emissions [%]
Kilns																		
4-1	KILN3	1	Kiln 3 Stack with baghouse	79	17	200	2.4	35.0	N/A	329949	4880085	SPM	N/A-1	24	1.28E+00	EF	Marginal	5%
4-1												Carbon Monoxide	630-08-0	½	1.41E+00	EF	Marginal	1%
4-1												Nitrogen Oxides	10102-44-0	1, 24	3.83E+01	EF	Marginal	24%
4-1												Sulphur dioxide	7446-09-5	1, 24	6.26E+01	EF	Marginal	18%
4-2	KILN4	9	Kiln 4 Stack with ESPs + Emissions from 2 Loshi Mills (raw mill) directed to the ESP	207	15	120	4.2	70.8	N/A	330054	4879945	SPM	N/A-1	24	1.08E+01	EF	Uncertain	43%
4-2												Carbon Monoxide	630-08-0	½	9.36E+01	ST	Highest	69%
4-2												Nitrogen Oxides	10102-44-0	1, 24	1.02E+02	ST	Highest	65%
4-2												Sulphur dioxide	7446-09-5	1, 24	2.79E+02	ST	Highest	79%
4-5	KILN4_BP	40	Kiln 4 Bypass Stack with baghouse	23	13	120	1.5	83.2	N/A	330099	4880073	SPM	N/A-1	24	4.56E-01	EF	Uncertain	2%
4-5												Carbon Monoxide	630-08-0	½	3.24E+00	ST	Highest	2%
4-5												Nitrogen Oxides	10102-44-0	1, 24	7.37E+00	ST	Highest	5%
4-5												Sulphur dioxide	7446-09-5	1, 24	1.16E+01	ST	Highest	3%

Notes: "EF" = Emission Factor, "ST" = Source Testing, "EC" = Engineering Calculation

The TOC assessment was limited to nitrogen oxides, carbon monoxide, sulphur dioxide and suspended particulate matter from Kiln 3, Kiln 4 and Kiln 4_BP. All other sources which shared these compounds were considered in the dispersion modelling.

Table G2
Emission Summary Table - TOC

Contaminant	CAS No.	Total Facility Emission Rate [g/s]	Air Dispersion Model Used	Maximum POI Concentration [µg/m³]	Averaging Period [hours]	MECP POI Limit [µg/m³]	Limiting Effect	Sch. 2 or Sch. 3	Source	Benchmark	% of POI Limit	Notes	Model Run Name	Version Date of ACB List
SPM	N/A-1	2.54E+01	AERMOD (v. 16216R)	4.26E+01	24	120	Visibility	Sch. 3	Standard	B1	35%		SPM-TOC	Apr-18
Carbon Monoxide	630-08-0	1.36E+02	AERMOD (v. 16216R)	1.55E+02	½	6000	Health		Standard	B1	3%	Note 9	Carbon Monoxide-TOC	Apr-18
Nitrogen Oxides	10102-44-0	1.57E+02	AERMOD (v. 16216R)	1.14E+02	24	200	Health	Sch. 3	Standard	B1	57%	Notes 2, 17	Nitrogen Oxides-TOC	Apr-18
Nitrogen Oxides	10102-44-0	1.57E+02	AERMOD (v. 16216R)	2.87E+02	1	400	Health	Sch. 3	Standard	B1	72%	Notes 2, 17	Nitrogen Oxides-TOC	Apr-18
Sulphur dioxide	7446-09-5	3.54E+02	AERMOD (v. 16216R)	1.85E+02	24	275	Health & Vegetation	Sch. 3	Standard	B1	67%	Effective until July 1, 2023 Note 2 URT - Note 4, Table 4	Sulphur dioxide -TOC	Apr-18
Sulphur dioxide	7446-09-5	3.54E+02	AERMOD (v. 16216R)	5.06E+02	1	690	Health & Vegetation	Sch. 3	Standard	B1	73%	Effective until July 1, 2023 Note 2 URT - Note 4, Table 4	Sulphur dioxide -TOC	Apr-18

Table G3 CEMS Summary

Date/Time	Max Stack NOX Events (kg/h)	Actual Flow (m³/hr)		Closest Kiln Stop	Closest Kiln Start
10-Mar-18 12:00:00	332.955658	712211.0625	197.8364063	Date: 09-Mar-18 00:00:00; Code Description: Other - Undefined	Date: 09-Mar-18 20:15:00; Code Description: Other - Undefined
26-Apr-18 20:00:00	368.9007263	700769.0625	194.6580729	Date: 10-Apr-18 05:03:00; Code Description: Other-Emission limits	Date: 10-Apr-18 18:33:00; Code Description: Other-Emission limits
26-Apr-18 21:00:00	334.0006409	697882.875	193.8563542	Date: 10-Apr-18 05:03:00; Code Description: Other-Emission limits	Date: 10-Apr-18 18:33:00; Code Description: Other-Emission limits
25-Aug-18 12:00:00	350.8858032	719131.4375	199.7587326	Date: 16-Aug-18 16:06:00; Code Description: Other-Power cut/drop-power contract	Date: 16-Aug-18 20:42:00; Code Description: Other-Power cut/drop-power contract
14-Nov-18 21:00:00	338.0745544	666089.875	185.0249653	Date: 06-Nov-18 02:34:00; Code Description: Preheater-Kiln feed-scale	Date: 06-Nov-18 07:21:00; Code Description: Preheater-Kiln feed-scale
	368.9007263	**666089.875**			

4-2Nitrogen Oxides 102.472424 g/s

Date/Time	Max Stack SO2 Events (kg/h)	Actual Flow (m³/hr)		Closest Kiln Stop	Closest Kiln Start
05-Apr-18 15:00:00	988.7095947	671102.1875		Date: 04-Apr-18 15:25:00; Code Description: Power loss-Power supply	Date: 04-Apr-18 18:59:00; Code Description: Power loss-Power supply
05-Apr-18 16:00:00	1003.973206	689662.4375		Date: 04-Apr-18 15:25:00; Code Description: Power loss-Power supply	Date: 04-Apr-18 18:59:00; Code Description: Power loss-Power supply
10-Jul-18 16:00:00	992.0921631	662965.5625		Date: 09-Jul-18 15:21:00; Code Description: Other-Power cut/drop-power contract	Date: 10-Jul-18 00:55:00; Code Description: Other-Power cut/drop-power contract
10-Jul-18 17:00:00	923.4864502	630205.6875		Date: 09-Jul-18 15:21:00; Code Description: Other-Power cut/drop-power contract	Date: 10-Jul-18 00:55:00; Code Description: Other-Power cut/drop-power contract
24-Aug-18 19:00:00	934.8551636	715109.5625		Date: 16-Aug-18 16:06:00; Code Description: Other-Power cut/drop-power contract	Date: 16-Aug-18 20:42:00; Code Description: Other-Power cut/drop-power contract
	1003.973206	**630205.6875**			

4-2Sulphur dioxide 278.881446 g/s

Date/ Time	Max CO Mass Rate (kg/h)	Actual Flow (m³/hr)		Closest Kiln Stop	Closest Kiln Start
21-Aug-18 03:00:00	336.0105028	705190.0625		Date: 16-Aug-18 16:06:00; Code Description: Other-Power cut/drop-power contract	Date: 16-Aug-18 20:42:00; Code Description: Other-Power cut/drop-power contract
14-Nov-18 05:00:00	322.9268488	640775.6875		Date: 06-Nov-18 02:34:00; Code Description: Preheater-Kiln feed-scale	Date: 06-Nov-18 07:21:00; Code Description: Preheater-Kiln feed-scale
14-Nov-18 07:00:00	334.6647388	662769.9375		Date: 06-Nov-18 02:34:00; Code Description: Preheater-Kiln feed-scale	Date: 06-Nov-18 07:21:00; Code Description: Preheater-Kiln feed-scale
14-Nov-18 18:00:00	323.3306882	671847.75		Date: 06-Nov-18 02:34:00; Code Description: Preheater-Kiln feed-scale	Date: 06-Nov-18 07:21:00; Code Description: Preheater-Kiln feed-scale
14-Nov-18 19:00:00	336.9766184	669671.375		Date: 06-Nov-18 02:34:00; Code Description: Preheater-Kiln feed-scale	Date: 06-Nov-18 07:21:00; Code Description: Preheater-Kiln feed-scale
	336.9766184	**640775.6875**			

4-2Carbon Monoxide 93.60461621 g/s

Date/Time	Max Stack PM Mass Rate Even	Actual Flow (m³/hr)		Closest Kiln Stop	Closest Kiln Start
02-May-18 00:00:00	34.64384244	643722.3125		Date: 10-Apr-18 05:03:00; Code Description: Other-Emission limits	Date: 10-Apr-18 18:33:00; Code Description: Other-Emission limits
25-Jul-18 11:00:00	35.25621664	739146		Date: 24-Jul-18 14:48:00; Code Description: Other-Power cut/drop-power contract	Date: 24-Jul-18 23:53:00; Code Description: Other-Power cut/drop-power contract
03-Aug-18 10:00:00	35.09828218	600563.375		Date: 24-Jul-18 14:48:00; Code Description: Other-Power cut/drop-power contract	Date: 24-Jul-18 23:53:00; Code Description: Other-Power cut/drop-power contract
03-Aug-18 11:00:00	31.73689	729284.625		Date: 24-Jul-18 14:48:00; Code Description: Other-Power cut/drop-power contract	Date: 24-Jul-18 23:53:00; Code Description: Other-Power cut/drop-power contract
21-Sep-18 19:00:00	38.90607519	618270.75		Date: 21-Sep-18 17:29:00; Code Description: Power loss-Power supply	Date: 21-Sep-18 18:45:00; Code Description: Power loss-Power supply
	38.90607519	**600563.375**			

4-2SPM 10.80724311 g/s

Date/Time	Max Bypass NOX Events (kg/h)	Actual Flow (m³/hr)		Closest Kiln Stop	Closest Kiln Start
14-Apr-18 16:00:00	26.52	79039.1		Date: 10-Apr-18 05:03:00; Code Description: Other-Emission limits	Date: 10-Apr-18 18:33:00; Code Description: Other-Emission limits
16-Apr-18 11:00:00	25.29	72841.97		Date: 10-Apr-18 05:03:00; Code Description: Other-Emission limits	Date: 10-Apr-18 18:33:00; Code Description: Other-Emission limits
14-Apr-18 18:00:00	24.66	74756.09		Date: 10-Apr-18 05:03:00; Code Description: Other-Emission limits	Date: 10-Apr-18 18:33:00; Code Description: Other-Emission limits
05-Nov-18 13:00:00	23.48	84589.41		Date: 30-Oct-18 00:00:00; Code Description: Gas cleaning-Mechanical	Date: 30-Oct-18 01:32:00; Code Description: Gas cleaning-Mechanical
14-Apr-18 17:00:00	23.1	75896.23		Date: 10-Apr-18 05:03:00; Code Description: Other-Emission limits	Date: 10-Apr-18 18:33:00; Code Description: Other-Emission limits
	26.52	**72841.97**			

4-5Nitrogen Oxides 7.366666667 g/s

Date/Time	Max Bypass SO2 Events (kg/h)	Actual Flow (m³/hr)		Closest Kiln Stop	Closest Kiln Start
02-Apr-18 07:00:00	41.61	61534.99		Date: 22-Mar-18 07:18:00; Code Description: Other-Emission limits	Date: 22-Mar-18 18:19:00; Code Description: Other-Emission limits
03-Apr-18 23:00:00	34.48	59279.5		Date: 22-Mar-18 07:18:00; Code Description: Other-Emission limits	Date: 22-Mar-18 18:19:00; Code Description: Other-Emission limits
31-Mar-18 20:00:00	29.58	47247.41		Date: 22-Mar-18 07:18:00; Code Description: Other-Emission limits	Date: 22-Mar-18 18:19:00; Code Description: Other-Emission limits
31-Mar-18 21:00:00	29.35	47992.76		Date: 22-Mar-18 07:18:00; Code Description: Other-Emission limits	Date: 22-Mar-18 18:19:00; Code Description: Other-Emission limits
31-Mar-18 23:00:00	28.59	45764.47		Date: 22-Mar-18 07:18:00; Code Description: Other-Emission limits	Date: 22-Mar-18 18:19:00; Code Description: Other-Emission limits
	41.61	**45764.47**			

4-5Sulphur dioxide 11.55833333 g/s

Date/Time	Max Bypass CO Events (kg/h)	Actual Flow (m³/hr)		Closest Kiln Stop	Closest Kiln Start
20-Sep-18 12:00:00	11.66083013	69168.52		Date: 18-Sep-18 15:27:00; Code Description: Power loss-Power supply	Date: 18-Sep-18 19:28:00; Code Description: Power loss-Power supply
20-Sep-18 09:00:00	10.72202798	68037.17		Date: 18-Sep-18 15:27:00; Code Description: Power loss-Power supply	Date: 18-Sep-18 19:28:00; Code Description: Power loss-Power supply
20-Sep-18 10:00:00	10.69613765	68603.45		Date: 18-Sep-18 15:27:00; Code Description: Power loss-Power supply	Date: 18-Sep-18 19:28:00; Code Description: Power loss-Power supply
20-Sep-18 11:00:00	10.58180951	67729.13		Date: 18-Sep-18 15:27:00; Code Description: Power loss-Power supply	Date: 18-Sep-18 19:28:00; Code Description: Power loss-Power supply
19-Jul-18 07:00:00	9.656250094	69341.48		Date: 18-Jul-18 05:35:00; Code Description: Other-Emission limits	Date: 19-Jul-18 00:12:00; Code Description: Other-Emission limits
	11.66083013	**67729.13**			

4-5Carbon Monoxide 3.23911948 g/s

LM8 Closest Stop	LM8 Closest Start	LM9 Closest Stop	LM9 Closest Start
Date: 10-Mar-18 10:58:00; Code Description: Separator-Mechanical	Date: 10-Mar-18 03:10:00; Code Description: Planned outage-Annual Overhaul	Date: 10-Mar-18 00:00:00; Code Description: Planned outage-Annual Overhaul	Date: 10-Mar-18 01:39:00; Code Description: Planned outage-Annual Overhaul
Date: 26-Apr-18 15:46:00; Code Description: Other - Process	Date: 26-Apr-18 15:54:00; Code Description: Other - Process	Date: 26-Apr-18 12:34:00; Code Description: Other - Process	Date: 26-Apr-18 12:39:00; Code Description: Other - Process
Date: 26-Apr-18 15:46:00; Code Description: Other - Process	Date: 26-Apr-18 15:54:00; Code Description: Other - Process	Date: 26-Apr-18 12:34:00; Code Description: Other - Process	Date: 26-Apr-18 12:39:00; Code Description: Other - Process
Date: 25-Aug-18 11:32:00; Code Description: Conveying-Air Slide	Date: 23-Aug-18 01:22:00; Code Description: Feed System-Other	Date: 24-Aug-18 23:03:00; Code Description: Other - Mechanical	Date: 24-Aug-18 23:06:00; Code Description: Other - Mechanical
Date: 14-Nov-18 07:36:00; Code Description: Other - Process	Date: 14-Nov-18 07:39:00; Code Description: Other - Process	Date: 14-Nov-18 13:15:00; Code Description: Other - Process	Date: 14-Nov-18 13:20:00; Code Description: Other - Process

LM8 Closest Stop	LM8 Closest Start	LM9 Closest Stop	LM9 Closest Start
Date: 04-Apr-18 21:11:00; Code Description: Other - Process	Date: 04-Apr-18 21:14:00; Code Description: Other - Process	Date: 04-Apr-18 15:25:00; Code Description: Power loss-Thunder storm	Date: 04-Apr-18 21:12:00; Code Description: Power loss-Thunder storm
Date: 05-Apr-18 15:15:00; Code Description: Planned outage/Maintenance outage	Date: 04-Apr-18 21:14:00; Code Description: Other - Process	Date: 05-Apr-18 15:15:00; Code Description: Planned outage/Maintenance outage	Date: 04-Apr-18 21:12:00; Code Description: Power loss-Thunder storm
Date: 10-Jul-18 15:40:00; Code Description: Power Savings - on peak hours only	Date: 10-Jul-18 13:28:00; Code Description: Other - Process	Date: 10-Jul-18 15:40:00; Code Description: Power Savings - on peak hours only	Date: 10-Jul-18 15:40:00; Code Description: Mill-Mechanical
Date: 10-Jul-18 15:40:00; Code Description: Power Savings - on peak hours only	Date: 10-Jul-18 13:28:00; Code Description: Other - Process	Date: 10-Jul-18 15:40:00; Code Description: Power Savings - on peak hours only	Date: 10-Jul-18 15:40:00; Code Description: Mill-Mechanical
Date: 23-Aug-18 01:19:00; Code Description: Feed System-Other	Date: 23-Aug-18 01:22:00; Code Description: Feed System-Other	Date: 24-Aug-18 18:57:00; Code Description: Other - Mechanical	Date: 24-Aug-18 18:56:00; Code Description: Other - Mechanical

LM8 Closest Stop	LM8 Closest Start	LM9 Closest Stop	LM9 Closest Start
Date: 20-Aug-18 07:29:00; Code Description: Raw Mill - Lack of raw feed	Date: 20-Aug-18 12:55:00; Code Description: Raw Mill - Lack of raw feed	Date: 21-Aug-18 00:33:00; Code Description: Other - Process	Date: 21-Aug-18 00:38:00; Code Description: Other - Process
Date: 13-Nov-18 11:49:00; Code Description: Mill-Mechanical	Date: 13-Nov-18 20:43:00; Code Description: Mill-Mechanical	Date: 13-Nov-18 16:39:00; Code Description: Other - Process	Date: 13-Nov-18 16:43:00; Code Description: Other - Process
Date: 13-Nov-18 11:49:00; Code Description: Mill-Mechanical	Date: 13-Nov-18 20:43:00; Code Description: Mill-Mechanical	Date: 14-Nov-18 06:19:00; Code Description: Feed System-Other	Date: 14-Nov-18 06:25:00; Code Description: Feed System-Other
Date: 14-Nov-18 07:36:00; Code Description: Other - Process	Date: 14-Nov-18 07:39:00; Code Description: Other - Process	Date: 14-Nov-18 13:15:00; Code Description: Other - Process	Date: 14-Nov-18 13:20:00; Code Description: Other - Process
Date: 14-Nov-18 07:36:00; Code Description: Other - Process	Date: 14-Nov-18 07:39:00; Code Description: Other - Process	Date: 14-Nov-18 13:15:00; Code Description: Other - Process	Date: 14-Nov-18 13:20:00; Code Description: Other - Process

LM8 Closest Stop	LM8 Closest Start	LM9 Closest Stop	LM9 Closest Start
Date: 01-May-18 23:43:00; Code Description: Conveying-Pneumatic	Date: 01-May-18 23:59:59; Code Description: Conveying-Pneumatic	Date: 01-May-18 23:43:00; Code Description: Conveying-Pneumatic	Date: 01-May-18 23:59:59; Code Description: Conveying-Pneumatic
Date: 25-Jul-18 00:00:00; Code Description: Power Savings - on peak hours only	Date: 25-Jul-18 01:48:00; Code Description: Power Savings - on peak hours only	Date: 25-Jul-18 00:00:00; Code Description: Power Savings - on peak hours only	Date: 25-Jul-18 01:56:00; Code Description: Power Savings - on peak hours only
Date: 03-Aug-18 07:27:00; Code Description: Kiln Down -no heat	Date: 01-Aug-18 07:05:00; Code Description: Kiln Down -no heat	Date: 03-Aug-18 07:27:00; Code Description: Kiln Down -no heat	Date: 01-Aug-18 07:27:00; Code Description: Other - Process
Date: 03-Aug-18 07:27:00; Code Description: Kiln Down -no heat	Date: 01-Aug-18 07:05:00; Code Description: Kiln Down -no heat	Date: 03-Aug-18 07:27:00; Code Description: Kiln Down -no heat	Date: 01-Aug-18 07:27:00; Code Description: Other - Process
Date: 21-Sep-18 17:29:00; Code Description: Kiln Down -no heat	Date: 21-Sep-18 16:10:00; Code Description: Other - Process	Date: 21-Sep-18 17:29:00; Code Description: Kiln Down -no heat	Date: 21-Sep-18 16:02:00; Code Description: Other - Process

LM8 Closest Stop	LM8 Closest Start	LM9 Closest Stop	LM9 Closest Start
Date: 14-Apr-18 02:37:00; Code Description: Mill-Mechanical	Date: 14-Apr-18 00:28:00; Code Description: Conveying-Pneumatic	Date: 14-Apr-18 13:37:00; Code Description: Conveying-Pneumatic	Date: 14-Apr-18 15:48:00; Code Description: Conveying-Pneumatic
Date: 16-Apr-18 10:20:00; Code Description: Feed System-Other	Date: 16-Apr-18 10:37:00; Code Description: Feed System-Other	Date: 16-Apr-18 10:41:00; Code Description: Feed System-Other	Date: 16-Apr-18 10:46:00; Code Description: Feed System-Other
Date: 14-Apr-18 02:37:00; Code Description: Mill-Mechanical	Date: 14-Apr-18 00:28:00; Code Description: Conveying-Pneumatic	Date: 14-Apr-18 17:27:00; Code Description: Conveying-Pneumatic	Date: 14-Apr-18 16:17:00; Code Description: Other - Process
Date: 05-Nov-18 04:22:00; Code Description: Mill-Mechanical	Date: 05-Nov-18 04:42:00; Code Description: Mill-Mechanical	Date: 05-Nov-18 08:14:00; Code Description: Planned outage/Maintenance outage	Date: 05-Nov-18 09:25:00; Code Description: Planned outage/Maintenance outage
Date: 14-Apr-18 02:37:00; Code Description: Mill-Mechanical	Date: 14-Apr-18 00:28:00; Code Description: Conveying-Pneumatic	Date: 14-Apr-18 16:16:00; Code Description: Other - Process	Date: 14-Apr-18 16:17:00; Code Description: Other - Process

LM8 Closest Stop	LM8 Closest Start	LM9 Closest Stop	LM9 Closest Start
Date: 01-Apr-18 18:40:00; Code Description: Other - Process	Date: 01-Apr-18 18:43:00; Code Description: Other - Process	Date: 01-Apr-18 03:13:00; Code Description: Other - Process	Date: 01-Apr-18 03:28:00; Code Description: Other - Process
Date: 03-Apr-18 09:35:00; Code Description: Other - Process	Date: 03-Apr-18 09:38:00; Code Description: Other - Process	Date: 02-Apr-18 08:08:00; Code Description: Kiln Down -no heat	Date: 02-Apr-18 10:07:00; Code Description: Kiln Down -no heat
Date: 31-Mar-18 02:15:00; Code Description: Other - Process	Date: 31-Mar-18 02:18:00; Code Description: Other - Process	Date: 30-Mar-18 04:52:00; Code Description: Other - Process	Date: 30-Mar-18 07:14:00; Code Description: Other - Process
Date: 31-Mar-18 02:15:00; Code Description: Other - Process	Date: 31-Mar-18 02:18:00; Code Description: Other - Process	Date: 30-Mar-18 04:52:00; Code Description: Other - Process	Date: 30-Mar-18 07:14:00; Code Description: Other - Process
Date: 31-Mar-18 02:15:00; Code Description: Other - Process	Date: 31-Mar-18 02:18:00; Code Description: Other - Process	Date: 30-Mar-18 04:52:00; Code Description: Other - Process	Date: 30-Mar-18 07:14:00; Code Description: Other - Process

LM8 Closest Stop	LM8 Closest Start	LM9 Closest Stop	LM9 Closest Start
Date: 19-Sep-18 21:28:00; Code Description: Other - Process	Date: 19-Sep-18 21:36:00; Code Description: Other - Process	Date: 19-Sep-18 14:01:00; Code Description: Planned outage/Maintenance outage	Date: 19-Sep-18 14:41:00; Code Description: Planned outage/Maintenance outage
Date: 19-Sep-18 21:28:00; Code Description: Other - Process	Date: 19-Sep-18 21:36:00; Code Description: Other - Process	Date: 19-Sep-18 14:01:00; Code Description: Planned outage/Maintenance outage	Date: 19-Sep-18 14:41:00; Code Description: Planned outage/Maintenance outage
Date: 19-Sep-18 21:28:00; Code Description: Other - Process	Date: 19-Sep-18 21:36:00; Code Description: Other - Process	Date: 19-Sep-18 14:01:00; Code Description: Planned outage/Maintenance outage	Date: 19-Sep-18 14:41:00; Code Description: Planned outage/Maintenance outage
Date: 19-Sep-18 21:28:00; Code Description: Other - Process	Date: 19-Sep-18 21:36:00; Code Description: Other - Process	Date: 19-Sep-18 14:01:00; Code Description: Planned outage/Maintenance outage	Date: 19-Sep-18 14:41:00; Code Description: Planned outage/Maintenance outage
Date: 19-Jul-18 00:00:00; Code Description: Kiln Down -no heat	Date: 19-Jul-18 03:22:00; Code Description: Kiln Down -no heat	Date: 19-Jul-18 03:22:00; Code Description: Other - Mechanical	Date: 19-Jul-18 03:22:00; Code Description: Kiln Down -no heat

2019

Kiln 4 Stack

Compound	2019 CEMS Emission Rate [kg/hr]	2019 CEMS Emission Rate [g/s]	Comment	Dec 2019 ESDM Report - TOC (2018 CEMS)	Date of hourly event
NOx	348	97	This value is less than the NOx emission rate report in the ESDM.	102	
SO2	1123	312	This value is greater than what is reported in the ESDM but the CEMS presented an error code and the next highest emission rate is less than the maximum presented in the ESDM Report - App G - TOC	279	Nov 10 @ 2pm
SO2	880	**245**			May 7th @ 9 am

Kiln 4 Bypass Stack

Compound	2019 CEMS Emission Rate [kg/hr]	2019 CEMS Emission Rate [g/s]	Comment	Dec 2019 ESDM Report - TOC (2018 CEMS)	Date of hourly event
NOx	24.1	6.7	This value is less than the NOx emission rate report in the ESDM.	7.4	
SO2	45.9	12.8	This value is greater than what is reported in the ESDM. No error code with the value.	11.6	4/6/2019 12:00
SO2	28	**7.9**	Next highest	11.6	4/6/2019 14:00

Kiln 4 Stack

Compound	2020 EMS Emission Rate [kg/hr]	2020 CEMS Emission Rate [g/s]	Comment	ESDM Report v.1.2 - TOC (2019 CEMS)	Date of hourly event
NOx	647.2	179.8	This value is greater than what is reported in the ESDM. No error code with the value.	96.7	06/23/2020 05:00
SO2	700	194	This value is less than what is reported in the ESDM previously.	312	12/01/2020 15:00

Kiln 4 Bypass Stack

Compound	2020 CEMS Emission Rate [kg/hr]	2020 CEMS Emission Rate [g/s]	Comment	ESDM Report v.1.2 - TOC (2019 CEMS)	Date of hourly event
NOx	19.5	5.4	This value is less than what is reported in the ESDM. No error code with the value.	6.7	12/31/2020 09:00
SO2	29.6	8.2	This value is greater than what is reported in the ESDM. No error code with the value.	7.9	12/28/2020 20:00

Kiln 4 Stack

Compound	2021 CEMS Emission Rate [kg/hr]	2021 CEMS Emission Rate [g/s]	ESDM Report v.1.3 - TOC (2020 CEMS)	Date of hourly event
CO	507.1	140.9	—	2021-06-22 23:00
NOx	725.8	201.6	179.8	2021-01-09 10:00
SO2	591.8	164.4	194	2021-12-25 18:00

Kiln 4 Bypass Stack

Compound	2021 CEMS Emission Rate [kg/hr]	2021 CEMS Emission Rate [g/s]	ESDM Report v.1.3 - TOC (2020 CEMS)	Date of hourly event
CO	2.3	0.6	—	2021-06-16 11:00
NOx	24.0	6.7	5.4	2021-02-13 9:00
SO2	49.3	13.7	8.2	2021-02-13 6:00

Made By: LL
Checked By: JJZ

APPENDIX H

ALCF Emission Increase Methodology

TECHNICAL MEMORANDUM

DATE November 24, 2022 **Project No.** 2148080301

TO Nick Papanicolaou
Lehigh Hanson Materials Limited

FROM Golder Associates Ltd. **EMAIL** jeffrey.zywicki@wsp.com

METHODOLOGY FOR ASSESSING THE USE OF ALCFS AT LEHIGH PICTON CEMENT PLANT

Lehigh Hanson Materials Ltd. (Lehigh) currently operates under Environmental Compliance Approval (ECA) Number 0073-BHGQHC issued October 31, 2019, for its facility located at 1370 Highway 49, Picton, Ontario (the Facility). This technical memorandum has been prepared to provide the methods for estimating emissions from the proposed use of alternative low carbon fuels (ACLFs) at the Facility and to satisfy s.10 of Ontario Regulation (O. Reg.) 419/05 in support of the ECA Application for the use of ALCFs.

Lehigh is seeking an ECA for the following change:

- To allow for a Non-Demonstration (Permanent) Project to use ALCFs satisfying O. Reg. 79/15 (as amended by O. Reg 54/21 and 824/21). Lehigh is requesting approval to use the following ALCFs:
  - Construction & Demolition (C&D) Materials; including but not limited to primarily wood material with minor amounts of non-recyclable paper and plastic.
  - Industrial, Commercial, and Institutional (IC&I) Materials; including but not limited to primarily non-recyclable paper, plastic and textiles but including wood material, and tire fibre and fluff.
  - The combustible fraction of non-recyclable household waste (commonly referred to as Refuse Derived Fuel [RDF]).
  - Discarded treated seed.
- The above noted ALCFs would meet the following criteria:
  - Be used as mixtures of non-recyclable and non-odorous materials
  - Not be derived from or composed of any material set out in Schedule 1 of O. Reg. 79/15
  - Wholly derived from or composed of materials that are biomass, municipal waste, or a combination of both; and
  - Have a high heat value of at least 10 megajoules per kilogram.

Purpose and Scope

This technical memorandum has been prepared to support the Emission Summary and Dispersion Modelling (ESDM) Report and the ECA Application for the use of ALCFs at the Facility.

Section 10 of O. Reg. 419/05 states that an acceptable operating condition is a scenario in which operating conditions for the Facility would result, for the relevant contaminant, in the highest concentration of the contaminant possible at the point of impingement (POI).

The maximum emission scenario for the dispersion modelling analysis must include all sources at the Facility operating simultaneously at their respective maximum rates.

The following sections describe the conservative emission estimates considered to represent the use of the ACLFs.

Identification of ALCF Emissions Sources

The emissions from the use of ALCFs have the potential to be emitted from the Kiln 4 main stack and the Kiln 4 Bypass stack. These stacks emit process combustion air from the kiln.

All material handling activities related to ALCFs will occur in an enclosed building with no expectation of emissions.

Identification of Significant ALCF Contaminants

Table H1, appended to this technical memorandum, presents the individual and groups of contaminants that could be emitted from the Kiln 4 main stack and Kiln 4 Bypass stack as a result of the combustion of ALCFs. The table provides the following contaminant groups:

- Combustion air and water
- Particulates
- Nitrogen oxides
- Sulphur dioxide
- Carbon monoxide
- Trace Incomplete Combustion Products: volatile organic carbon (VOCs) & polycyclic aromatic hydrocarbons (PAHs)
- Trace inorganic metals & chlorinated compounds
- Ammonia
- Dioxins and furans

The table also presents the following:

- The controls used at the Facility to mitigate the emissions of the contaminant group.
- The anticipated changes to the emissions from using ALCFs versus conventional fuels.
- The rationale for excluding the contaminant group from the dispersion modelling analysis in the ESDM Report.
- The monitoring (CEMS, BMPPs) used at the Facility to monitor the emissions form the contaminant group.

Based on the expertise of Golder and Lehigh's internal experience with ALCF projects in western Canada, the only emissions anticipated to increase are related to trace inorganics, metals, and chlorinated compounds. This is further described below:

- Combustion air: carbon dioxide and water emissions are not anticipated to change from the use ALCFs. The non-biogenic carbon dioxide emissions will decrease with the use of ALCFs.
- Particulate emissions are not anticipated to be affected from the use of ALCFs in comparison to coal and petcoke. Fuel combustion is an insignificant contribution to total dust in comparison to the raw meal/clinker dust generated during the process.
- Nitrogen oxides (NOx) emissions are not anticipated to change with ALCFs as these emissions are dominated from thermal NOx (i.e., formed within the high temperature of kiln) and not the fuel itself. Additionally, NOx emissions are controlled with the use of selective non-catalytic reduction (SNCR) by injection of ammonia.
- Sulphur dioxide (SO_2) emissions are not anticipated to change from the use of ALCFs as these emissions are largely a result of sulphur compounds within the limestone rock (i.e., formed within the high temperature of kiln) and not the fuel itself.
- Carbon monoxide, trace PAHs and VOCs may be emitted from incomplete combustion. Lehigh has committed to only using ALCFs during normal operations when the kiln operates at optimal combustion temperatures greater than 1,450 °C. During these normal operations, the kiln is operating with good combustion, and the combustion of ALCFs should not be a significant source of these contaminants. Lehigh will have an interlock to shut off the feed of ALCFs during any sort of transitional operating condition (TOC), and as a result carbon monoxide, PAHs and VOCs have been excluded from the analysis of ALCF combustion. Please refer to Figure 1 below presenting a graphical representation of the interlock/control software. This specific graphic presents the ramp-up of the kiln and when ALCFs will be combusted. Lehigh will have alarms and interlocks in place to shutoff the ALCF feed if the kiln is not operating at its desired combustion.
- Trace inorganics, metals, and chlorinated compounds have the potential for increased emissions from the use of ALCFs in comparison to petcoke and coal; therefore, these emission rate increases have been assessed in this appendix.
- Ammonia was not considered to have a significant emission rate change from the use of ALCFs as the source of ammonia from the Kiln 4 stack is a result of natural occurring ammonia in the limestone rock, and in some instances, from ammonia slip from the SNCR.

- Dioxins and furans can be emitted from the kiln; however, these emissions occur at temperatures lower than what the kiln operates at during normal conditions. As mentioned above, ALCFs will not be combusted until the kiln is in the normal operating range when the kiln should not be a significant source of dioxins and furans.

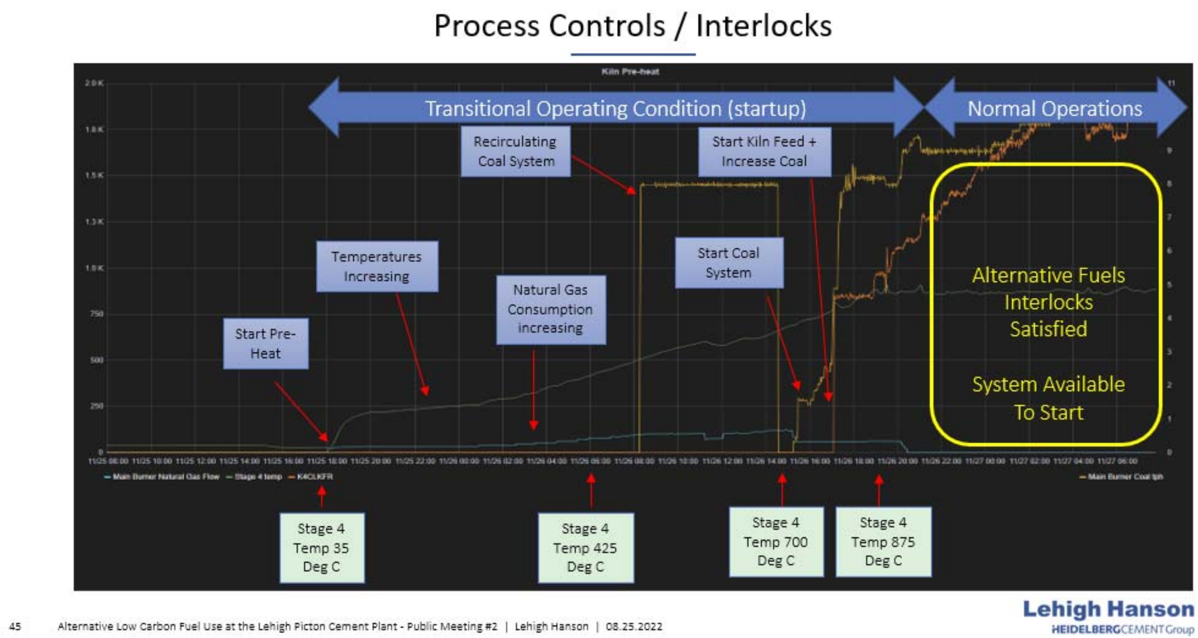


Figure 1: Process Controls/Interlocks

Methodology – Mass Balance

To estimate the emissions that have the potential to be emitted at higher rates from the use of ALCFs in comparison to petcoke and coal, Lehigh carried out a lab analysis on the low sulphur coal (LSC), petcoke, and the four ALCFs under consideration for use in the process kiln.

Of the 39 contaminants that were analyzed, 16 contaminants were found to have higher concentrations in LSC or petcoke and were excluded from further assessment (i.e., the existing conventional fuel scenario would represent the worst-case scenario).

The 23 remaining contaminants that were found to have higher concentrations in one of the four ALCFs were assessed and an estimated increase in emission rate was applied to the Kiln 4 Bypass Stack. This is due to the contaminants could be emitted as solid (fraction of the particulate).

Several metals analyzed are considered non-volatile or semi-volatile and will not be emitted from the kiln (Kiln 4) because of fuel combustion. This is due to the expectation that these contaminants will condense and re-circulate in the pre-heater and kiln and eventually be contained in the clinker matrix as per section 1.3.4.7 of the EU BAT (2013)[1] and in consultation with Lehigh process engineers. The six contaminants that would not be bound in the clinker matrix had an estimated increase in emission rate applied to them from Kiln 4. This screening process can be seen in Table H2 appended to this technical memorandum.

The detailed process of how these emissions were assessed is described in Steps 1 to 7 below:

Step 1: Carry out an analysis of the maximum contaminant concentrations analyzed from the ALCFs, coal and petcoke

Table H2 provides a tabular analysis of the contaminants analyzed from petcoke, LSC and the four ALCFs under consideration. The references to the lab analysis for this data are provided in the column headers.

- 39 contaminants (on an elemental basis) were analyzed from these materials
- 16 contaminants were found to have higher concentrations in coal or petcoke than any of the four ALCFs, and were excluded from further analysis
- 23 contaminants were found to have higher concentrations in one of the four ALCFs and increased emission rates were estimated from the Kiln 4 Bypass Stack:
  - Chlorine was assessed as hydrogen chloride and assumed to have a maximum concentration in the ALCFs of 1.5% by weight to be consistent with the fuel handling and testing manual limits
  - Calcium was assessed as calcium oxide

The screening result of Step 1 is summarized below:

Contaminant Category	Number of Contaminants
Contaminants from ALCFs assessed	39
Contaminants from ALCFs with higher concentrations in LSC or petcoke	16
Contaminants from ALCFs with higher concentrations in one of the four ALCFs and passed on to Step 2a and 2b	23

[1] Frauke Schorcht et al., Best Available Techniques (BAT) Reference Document for the Production of Cement, Lime and Magnesium Oxide, 2013

Step 2a: Estimate a mass balance increase in emission rates from Kiln 4 Bypass

Emission rates for all 23 contaminants that have higher concentrations in an ALCF than coal or petcoke have been estimated from the Kiln 4 bypass stack. Emission rate estimation methodologies for bismuth, iron, magnesium, silicon, sodium, tungsten, and zinc are provided in Steps 5, 6 and 7 below. All other contaminants were estimated using the following method:

$$\text{E-rate}_{ALCF} = \text{E-rate}_{existing} * \%\text{Conc}_{increase}$$

Where:

E-rate_{ALCF} = new emission rate considering ALCFs
$\text{E-rate}_{existing}$ = emission rate in 2021 ESDM Report
$\%\text{Conc}_{increase}$ = calculated percentage increase of contaminant in ALCF compared to LSC or petcoke
$\%\text{Conc}_{increase}$ is calculated in Step 3.

Step 2b: Estimate a mass balance increase in emission rates from Kiln 4

For the contaminants that have higher concentrations in an ALCF than coal or petcoke, only volatile contaminants will be considered from Kiln 4.

Several metals analyzed are considered non-volatile or semi-volatile and will not be emitted from the kiln as a result of fuel combustion. This is due to the expectation that these contaminants will condense and re-circulate in the pre-heater and kiln, and eventually be contained in the clinker matrix per section 1.3.4.7 of the EU BAT (2013)[2] and in consultation with Lehigh process engineers.

6 of the 23 contaminants that would not be bound in the clinker matrix had increased emission rates estimated from Kiln 4, and the contaminants that would screen out as non-volatile or semi-volatile in this step are indicated in Table H2.

The results of screening Step 2a and 2b are summarized below:

Contaminant Category	Number of Contaminants
Contaminants from ALCFs assessed	39
Contaminants from ALCFs with higher concentrations in LSC or petcoke	16
Contaminants from ALCFs with higher concentrations in one of the four ALCFs and passed on to Step 2a and 2b	23
Contaminants from ALCFs with increased emission rates applied to the Kiln 4 bypass stack	23
Contaminants from ALCFs with increased emission rates applied to Kiln 4	6

Notes: ** 17 contaminants were screened out from Kiln 4 due to them being non-volatile, refractory or semi-volatile.

[2] Frauke Schorcht et al., Best Available Techniques (BAT) Reference Document for the Production of Cement, Lime and Magnesium Oxide, 2013

Step 3: Determine the increase in mass of each contaminant entering the kiln process as a result of 200 tonnes per day (tpd) of ALCFs displacing the equivalent amount of coal/petcoke

The concentration increase as a percentage has been estimated using the following equation:

$$\%Conc_{increase} = (A + B) / C$$

Where:

A = maximum concentration of contaminant in an ALCF multiplied by the mass of ALCFs used per day (200 tpd)

B = maximum concentration of contaminant in coal/petcoke multiplied by the mass of coal/petcoke NOT REPLACED by ALCFs (determined in Step 4b below)

C = maximum concentration of contaminant in coal/petcoke multiplied by the average mass of coal/petcoke if ALCFs are not used

For contaminants with maximum concentrations below the detection limit, half the detection limit will be used for coal, petcoke, and all four ALCFs.

This step was based on the following inputs:

Parameter	Value	Unit
Average Coal/Petcoke Used[1]	300	tonnes/day
Maximum Total ALCFs Used	200	tonnes/day
Lowest High Heating Value (HHV) of ALCFs – Seed[2]	14.55	MJ/kg
Maximum Total Energy Used from ALCFs	2,910,000	MJ/day
Highest HHV of Coal/Petcoke – Petcoke[2]	33.16	MJ/kg
Mass of Coal/Petcoke Replaced by ALCFs	87.8	tonnes/day
Total Coal/Petcoke Required in Addition to ALCFs	212.2	tonnes/day

1-The average coal/petcoke used per day represents a conservative emissions scenario as it provides a higher proportion of ALCF to conventional fuel usage; and therefore, a larger increase in emission rates when compared to using the maximum coal/petcoke used per day

2-Using the lowest HHV of the four ALCFs and the highest HHV of the conventional fuels represent a conservative emissions scenario as they result in less conventional fuel replaced by 200 tonnes of ALCFs; and therefore, a larger amount of conventional fuels required (B in the formula above) (i.e., higher material kiln input to get the equivalent energy demand)

Please note the values (e.g., HHVs, Heat input demands) presented in this appendix may differ from other technical studies included with the ECA Amendment Application for the use of ALCFs (e.g., CO_2 Emission Intensity Report). This is due to the CO_2 Emission Intensity Report presented an estimated annual CO_2 emission reduction based on a range of estimated CO_2 emission intensities of a typical fuel mix, while the ESDM Report and this appendix assesses daily worst case air emissions from a maximum use of 200 tonnes per day of any of the ACLFs.

Step 4a: Determine the amount of coal/petcoke replaced by using 200 tpd of ALCFs.

The mass of coal/petcoke replaced by using 200 tpd of ALCFs has been estimated using the lowest Higher Heat Value (HHV) of the four ALCFs to convert mass into energy units. This conservatively replaces the least amount of coal/petcoke from 200 tpd of ALCFs. This amount of energy is then converted back into mass of coal/petcoke using the lower HHV of coal/petcoke. The lower HHV is used in this case because the maximum total mass of coal/petcoke used if ALCFs are not used (C from Step 3) is based on the fuel with the lower HHV. The result is the mass of coal/petcoke replaced by the ALCFs to fuel the kiln.

$$Energy_{ALCF} = HHV_{ALCF} \text{ x } 200 \text{ tpd}$$

Where:

$Energy_{ALCF}$ = Smallest amount of energy produced from 200 tpd of ALCFs
HHV_{ALCF} = Lowest HHV of the four ALCFs

$$MASS_{Coal/Petcoke} = Energy_{ALCF} / HHV_{Coal/Petcoke}$$

Where:

$MASS_{Coal/Petcoke}$ = Mass of coal/petcoke replaced by using 200 tpd of ALCFs
$Energy_{ALCF}$ = Smallest amount of energy produced from 200 tpd of ALCFs
$HHV_{Coal/Petcoke}$ = Lower HHV of coal/petcoke

Step 4b: Determine the amount of coal/petcoke not replaced by using 200 tpd of ALCFs.

The amount of coal/petcoke not replaced by using 200 tpd of ALCFs is estimated by subtracting the mass of coal/petcoke replaced by 200 tpd of ALCFs ($MASS_{Coal/Petcoke}$ from Step 4a) from the total amount of coal/petcoke used if zero ALCFs are used.

Step 5: For iron, sodium, and zinc, determine the maximum emission rate from the Kiln 4 bypass stack.

Iron is considered non-volatile while sodium and zinc are considered semi-volatile and they will not be emitted from the kiln as a result of fuel combustion because these contaminants will condense and re-circulate in the pre-heater and kiln and eventually be contained in the clinker matrix per section 1.3.4.7 of the EU BAT (2013)[2].

Using Step 2a to apply an increase to the emission rates of these contaminants would result in the emission rates exceeding the emission rate of Suspended Particulate Matter (SPM) from the Kiln 4 Bypass Stack, which is not possible at the temperatures that the bypass stack exhausts (i.e., these metals would be emitted as particulate). Therefore, the maximum emission rates for iron, sodium, and zinc were conservatively assumed to equal the emission rate of SPM from the Kiln 4 Bypass Stack.

Step 6: For bismuth, magnesium and tungsten, determine the maximum emission rate from the Kiln 4 bypass stack.

Bismuth, magnesium, and tungsten were not included in the 2021 ESDM Report to apply an increase in emission rate. Therefore, the maximum emission rates for bismuth, magnesium, and tungsten were conservatively assumed to equal the emission rate of SPM from the Kiln 4 Bypass Stack as they would not exceed the SPM emission rate. Bismuth, magnesium and tungsten are expected to be non-volatile or semi-volatile and not emitted as a result of an increase in mass loading into the kiln.

Step 7: For silicon determine the maximum emission rate from Kiln 4 and the Kiln 4 bypass stack.

Silicon does not have an analysed concentration in coal or petcoke to apply an increase in emission rate to, nor is it considered a non-volatile or semi-volatile contaminant. Therefore, the maximum emission rates for silicon from Kiln 4 and the Kiln 4 bypass stack were conservatively assumed to equal the SPM emissions rates from the Kiln 4 and Kiln 4 bypass stack, respectively, as they would not exceed the SPM emission rates.

Summary

The following summarizes the screening process for assessing the contaminants that have the potential to be emitted from Kiln 4 and the Kiln 4 Bypass.

Contaminant Category	Number of Contaminants
Contaminants from ALCFs assessed	39
Contaminants from ALCFs with higher concentrations in LSC or petcoke	16
Contaminants from ALCFs with higher concentrations in one of the four ALCFs	23
Contaminants from ALCFs with increased emission rates applied to the Kiln 4 bypass stack	23
Contaminants from ALCFs with increased emission rates applied to Kiln 4	6

Table H1 provides a high level description of the types of emissions from Kiln 4 and Kiln 4 BP and whether changes are anticipated for those emissions.

Table H2 provides the screening table that includes the analysis of the LSC, petcoke and the four proposed ALCFs in ug/g or ppm.

Table H3 summarizes the method employed to increase the emission rates on the Kiln 4 and Kiln 4 Bypass stacks.

Table H4 provides a comparison of the Facility-wide emission rates before the proposed use of ALCFs and the estimated increases to emission rates as a result of using ALCFs. Please refer to Appendix B for the individual increases to emission rates from Kiln 4 and Kiln 4 Bypass. Appendix K provides a comparison of the maximum point-of-impingement (POI) concentrations of the 23 contaminants considered with and without the ACLF emission estimates.

Table H1: Anticipated Changes to Emissions with ACLFs

Contaminant Category	Emission Control	Change from Conventional Fuels	Rationale	Monitoring
Combustion Air & Water	▪ None	**Decrease in non-biogenic CO_2**	▪ ALCFs reduce non-biogenic CO2 emissions; majority of these compounds are air (Nitrogen and Oxygen) ▪ ALCF's may contain higher moisture leading to increases water vapor	▪ CEMS
Trace Inorganic Metals & Chlorinated Compounds	▪ **Kiln 4 - ESP** ▪ **Incoming testing and fuel handling of ACLF materials**	**May Increase**	▪ **Based on material lab analysis, certain inorganic materials & metals may increase. These increases in potential emission estimates have been assessed.** ▪ **ALCFs may have higher chlorine content. Emission increases have been estimated and assessed.**	▪ **Incoming Fuel Handling** ▪ **Source Testing**
Particulates (Dust)	▪ Material Handling in building ▪ Kiln 4 – ESP & Kiln 4 Bypass dust collector	Negligible	▪ Dust from truck traffic will be a negligible increase ▪ Material Handling will be carried out inside a building and covered conveyors ▪ Dust from the fuel combustion is insignificant	▪ CEMS (opacity) ▪ Fugitive Dust BMPP
Oxides of Nitrogen (NOx)	▪ CEMS & SNCR (ammonia injection)	Negligible	▪ NOx is mostly generated from the temperature of the combustion, not the fuel type. SNCR system operation to control NOx emissions	▪ CEMS
Sulphur Dioxide (SO_2)	▪ Kiln 4 – Lime injection (currently being trialed)	Negligible	▪ SO_2 is mostly a result of the raw materials (limestone). The fuels will be screened to be low in sulphur.	▪ CEMS
Carbon Monoxide	▪ Good combustion in the CEMS	Negligible	▪ No material change to combustion efficiency is anticipated	▪ CEMS (monitor combustion)
Trace Incomplete Combustion Products: VOC & PAHs	▪ Source Testing ▪ Interlock	Negligible	▪ It is not expected that VOC & PAH emissions will change due to the high temperature and residence time of the kiln.	▪ Source Testing
Dioxins & Furans	▪ Source Testing ▪ Interlock	Negligible	▪ It is not expected that D&F emissions will change due to the high temperature and residence time of the kiln.	▪ Source Testing
Ammonia	▪ Ammonia used to control NOx	Negligible	▪ Ammonia (naturally occurring in limestone & added to control NOx)	▪ Source Testing

Table H2: Analyses of Contaminants

Fuel	Limestone	Coal	Petcoke	C&D	ICI	MSW RDF	Seed	Maximum Concentration from any fuel [ppm]	Maximum Concentration from Coal/Petcoke [ppm]	Fuel with Maximum concentration	Emission Rate Increase Assessed?
Concentration Unit	[µg/g]	[µg/g]	[µg/g]	As Received [ppm]	[µg/g]	As Received [ppm]	As Received [ppm]				
ALCF Source				Edm AB, Jasper		Edm AB, Jasper	Ray Testing				
Data Sheet Name / Contaminant	Report CA19199-APR22rock	Additive TM MAR20 McCreath Analysis RobertSPierson_120221coal		Ultimate+ Metals-CDRCF	buffalo TM CA19183-MAY22	RDF MSW analysis	Seed analysis & Seed metals analysis				
Aluminum, Al	38000	40,000	150	1,422	16,000	1,108	1,039	40,000	40,000	Coal	No. Screened out in Step 1
Beryllium, Be	0.95	1.5	0.03	—	0.43	<1	<0.10	1.5	1.5	Coal	No. Screened out in Step 1
Boron, B	1.6	49	1.2	—	—	11	6.05	49	49	Coal	No. Screened out in Step 1
Fluorine, F	—	143	<1	—	—	—	—	143	143	Coal	No. Screened out in Step 1
Lithium, Li	29	50	<2	—	17	—	—	50	50	Coal	No. Screened out in Step 1
Molybdenum, Mo	0.7	1.6	49	1.29	16	1.16	2.14	49	49	Petcoke	No. Screened out in Step 1
Nickel, Ni	13	14	440	4.7	52	6.1	42.12	440	440	Petcoke	No. Screened out in Step 1
Potassium, K	16000	6,700	14	—	3,500	—	3,524	6,700	6,700	Coal	No. Screened out in Step 1
Selenium, Se	<0.7	4.4	<0.7	<0.1	<0.7	0.8	0.72	4.4	4.4	Coal	No. Screened out in Step 1
SiO2 [%]	29.3	19.6	0.31	—	—	—	—	19.6	19.6	Coal	No. Screened out in Step 1
Strontium, Sr	660	110	0.83	—	100	—	—	110	110	Coal	No. Screened out in Step 1
Sulfur, S	—	17,600	—	0.05	—	0.14	0	17,600.000	17,600.000	Coal	No. Screened out in Step 1
Thallium, Tl	0.28	0.49	<0.02	—	0.09	—	<0.10	0.49	0.49	Coal	No. Screened out in Step 1
Uranium, U	1.3	1.7	0.04	—	0.81	—	<0.10	1.7	1.7	Coal	No. Screened out in Step 1
Vanadium, V	33	51	1,100	—	26	—	0.59	1,100	1,100	Petcoke	No. Screened out in Step 1
Yttrium, Y	10.4	12	0.15	—	4.88	—	<0.50	12	12	Coal	No. Screened out in Step 1
Antimony, Sb	**<0.8**	**<0.8**	**<0.8**	**4.56**	**54**	**10.82**	**0.13**	**54**	**0.4**	**ICI**	**Yes**
Arsenic, As	**4.2**	**4.30**	**<0.5**	**9.38**	**4.6**	**0.69**	**0.33**	**9.38**	**4.30**	**C&D**	**Yes**
Barium, Ba	**86**	**0.93**	**180**	**—**	**330**	**—**	**8.21**	**330**	**180**	**ICI**	**Yes**
Bismuth, Bi	**—**	**—**	**—**	**—**	**—**	**—**	**<0.50**	**<0.50**	**<0.50**	**Seed**	**Yes**
Cadmium, Cd	**0.04**	**0.04**	**<0.02**	**0.24**	**2**	**0.86**	**<0.10**	**2**	**0.04**	**ICI**	**Yes**
Calcium, Ca	**370000**	**1,500**	**230**	**10,307**	**68,000**	**20,542**	**12,770**	**68,000**	**1,500**	**ICI**	**Yes**
Chlorine, Cl[1]	**—**	**1,202**	**—**	**1,728**	**—**	**3,761**	**5**	**15,000**	**1,202**	**MSW RDF**	**Yes**
Chromium, Cr	**63**	**40**	**2.3**	**22.5**	**90**	**6.9**	**34.64**	**90**	**40**	**ICI**	**Yes**
Cobalt, Co	**6**	**6.6**	**2**	**—**	**570**	**—**	**0.6**	**570.0**	**6.6**	**ICI**	**Yes**
Copper, Cu	**4.5**	**17**	**0.62**	**1,136.7**	**990**	**48.1**	**10.3**	**1,136.7**	**17**	**C&D**	**Yes**
Iron, Fe	**21000**	**8,200**	**440**	**558**	**68,000**	**922**	**1,403**	**68,000**	**8,200**	**ICI**	**Yes**
Lead, Pb	**8**	**12**	**0.44**	**15.11**	**91**	**10.07**	**1.7**	**91**	**12**	**ICI**	**Yes**
Magnesium, Mg	**13000**	**1,800**	**55**	**431.6**	**14,000**	**1,063.3**	**2,685**	**14,000**	**1,800**	**ICI**	**Yes**
Manganese, Mn	**300**	**32**	**6.4**	**36.9**	**460**	**46.7**	**26.11**	**460**	**32**	**ICI**	**Yes**
Mercury, Hg	**<0.05**	**<0.05**	**<0.05**	**<0.05**	**<0.05**	**0.14**	**0.31**	**0.31**	**0.025**	**Seed**	**Yes**
Phosphorous, P	**500**	**140**	**7.7**	**—**	**700**	**—**	**3,785**	**3,785**	**140**	**Seed**	**Yes**
Silicon, Si	**—**	**—**	**—**	**—**	**—**	**—**	**5,836**	**5,836**	**N/A**	**Seed**	**Yes**
Silver, Ag	**<0.5**	**<1**	**<1**	**—**	**0.6**	**—**	**<0.10**	**0.6**	**0.5**	**ICI**	**Yes**
Sodium, Na	**1600**	**610**	**73**	**—**	**22,000**	**—**	**674**	**22,000**	**610**	**ICI**	**Yes**

Fuel	Limestone	Coal	Petcoke	C&D	ICI	MSW RDF	Seed	Maximum Concentration from any fuel [ppm]	Maximum Concentration from Coal/Petcoke [ppm]	Fuel with Maximum concentration	Emission Rate Increase Assessed?
Concentration Unit	[µg/g]	[µg/g]	[µg/g]	As Received [ppm]	[µg/g]	As Received [ppm]	As Received [ppm]				
ALCF Source				Edm AB, Jasper		Edm AB, Jasper	Ray Testing				
Data Sheet Name / Contaminant	Report CA19199-APR22rock	Additive TM MAR20 McCreath Analysis RobertSPierson_120221coal		Ultimate+ Metals-CDRCF	buffalo TM CA19183-MAY22	RDF MSW analysis	Seed analysis & Seed metals analysis				
Tin, Sn	<6	<6	<6	3.16	70	2.87	1.82	70	3	ICI	Yes
Titanium, Ti	1600	2,500	24	30.5	3,000	14.3	281	3,000	2,500	ICI	Yes
Tungsten, W	0.4	0.68	0.16	—	6	—	10.8	10.8	0.7	Seed	Yes
Zinc, Zn	22	19	4.5	77	53,000	110	30.77	53,000	19	ICI	Yes

Notes: 1 – The maximum concentration of chlorine in an ALCF from laboratory analysis was 3,761ppm. However, Lehigh will accept ALCFs with a chlorine content of up to 1.5% by weight (15,000ppm) so 15,000ppm was used to increase the emission rates from Kiln 4 and the Kiln 4 Bypass Stack.

Table H3 – Emission Rate Increase Summary

Contaminant	Maximum Concentration in Coal/Petcoke [%]	Maximum Concentration in ALCF [%]	Maximum Mass from Coal/Petcoke [tonne/day]	Maximum Mass from ALCF [tonne/day]	Maximum Mass from Coal/Petcoke NOT Replaced by ALCF [tonne/day]	% Increase	K4 Emission Increase Method	K4BP Emission Increase Method
Antimony, Sb	0.00004%	0.0054%	1.20E-04	1.08E-02	8.49E-05	9071%	No change: SV	**% Increase**
Arsenic, As	0.00043%	0.000938%	1.29E-03	1.88E-03	9.13E-04	216%	No change: NV	**% Increase**
Barium, Ba	0.018%	0.033%	5.40E-02	6.60E-02	3.82E-02	193%	No change: NV	**% Increase**
Bismuth, Bi	—	0.000025%	—	5.00E-05	—	—	No change: SV	**SPM ER**
Cadmium, Cd	0.0000038%	0.0002%	1.14E-05	4.00E-04	8.07E-06	3580%	No change: SV	**% Increase**
Calcium, Ca	0.15%	6.8%	4.50E-01	1.36E+01	3.18E-01	3093%	No change: NV	**% Increase as CaO**
Chromium, Cr	0.004%	0.009%	1.20E-02	1.80E-02	8.49E-03	221%	No change: NV	**% Increase**
Copper, Cu	0.0017%	0.11367%	5.10E-03	2.27E-01	3.61E-03	4528%	No change: NV	**% Increase**
Iron, Fe	0.82%	6.8%	2.46E+00	1.36E+01	1.74E+00	624%	No change: NV	**SPM ER**
Lead, Pb	0.0012%	0.0091%	3.60E-03	1.82E-02	2.55E-03	576%	No change: SV	**% Increase**
Magnesium, Mg	0.18%	1.4%	5.40E-01	2.80E+00	3.82E-01	589%	No change: SV	**SPM ER**
Manganese, Mn	0.0032%	0.046%	9.60E-03	9.20E-02	6.79E-03	1029%	No change: NV	**% Increase**
Silver, Ag	0.00005%	0.00006%	1.50E-04	1.20E-04	1.06E-04	151%	No change: NV	**% Increase**
Sodium, Na	0.061%	2.2%	1.83E-01	4.40E+00	1.29E-01	2475%	No change: SV	**SPM ER**
Titanium, Ti	0.25%	0.3%	7.50E-01	6.00E-01	5.31E-01	151%	No change: NV	**% Increase**
Tungsten, W	0.000068%	0.00108%	2.04E-04	2.16E-03	1.44E-04	1130%	No change: NV	**SPM ER**
Zinc, Zn	0.0019%	5.3%	5.70E-03	1.06E+01	4.03E-03	186036%	No change: SV	**SPM ER**
Chlorine, Cl	0.1202%	1.5%	3.61E-01	3.00E+00	2.55E-01	903%	**% Increase as HCl**	**% Increase as HCl**
Cobalt, Co	0.00066%	0.057%	1.98E-03	1.14E-01	1.40E-03	5828%	**% Increase**	**% Increase**
Mercury, Hg	0.0000025%	0.000031%	7.50E-06	6.20E-05	5.31E-06	897%	**% Increase**	**% Increase**
Phosphorous, P	0.014%	0.3785%	4.20E-02	7.57E-01	2.97E-02	1873%	**% Increase**	**% Increase**
Tin, Sn	0.0003%	0.007%	9.00E-04	1.40E-02	6.37E-04	1626%	**% Increase**	**% Increase**
Silicon, Si	—	0.5836%	—	1.17E+00	—	—	**SPM ER**	**SPM ER**

Notes:

"—" denotes not analyzed
"SV" denotes semi-volatile. See Step 2b: these contaminants will condense and re-circulate in the pre-heater and kiln and eventually be contained in the clinker matrix as per section 1.3.4.7 of the EU BAT (2013)
"NV" denotes non-volatile or refractory See Step 2b: These contaminants will condense and re-circulate in the pre-heater and kiln and eventually be contained in the clinker matrix as per section 1.3.4.7 of the EU BAT (2013)

Sample calculation of percent increase in concentration of Cobalt using 200 tpd of ALCFs to replace conventional fuels

$\%Conc_{increase} = (A + B) / C$

Where:

A = maximum concentration of contaminant in an ALCF multiplied by the mass of ALCFs used per day (200 tpd)

B = maximum concentration of contaminant in coal/petcoke multiplied by the mass of coal/petcoke NOT REPLACED by ALCFs (196.5 tpd from Step 3)

C = maximum concentration of contaminant in coal/petcoke x total mass of coal/petcoke if ALCFs are not used (300 tpd from Step 3)

$\%Conc_{increase}$ of Co = ((0.057% x 200) + (0.00066% x 212.2)) / (0.00066% x 300)

$\%Conc_{increase}$ of Co = (1.14E-01 + 1.40E-03) / 1.98E-03

$\%Conc_{increase}$ of Co = 5828%

Table H4 – Comparison of Emissions with and without ALCFs

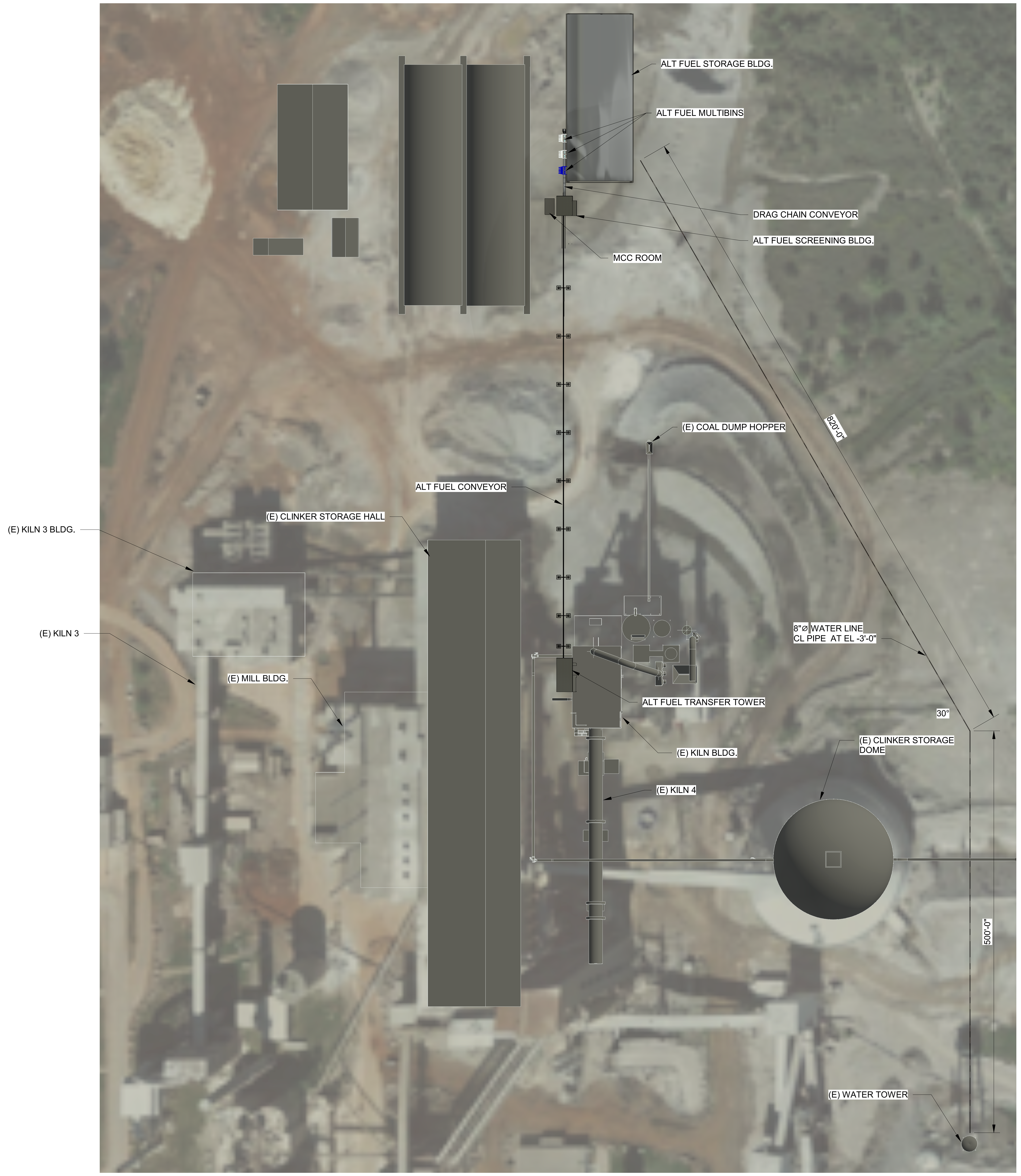
Contaminant	CAS No.	Total Facility Emission Rate -Without ALCFs- [g/s]	Total Facility Emission Rate -With ALCFs- [g/s]
Antimony	7440-36-0	1.47E-04	1.21E-03
Arsenic	7440-38-2	3.36E-04	3.84E-04
Barium	7440-39-3	1.86E-02	2.82E-02
Bismuth	7440-69-9	N/A[1]	4.56E-01
Cadmium	7440-43-9	2.03E-04	6.49E-04
Calcium Oxide	1305-78-8	5.44E+00	5.51E+00
Chromium	7440-47-3	6.78E-04	1.28E-03
Cobalt	7440-48-4	2.28E-04	1.33E-02
Copper	7440-50-8	1.18E-01	1.21E-01
Hydrogen chloride	7647-01-0	1.16E+00	1.04E+01
Iron	7439-89-6	7.70E-01	8.41E-01
Lead	7439-92-1	1.68E-02	1.90E-02
Magnesium	7439-95-4	N/A[1]	4.56E-01
Manganese	7439-96-5	1.98E-02	2.24E-02
Mercury	7439-97-6	4.99E-03	4.48E-02
Phosphorus	7723-14-0	6.90E-03	1.29E-01
Silicon	7440-21-3	2.23E+00	6.67E+00
Silver	7440-22-4	2.81E-05	3.52E-05
Sodium	7440-23-5	1.36E+00	1.36E+00
Tin	7440-31-5	7.94E-03	1.29E-01
Titanium	7440-32-6	1.72E-02	2.16E-02
Tungsten	7440-33-7	N/A[1]	4.56E-01
Zinc	7440-66-6	1.26E-02	4.68E-01

Notes:
N/A[1]: Bismuth, Magnesium and Tungsten did not have emission rates prior to ALCF inclusion and have emission estimates that are very conservative at equal to the SPM emission rate.

APPENDIX I

Lehigh Supporting Documents

THIS DOCUMENT CONTAINS PROPRIETARY INFORMATION BELONGING TO INDUSTRIAL ALLY, ITS AFFILIATED COMPANIES, AND THEIR CLIENTS AND SHALL BE USED ONLY FOR THE PURPOSE FOR WHICH IT WAS SUPPLIED. IT SHALL NOT BE COPIED, REPRODUCED, OR OTHERWISE USED NOR SHALL SUCH INFORMATION BE FURNISHED IN WHOLE OR IN PART TO OTHERS, EXCEPT IN ACCORDANCE WITH THE TERMS OF ANY AGREEMENT UNDER WHICH IT WAS SUPPLIED OR WITH THE PRIOR WRITTEN CONSENT OF THE COMPANY, AND SHALL BE RETURNED UPON REQUEST.



N

PLAN - OVERALL SITE

1" = 80'-0"

PRELIMINARY

NOT FOR CONSTRUCTION

REV	DATE	DESCRIPTION	BY	CHK	APP
A	06/01/22	ISSUED FOR REVIEW	CRN	TED	TH

Lehigh Hanson
HEIDELBERGCEMENTGroup

LEHIGH CEMENT
1370 HWY 49 PICTON PLANT AND TERMINAL,
PICTON, ON K0K 2T0, CANADA

DESIGNED:	TED	DATE:	05/25/22
DRAWN:	CRN	DATE:	05/26/22
CHECKED:	TED	DATE:	05/31/22
SMACC APPR:	TH	DATE:	-

Industrial Ally
Full Service Engineering and Design
1422 Elbridge Payne Rd. Suite 120
Chesterfield, MO 63017

INDUSTRIAL ALLY PROJECT NUMBER: 2129

ALTERNATIVE FUELS STUDY
OVERALL SITE
GENERAL ARANGEMENT
PLOT PLAN

DRAWING NUMBER
2129-GA-100

1" LONG
@ FULL SIZE

REV.
A

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DRAWING FORMAT: ARCH D - 24"x36"

APPENDIX J

In-stack Limit Comparison

IN STACK EMISSION LIMITS

Source ID	Source Description	Contaminant	Source Testing		Guideline A-7 Limits for Cement and Lime Kilns		Below Guideline A-7 Limit?
			In-stack Concentration	Unit*	In-Stack Emission Limit	Unit**	Yes/No
4-2	Kiln 4 Stack	SPM	24.6	mg/DRm^3	50	mg/Rm^3	Yes
		Cadmium	1.17	µg/DRm^3	7	µg/Rm^3	Yes
		Lead	13	µg/DRm^3	60	µg/Rm^3	Yes
		Mercury	4.22	µg/DRm^3	20	µg/Rm^3	Yes
		Dioxins and Furans	13.4	pg/DRm^3	80	pg/Rm^3	Yes
		Hydrochloric Acid	0.754	mg/DRm^3	27	mg/Rm^3	Yes
4-5	Kiln 4 By-Pass Stack	SPM	39.4	mg/DRm^3	50	mg/Rm^3	Yes
		Cadmium	0.908	µg/DRm^3	7	µg/Rm^3	Yes
		Lead	34.2	µg/DRm^3	60	µg/Rm^3	Yes
		Mercury	0.781	µg/DRm^3	20	µg/Rm^3	Yes
		Dioxins and Furans	6.97	pg/DRm^3	80	pg/Rm^3	Yes
		Hydrochloric Acid	1.69	mg/DRm^3	27	mg/Rm^3	Yes

*DR- Dry reference; Reference - 25C & 101.3 kPa
**Reference = 25C, 101.3kPa, 11% Oxygen & dry conditions

Made By: LL
Checked By: JJZ

APPENDIX K

Emission Rate and Maximum POI Concentration Comparison with and without ALCFs

Table K1: Emission Rate and Maximum POI Concentration Comparison with and without ALCFs

Contaminant	CAS No.	Total Facility Emission Rate -Without ALCFs- [g/s]	Total Facility Emission Rate -With ALCFs- [g/s]	Maximum POI Concentration -Without ALCFs- [µg/m³]	Maximum POI Concentration -With ACLFs- [µg/m³]	Averaging Period	MECP POI Limit [µg/m³]	Schedule	Source	Percentage of MECP POI Limit -Without ALCFs- [%]	Percentage of MECP POI Limit -With ALCFs- [%]
Antimony	7440-36-0	1.47E-04	1.21E-03	8.33E-05	3.69E-03	24	25	Sch. 3	Standard	0.00033%	0.015%
Arsenic	7440-38-2	3.36E-04	3.84E-04	2.35E-04	3.90E-04	24	0.3	Sch. 3	Guideline	0.08%	0.13%
Barium	7440-39-3	1.86E-02	2.82E-02	3.78E-02	6.87E-02	24	10	Sch. 3	Guideline	0.38%	0.69%
Bismuth	7440-69-9	N/A[1]	4.56E-01	N/A[1]	1.54E+00	24	2.5	Sch. 3	SL-JSL	—	61.7%
Cadmium	7440-43-9	2.03E-04	6.49E-04	1.04E-04	1.61E-03	24	0.025	Sch. 3	Standard	0.42%	6.4%
Calcium Oxide	1305-78-8	5.44E+00	5.51E+00	1.61E+00	1.68E+00	24	10	Sch. 3	Standard	16.1%	16.8%
Chromium	7440-47-3	6.78E-04	1.28E-03	1.75E-03	3.71E-03	24	0.5	Sch. 3	Standard	0.35%	0.74%
Cobalt	7440-48-4	2.28E-04	1.33E-02	1.22E-04	7.12E-03	24	0.1	Sch. 3	Guideline	0.12%	7.1%
Copper	7440-50-8	1.18E-01	1.21E-01	3.79E-02	4.87E-02	24	50	Sch. 3	Standard	0.08%	0.10%
Hydrogen chloride	7647-01-0	1.16E+00	1.04E+01	3.57E-01	3.22E+00	24	20	Sch. 3	Standard	1.8%	16.1%
Iron	7439-89-6	7.70E-01	8.41E-01	1.18E+00	1.40E+00	24	4	Sch. 3	Standard	30%	35%
Lead	7439-92-1	1.68E-02	1.90E-02	6.81E-03	1.44E-02	24	0.5	Sch. 3	Standard	1.4%	2.9%
Lead	7439-92-1	1.68E-02	1.90E-02	2.66E-03	5.60E-03	30-day	0.2	Sch. 3	Standard	1.3%	2.8%
Magnesium	7439-95-4	N/A[1]	4.56E-01	N/A[1]	1.54E+00	24	72	Sch. 3	SL-MD	—	2.1%
Manganese	7439-96-5	1.98E-02	2.24E-02	7.17E-03	1.60E-02	24	0.4	Sch. 3	Standard	1.8%	4.0%
Mercury	7439-97-6	4.99E-03	4.48E-02	1.63E-03	1.45E-02	24	2	Sch. 3	Standard	0.08%	0.73%
Phosphorus	7723-14-0	6.90E-03	1.29E-01	3.66E-03	6.84E-02	24	0.5	Sch. 3	SL-MD	0.73%	14%
Silicon	7440-21-3	2.23E+00	6.67E+00	1.18E+00	3.53E+00	24	27	Sch. 3	SL-PA	4.4%	13%
Silver	7440-22-4	2.81E-05	3.52E-05	5.19E-05	7.35E-05	24	1	Sch. 3	Standard	0.0052%	0.0074%
Sodium	7440-23-5	1.36E+00	1.36E+00	1.83E+00	1.83E+00	24	5.387	—	Previously Approved MAXGLC	34%	34%
Tin	7440-31-5	7.94E-03	1.29E-01	3.71E-03	6.01E-02	24	10	Sch. 3	Standard	0.04%	0.60%
Titanium	7440-32-6	1.72E-02	2.16E-02	3.18E-02	4.51E-02	24	120	Sch. 3	Standard	0.027%	0.038%
Tungsten	7440-33-7	N/A[1]	4.56E-01	N/A[1]	1.54E+00	24	5	Sch. 3	SL-JSL	—	31%
Zinc	7440-66-6	1.26E-02	4.68E-01	5.20E-03	1.55E+00	24	120	Sch. 3	Standard	0.004%	1.3%

Notes:
N/A[1] = Bismuth, Magnesium and Tungsten did not have emission rates prior to ALCF inclusion

Made by: LK
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