TAB E

NETTING ANALYSIS
(Revised July 2009)

TAB E

EMISSION CALCULATIONS AND NETTING

For purposes of evaluating the air quality impacts of the Ravena Modernization Project, Lafarge has prepared the following emission estimates and analyses:

1. Baseline emissions of the current plant
2. Emissions at current plant capacity
3. Potential to emit (PTE) of the modified plant
4. Net emission increase.

The scope and approach to these estimates were determined by the applicable requirements under Federal and State rules as discussed below.

Baseline Emissions

The pollutants covered in the PSD baseline inventory are the pollutants subject to the U.S. Environmental Protection Agency's (EPA's) Prevention of Significant Deterioration rules at 40 CFR 52.21. (Although New York has adopted its own PSD rules which became effective March 5, 2009, the EPA will also implement the PSD program in the State of New York until it approves New York's rules as a State Implementation Plan revision). The PSD-regulated pollutants at the Lafarge plant are: total particulate matter (PM); PM less than 10 micrometers in diameter (PM_{10}); PM less than 2.5 micrometers in diameter ($PM_{2.5}$); sulfur oxides (SO_x); nitrogen oxides (NO_x); carbon monoxide (CO); lead (Pb); and fluorides.

The procedure for estimating PSD baseline emissions under EPA's rules follows the requirements in 40 CFR 52.21. The baseline emissions from all stationary sources, which must include quantifiable fugitive emissions, can be based on the plant's actual emissions in any consecutive 24-month period in the last 10 years, as selected by Lafarge. Lafarge has selected 8/04-7/06 as the baseline period. The average clinker production during the baseline period was 1,722,837 tons per year (tons/yr). The actual emissions must be adjusted downward to reflect any applicable requirements during the baseline period that the plant had not yet complied with.

As of the date of the permit application, no applicable requirements have been identified that would mandate a downward adjustment.

The pollutants potentially subject to NNSR under Subpart 231-2 (6 NYCRR) are volatile organic compounds (VOC) and NO_x. Other PSD-regulated pollutants are potentially subject to Subpart 231-8. Under Subparts 231-2 and 231-8, the baseline emissions are to be based on the most recent 2-year period unless another 2-year period (within the last 5 years) is shown to be more representative of normal operations. To simplify the analysis, Lafarge proposes to use 8/04-7/06 as the baseline period for all pollutants,since NO_x is a PSD pollutant (because the area is attainment for NO_2) as well as a nonattainment pollutant (as an ozone precursor).

With respect to the baseline for VOC, it should be noted that a different approach has been used to project annual emissions based on a source test than was used in the emissions statements filed by the plant for 2004 and 2005. Both are based on a source test conducted in February 2004 which reported an emission rate of 55.2 lbs/hr. The emission statements were based on the 55.2 lbs/hr times the kiln operating hours, which would not be appropriate for kiln clinker rates higher or lower than the rate during the source test. Instead, a more accurate approach was used in this netting analysis, whereby an emission factor of 0.25 lbs VOC/t of clinker was calculated from the source test and then multiplied by the clinker produced in the baseline years. Lafarge believes that this is a more appropriate approach and thus it was used for the other gaseous pollutants as well.

With respect to PM emissions, there are a number of differences between the baseline inventory and the emission statements submitted for 2004 and 2005. The major differences involve 1) the baseline inventory includes condensables from the kilns based on a March 2005 stack test while the emission statements included only filterable PM (a difference of 239.3 tons/yr), 2) the baseline inventory more completely accounts for fugitive emissions from paved and unpaved roads, piles, process fugitives, and quarry emissions, and 3) the baseline inventory includes emissions from Exempt sources, while the emission statements do not. The inclusion of condensables in the baseline inventory was verbally approved by the NYSDEC in several early meetings on the project. The inclusion of condensables is consistent with long-standing EPA policy and guidance that PM_{10} and $PM_{2.5}$ include condensables (see 73 FR at 28334, May 15, 2008). Lafarge believes the baseline inventory is the most accurate estimate of all plantwide emissions and has filed revised emission fee reports for years since 2004 using the techniques and assumptions employed in the baseline inventory.

Emissions at Current Plant Capacity

Emissions that would occur at the current capacity of the plant (1.88 million tons/yr of clinker) have been estimated for information purposes. Part of these estimates are used in the calculations for determining the net emission changes for existing equipment that is being retained and modified. See discussion under Net Emission Increase for further explanation.

PTE of the Modified Plant

The PTE is maximum plantwide stationary source emissions under the plant's physical and operational design after modification. This includes compliance with all applicable State and Federal requirements as well as any emission, throughput, or operating hour limits requested by Lafarge and included in the air permits issued by DEC and EPA. The pollutants covered by the PTE inventory include the baseline pollutants discussed above plus applicable pollutants regulated under DEC's Guidelines for Control of Toxic Ambient Air Contaminants (TAACs) (Air Guide 1).

The list of TAACs to be evaluated were determined by examining various references for toxic emission factors from Portland cement kilns, including EPA's AP-42, the Factor Information Retrieval (FIRE) System, EPA's Toxic Release Inventory (TRI) reporting guidance and data from a 2004 source test on the existing kilns; 48 TAACs were evaluated.

Consistent with DEC policy, the TAAC emissions analysis focuses on the new major TAAC emission source, the kiln stack. This is because the overwhelming majority of TAAC emissions from the plant are from the kiln stack and because the emission factors are specific to the kiln.

Both the baseline and the PTE inventory include all fugitive PM sources at the plant (e.g., process fugitives, paved and unpaved roads, and raw material storage piles) and condensable PM from the kiln stack.

It should be noted that the PTE for PM, PM_{10}, and $PM_{2.5}$ from the new kiln system assumes that the condensable emissions will be 75 percent lower than the "uncontrolled" AP-42 emissions, due to the wet scrubber. This equates to a final condensable emission rate of 0.040

lb/ton of clinker. The wet scrubber reduces the kiln gas temperature during normal operation (raw mill and coal mill on) from 181 °F to 120 °F, converting a significant portion of the condensables to solid or liquid particles which are removed in the scrubber or causing the condensables to condense onto other particles. In PM tests at the Lehigh Cement Company in Mason City, Iowa, conducted in April and May 2006 on a preheater/precalciner kiln equipped with a wet scrubber, the measured condensable emission rates were: Mill-on: 0.033 lb/ton clinker and mill-off: 0.038 lb/ton clinker. Thus, Lafarge believes that the reduction in condensable emissions due to the scrubber is reasonable and fully supported by theory and empirical data.

Net Emission Increase

The applicability of certain State and Federal rules is contingent on whether the project results in a significant net emission increase as discussed below.

As noted above, the Ravena area is in attainment with all the National Ambient Air Quality Standards (NAAQS) except for the 8-hour ozone standard. Also, because all of New York State is in the ozone transport region, VOC and NO_x are treated as nonattainment contaminants statewide. The existing Lafarge plant is considered a major facility for VOC and NO_x under Subpart 231-2 of New York's Air Resource rules (6 NYCRR Part 231). The facility is also considered a major source under the PSD rules at 40 CFR 52.21 and Subpart 231-8. If the modification project proposed by Lafarge would result in a significant net emission increase of VOC or NO_x (40 tons per year of either pollutant), the facility would be subject to the Nonattainment New Source Review (NNSR) requirements of Subpart 231-2. If the project would result in a significant net emission increase of any other PSD-regulated pollutant (as defined in § 52.21 and Subpart 231-8), the facility would be subject to the EPA and New York PSD rules for that pollutant (or pollutants).

The determination as to whether there is a significant net emission increase for PSD pollutants is based on the procedures in 40 CFR 52.21 and Subpart 231-8. Because the project involves the construction of new sources and the modification of existing sources, the hybrid test for PSD applicability under Section 52.21(a)(2)(iv)(f) and Subpart 231-4.1 (b) (29) and (39) was followed. Under these procedures, the projected actual emissions for existing sources that remain are adjusted downward to account for the emissions the units could have accommodated during the baseline period that are unrelated to the project, including any increased utilization due to demand growth. The production the plant was capable of accommodating during the baseline period was 1.88 million tons/yr of clinker, a rate that was actually produced in the late 1990's (versus actual production of 1.72 million tons/yr in the baseline period). The emissions from existing sources associated with this difference are subtracted from the projected actual emissions for determining PSD applicability. This adjustment is not allowed for determining NNSR applicability under Subpart 231-2. In any case, this adjustment affects only PM, PM_{10}, and $PM_{2.5}$ emissions, because there are no existing sources of other pollutants (e.g., SO_2, NO_x, VOC, and CO) that remain after completion of the project (i.e., the existing kilns will be shut down). For new emission units, the actual to potential test under 40 CFR 52.21(a)(2)(d)and Subpart 231-4.1 (b) (39) was used in determining the net emission increase at the plant. Finally, the net emission increase calculations included minor PM emission increases that are contemporaneous [as defined at 40 CFR 52.21(b)(3) and Subpart 231-4.1 (b) (29) (ii)] with the proposed project.

Based on these procedures, there will be no significant net emission increase for any pollutant except CO. Emissions of PM_{10}, $PM_{2.5}$, SO_2 and NO_x are expected to decrease. Therefore, only the PSD requirements for CO will be triggered, as shown in following table.

EMISSIONS AT CURRENT PLANT CAPACITY

NET EMISSION CHANGES FROM LAFARGE MODERNIZATION PROJECT
(SHORT TONS PER YEAR)

Pollutant	Baseline Actual Emissions[1]	Emissions at Current Capacity	Future Emissions	Net Emissions Increase[2]	Significant Net Increase Level	Triggers Major Source NSR?
PM	1,069.0	1,217.5	1,170.9	13.5	25	No
PM_{10}	821.0	909.0	802.1	-52.9	15	No
$PM_{2.5}$	558.8	610.0	411.5	-156.2	10	No
SO_2	11,825.5	12,899.9	1,969.3	-9,856.2	40	No
NO_X	5,223.0	5,682.0	3,232.1	-1,990.9	40	No
CO	965.9	1,053.9	3,512.8	2,546.8	100	Yes
VOC	215.4	235.1	254.5	39.0	40	No
Lead	0.16	0.17	0.25	0.09	0.6	No
Fluorides	0.42	0.46	1.26	0.84	3	No

[1] As defined at 40 CFR 52.21(b)(48). The 24-month baseline period is August 2004 - July 2006

[2] Determined under the hybrid test for PSD applicability of 40 CFR 52.21(a)(2)(iv)(f).

Emissions Summary

Pollutant	Future Emissions (tons/yr)	Net Emissions Change (tons/yr)	PSD Significance Threshold	Requires PSD Review?
PM	1,170.94	13.46	25	No
PM10	802.09	-52.86	15	No
PM2.5	411.47	-156.15	10	No
SO2	1,969.27	-9,856.18	40	No
NOX	3,232.08	-1,990.91	40	No
CO	3,512.77	2,546.83	100	Yes
VOC	254.46	39.03	40	No
Lead	0.25	0.09	0.6	No
Fluoride	1.26	0.84	3	No

Clinker production (st/yr)	2,809,939
Clinker (mt/yr)	2,549,160
Clinker (mt/day)	**8,000**

Notes - Cement Plant

Annual capacity factor is 0.873
Kiln emissions include condensibles; assumes 75% future reduction by scrubber or other controls
Assumes new kiln will comply with proposed NSPS limits for PM
SO2 and NOx emissions based on discussions with EPA and DEC for modified plant
Assumes raw mill, kiln, clinker cooler, preblend systems, clinker storage, and new finish mill are built
Assumes two existing finish mills are modified and used (no limit on operating hours)
Assumes all new roads are unpaved; existing roads are unchanged
Assumes dust collectors are limited to 0.01 gr/acf (existing) & 0.008 gr/scf (new)

RAVENA NETTING ANALYSIS (PM)

1. PM (TSP) Emissions

Emission Unit	Emissions at Current Capacity[1]	Baseline Emissions[2] (A)	Emissions Adjustment[3] (B)	Future Emissions (C)	Emissions Change[4] (C - B) - A
Existing Kilns	474.38	434.82	NA	0	-434.82
Existing Clinker Coolers	121.78	114.08	NA	0	-114.08
Misc. Equipment Being Shut Down	150.82	138.70	NA	0	-138.70
Existing Equipment To Remain	173.55	159.23	14.32	78.76	-94.79
Process Fugitive Sources	25.84	24.07	1.78	28.42	2.58
Storage Piles	6.68	6.68	0.00	8.06	1.39
Quarry Operations	32.36	24.45	7.91	36.11	3.75
Plant & Quarry Roads	232.05	166.99	65.06	284.44	52.39
New Kiln & Clinker Cooler	0	0	NA	297.85	297.85
New Misc. Equipment	0	0	NA	437.30	437.30
Totals	1,217.46	1,069.01	89.07	1,170.94	12.86
Contemporaneous Increase[5]					0.60
Net Emissions Change					13.46
PSD Threshold					25.00
Triggers Major Source NSR?					No

2. PM10 Emissions

Emission Unit	Emissions at Current Capacity[1]	Baseline Emissions[2] (A)	Emissions Adjustment[3] (B)	Future Emissions (C)	Emissions Change[4] (C - B) - A
Existing Kilns	442.12	405.22	NA	0	-405.22
Existing Clinker Coolers	102.29	95.83	NA	0	-95.83
Misc. Equipment Being Shut Down	126.69	116.51	NA	0	-116.51
Existing Equipment To Remain	145.78	133.76	12.03	66.15	-79.63
Process Fugitive Sources	12.15	11.31	0.84	13.35	1.20
Storage Piles	3.34	3.34	0.00	4.03	0.69
Quarry Operations	12.03	8.69	3.34	13.21	1.18
Plant & Quarry Roads	64.59	46.32	18.27	78.82	14.22
New Kiln & Clinker Cooler	0	0	NA	259.19	259.19
New Misc. Equipment	0	0	NA	367.33	367.33
Totals	908.99	820.98	34.48	802.09	-53.36
Contemporaneous Increase (Note 1)					0.50
Net Emissions Change					-52.86
PSD Threshold					25.00
Triggers Major Source NSR?					No

RAVENA NETTING ANALYSIS (PM)

3. PM2.5 Emissions

Emission Unit	Emissions at Current Capacity[1]	Baseline Emissions[2] (A)	Emissions Adjustment[3] (B)	Future Emissions (C)	Emissions Change[4] (C - B) - A
Existing Kilns	397.17	364.03	NA	0	-364.03
Existing Clinker Coolers	54.80	51.34	NA	0	-51.34
Misc. Equipment Being Shut Down	67.87	62.41	NA	0	-62.41
Existing Equipment To Remain	78.10	71.66	6.44	35.44	-42.66
Process Fugitive Sources	1.89	1.76	0.13	2.08	0.19
Storage Piles	0.50	0.50	0.00	0.60	0.10
Quarry Operations	2.71	2.09	0.62	3.05	0.35
Plant & Quarry Roads	6.92	5.01	1.90	8.56	1.64
New Kiln & Clinker Cooler	0	0	NA	164.94	164.94
New Misc. Equipment	0	0	NA	196.78	196.78
Totals	609.95	558.80	9.09	411.47	-156.42
Contemporaneous Increase (Note 1)					0.27
Net Emissions Change					-156.15
PSD Threshold					25.00
Triggers Major Source NSR?					No

Notes

1. Current capacity defined as 1,880,000 tpy clinker.
2. Baseline emissions as defined at 40 CFR 52.21(b)(48). The 24-month baseline period is 8/04 - 7/06.
3. Adjustment to projected actual emissions of existing emissions units to exclude emissions that such existing units could have accomodated during the baseline period as per 40 CFR 52.21(b)(41)(ii)(c).
4. Determined under the hybrid test for PSD applicability under 40 CFR 52.21(a)(2)(iv).
5. See separate calculations for details of contemporaneous emission changes.

RAVENA NETTING ANALYSIS (GASES)

1. SO2 Emissions

Emission Unit	Emissions at Current Capacity[1]	Baseline Emissions[2] (A)	Emissions Adjustment[3] (B)	Future Emissions (C)	Emissions Change[4] (C - B) - A
Existing Kilns	12,899.94	11,825.45	NA	0	-11,825.45
New Kiln & Clinker Cooler	0	0	NA	1,966.96	1,966.96
New Misc. Equipment	0	0	NA	2.31	2.31
Totals	12,899.94	11,825.45	0.00	1,969.27	
Net Emissions Change					-9,856.18
PSD Threshold					40.00
Triggers Major Source NSR?					No

2. NOx Emissions

Emission Unit	Emissions at Current Capacity[1]	Baseline Emissions[2] (A)	Emissions Adjustment[3] (B)	Future Emissions (C)	Emissions Change[4] (C - B) - A
Existing Kilns	5,682.01	5,223.00	NA	0	-5,223.00
New Kiln & Clinker Cooler	0	0	NA	3,231.43	3,231.43
New Misc. Equipment	0	0	NA	0.65	0.65
Totals	5,682.01	5,223.00	0.00	3,232.08	
Net Emissions Change					-1,990.91
PSD Threshold					40.00
Triggers Major Source NSR?					No

3. CO Emissions

Emission Unit	Emissions at Current Capacity[1]	Baseline Emissions[2] (A)	Emissions Adjustment[3] (B)	Future Emissions (C)	Emissions Change[4] (C - B) - A
Existing Kilns	1,053.90	965.94	NA	0	-965.94
New Kiln & Clinker Cooler	0	0	NA	3,512.42	3,512.42
New Misc. Equipment	0	0	NA	0.34	0.34
Totals	1,053.90	965.94	0.00	3,512.77	
Net Emissions Change					2,546.83
PSD Threshold					100.00
Triggers Major Source NSR?					Yes

4. VOC Emissions

Emission Unit	Emissions at Current Capacity[1]	Baseline Emissions[2] (A)	Emissions Adjustment[3] (B)	Future Emissions (C)	Emissions Change[4] (C - B) - A
Existing Kilns	235.08	215.43	NA	0	-215.43
New Kiln & Clinker Cooler	0	0	NA	254.44	254.44
New Misc. Equipment	0	0	NA	0.02	0.02
Totals	235.08	215.43	0.00	254.46	
Net Emissions Change					39.03
PSD Threshold					40.00
Triggers Major Source NSR?					No

Notes

1. Current capacity defined as 1,880,000 tpy clinker.
2. Baseline emissions as defined at 40 CFR 52.21(b)(48). The 24-month baseline period is 8/04 - 7/06.
3. Adjustment to projected actual emissions of existing emissions units to exclude emissions that such existing units could have accomodated during the baseline period as per 40 CFR 52.21(b)(41)(ii)(c).
4. Determined under the hybrid test for PSD applicability under 40 CFR 52.21(a)(2)(iv).

RAVENA NETTING ANALYSIS (OTHER POLLUTANTS)

1. Lead Emissions

Emission Unit	Emissions at Current Capacity[1]	Baseline Emissions[2] (A)	Emissions Adjustment[3] (B)	Future Emissions (C)	Emissions Change[4] (C - B) - A
Existing Kilns	0.17	0.16	NA	0	-0.16
New Kiln & Clinker Cooler	0	0	NA	0.25	0.25
Totals	0.17	0.16	0.00	0.25	
Net Emissions Change					0.09
PSD Threshold					0.60
Triggers Major Source NSR?					No

2. Fluoride Emissions

Emission Unit	Emissions at Current Capacity[1]	Baseline Emissions[2] (A)	Emissions Adjustment[3] (B)	Future Emissions (C)	Emissions Change[4] (C - B) - A
Existing Kilns	0.46	0.42	NA	0	-0.42
New Kiln & Clinker Cooler	0	0	NA	1.26	1.26
Totals	0.46	0.42	0.00	1.26	
Net Emissions Change					0.84
PSD Threshold					3.00
Triggers Major Source NSR?					No

Notes

1. Current capacity defined as 1,880,000 tpy clinker.
2. Baseline emissions as defined at 40 CFR 52.21(b)(48). The 24-month baseline period is 8/04 - 7/06.
3. Adjustment to projected actual emissions of existing emissions units to exclude emissions that such existing units could have accomodated during the baseline period as per 40 CFR 52.21(b)(41)(ii)(c).
4. Determined under the hybrid test for PSD applicability under 40 CFR 52.21(a)(2)(iv).

Contemporaneous Emission Changes

Date (Period)	Process Group	Emission Point ID	Description	Control Device	Material Processed	Annual Operation hrs/yr	Flow ACFM	Grain Loading gr/acf	PM Emis lb/hr	PM Emis TPY	PM10 Fraction	PM10 Emis TPY	PM2.5 Fraction	PM2.5 Emis TPY
1. Replacement of CKD Pelletizer with a Pugmill (10/05)														
1a. Emissions Before Change			(7000 acfm dust collector included in Baseline Emissions)											
1b. Emissions After Change			(4500 acfm dust collector included in Future Emissions)											
1c. Contemporaneous Emissions Change (Accounted for in Netting Analysis)														
2. Modification of CKD Loadout with Addition of New Dust Collector (6/06)														
2a. Emissions Before Change			(None)											
2b. Emissions After Change			(1000 acfm dust collector included in Future Emissions)											
2007		43106	CKD Loadout	5DC12	Cement	1,664	1,000	0.02	0.17	0.14	0.84	0.12	0.45	0.06
2c. Contemporaneous Emissions Change (New - Old))										0.14		0.12		0.06
3. Replaced Baghouse on Cement Finish Mill #4 (12/06)														
3a. Emissions Before Change														
2004-2005	CM4	53401	CM 4 Discharge D/C	5DC12	Cement	6,076	16,500	0.02	2.83	8.59	0.84	7.22	0.45	3.87
3b. Emissions After Change														
2007	CM4	53401	CM 4 Discharge D/C	5DC12	Cement	5,279	20,000	0.02	3.43	9.05	0.84	7.60	0.45	4.07
3c. Contemporaneous Emissions Change (New - Old)										0.46		0.38		0.21
4. Convert East Storage Silo to Store Limestone & Add Dust Collector (12/07)														
4a. Emissions Before Change			(None - the east silo previously stored flyash and was vented to the west silo with both controlled by a different existing DC)											
4b. Emissions After Change			(1250 acfm dust collector included in Future Emissions)											
4c. Contemporaneous Emissions Change (Accounted for in Netting Analysis)														
Sum of Applicable Emission Changes										**0.60**		**0.50**		**0.27**

Plantwide Total Emissions

Existing Capacity

EU Description	PM tons/yr	PM_{10} tons/yr	$PM_{2.5}$ tons/yr	SO_2 tons/yr	NO_X tons/yr	CO tons/yr	VOC tons/yr	Lead tons/yr	Fluoride tons/yr
Kiln System	473.65	441.59	396.70	12,868.60	5,677.60	1,052.80	235.00	0.17	0.46
Kiln Preheaters & Coal Mill Booster Heaters	0.73	0.53	0.47	31.34	4.41	1.10	0.08		
Kiln System (Total)	474.38	442.12	397.17	12,899.94	5,682.01	1,053.90	235.08	0.17	0.46
Clinker Coolers	121.78	102.29	54.80						
Miscellaneous Point Sources	324.37	272.47	145.97						
Process Equipment Fugitives	25.84	12.15	1.89						
Storage Piles	6.68	3.34	0.50						
Quarry Operations	32.36	12.03	2.71						
Roads	232.05	64.59	6.92						
Total	**1,217.46**	**908.99**	**609.95**	**12,899.94**	**5,682.01**	**1,053.90**	**235.08**	**0.17**	**0.46**

Clinker production = **1,880,000 tons/yr**
1,705,525 metric

Notes
Actual projected emissions are shown for all pollutants except SO2 and NOx emitted by the kiln system.
Kiln PM emissions include condensibles. See "Kiln System" sheet for details.

Operation/Material	Capacity tons/hr	Average tons/hr	Existing Capacity tons/yr	hrs/yr	%
Quarry					
Overburden moved			55,344		
New Scotland LS (to waste)			3,637,104		
Kalkberg			1,674,059		
Coeymans			2,148,236		
Becraft			81,834		
New Scotland LS (Callanan)			1,062,275		
Total			4,966,404		
Primary Crusher		1,131	4,966,404	4,392	
Raw Materials Used					
Kalkberg			1,674,059		
Aggregate (plant roads etc)			16,291		
Coeymans			2,329,696		
Becraft			92,137		
Subtotal LS reclaim			2,421,832		
Bauxite			44,978		
Gypsum			117,352		
Total (Belt 3/4)			2,584,162		
Secondary Crusher	1,250	296		8,732	
Iron			51,014		
Coke			67,293		
Subtotal (auxilliary hopper)			118,307		
Fly Ash transfer	33		112,669	8,760	
Total (Raw Mill Input)			2,630,493		
Raw Mill #1	300	222	1,416,133	6,384	
Raw Mill #2	300	222	1,416,133	6,384	
Raw mix produced	600	444	2,832,267		
Raw mix used			2,832,267		
Dry kiln feed			3,075,680		
Kiln #1 & Clinker Cooler #1	130	118	940,000	7,959	
Kiln #2 & Clinker Cooler #2	130	118	940,000	7,959	
Clinker produced	260	236	1,880,000	7,959	1.0861
Dust Scoop System	55			7,801	
Clinker Hall Silo #8			940,000	7,556	
Clinker Hall Silo #11			940,000	7,213	
Clinker Hall Storage Bins			564,000		30%
CKD Pugmill (Pelletizer)		36	155,842	4,380	8.3%
Kiln Fuels Used					
Coal			303,635		
Coke			60,963		
Subtotal solid fuels			364,598		
Fuel oil (gallons)			441,375		
Natural gas (MMCF)			6.7		
Finish Materials					
Gypsum			117,352		5.9%
Finish Mills (Cement)					

Operation/Material	Capacity	Average	Existing Capacity		
	tons/hr	tons/hr	tons/yr	hrs/yr	%
Cement Mill #1	90	83	496,317	5,989	
Cement Mill #2	90	83	496,317	5,989	
Cement Mill #3	90	83	496,317	5,989	
Cement Mill #4	90	83	496,317	5,989	
Total cement	360	331	1,985,268		
Customer Silos			417,648	8,760	
Masonry Fringe Silo				8,760	
Buffer Silos			1,438,637	8,760	
Buffer Silos Discharge			1,438,637	2,818	
Truck Loading					
Bulk cement			417,648		
Bulk masonry			59,804		
Total			477,452	3,183	23%
Truck Loadout N/S (each)	214	150	238,726	1,592	
CKD truck loadout			35,303	1,664	
Rail Loading (cement)		500	15,856	32	1%
Packhouse			115,611	3,011	6%
Bags packed (number)			2,890,283	3,011	
Packing E/W (each)	70.5	38	57,806	1,505	
Vacuum system				1,505	
Bag shredder				0	
Barge Loading (cement)	1,000	510	1,438,637	2,818	70%
Total Cement Shipped			2,047,557		100%
Rail Unloading					
Coal			255,454		
Coke			67,293		
Total			322,748	4,992	
Barge Unloading					
Gypsum			138,061	1,248	
Truck Unloading					
Fly Ash (silo)			112,274	8,760	
Bauxite			44,926		
Iron			43,650		
Total			200,849		
Miscellaneous					
Quarry Drilling (feet)			295,364		
Blasts (number)			170		

Kiln System (Main Stack)

Pollutant	Emission Factor	lb/T basis	Note	Test lbs/hr	Total tons/yr	Average lbs/hr	Permit Limits				
PM (Filterable)	0.139	kiln feed	1	52.08	213.76	53.71	0.30	lb/T KF	Total Kiln Feed	3,075,680	TPY
PM10 (Filterable)	0.118	kiln feed	2	44.27	181.70	45.66			Total Clinker	1,880,000	TPY
PM2.5 (Filterable)	0.089	kiln feed	3	33.33	136.81	34.38			Operation	7,959	hrs/yr
Condensible PM	0.169	kiln feed	1	63.36	259.89	65.31			Clinker	236	tph
PM (Total)				115.44	473.65	119.02				5,669	tpd
PM10 (Total)				107.63	441.59	110.96				5,143	mtpd
PM2.5 (Total)				96.69	396.70	99.68					
SO2	13.69	clinker	4	3073	12868.60	3233.6					
NOX	6.04	clinker	5	NA	5677.60	1426.7					
CO	1.12	clinker	6	252.4	1052.80	264.5	300	1,446.25	lbs/hr & tons/yr		
VOC	0.25	clinker	6	55.2	235.00	59.1					
Lead	1.13E-04	kiln feed	6	0.040	0.17	0.044					
Fluoride	3.01E-04	kiln feed	6,7	0.108	0.46	0.116					

Notes

1 Pollutant emissions derived from March 2005 kiln stack test
2 PM10 estimated at 85% of PM emissions for kilns with ESPs using AP-42 Table 11.6-5
3 PM2.5 estimated at 64% of PM emissions for kilns with ESPs using AP-42 Table 11.6-5
4 SO2 emissions derived from February 2004 kiln stack test
5 NOx emission factor derived from 2004-2005 baseline CEMS data
6 Pollutant emissions derived from February 2004 kiln stack test
7 Fluoride emissions not detected. Emissions are shown at the detection limit.

Clinker Cooler #1 Stack

Pollutant	Emission Factor	lb/T basis	Note	Test lbs/hr	Total tons/yr	Average lbs/hr	Permit Limits				
PM	0.092	kiln feed	8	17.80	70.84	17.80	0.10	lb/T KF	Kiln Feed	1,537,840	TPY
PM10	0.077	kiln feed	9	14.95	59.50	14.95			Clinker	940,000	TPY
PM2.5	0.041	kiln feed	10	8.01	31.88	8.01			Operation	7,959	hrs/yr

Clinker Cooler #2 Stack

Pollutant	Emission Factor	lb/T basis	Note	Test lbs/hr	Total tons/yr	Average lbs/hr	Permit Limits				
PM	0.066	kiln feed	8	12.80	50.94	12.80	0.10	lb/T KF	Kiln Feed	1,537,840	TPY
PM10	0.056	kiln feed	9	10.75	42.79	10.75			Clinker	940,000	TPY
PM2.5	0.030	kiln feed	10	5.76	22.92	5.76			Operation	7,959	hrs/yr

Clinker Cooler #1 and #2 Total

Pollutant	Emission Factor	lb/T basis	Note	Test lbs/hr	Total tons/yr	Average lbs/hr	Permit Limits				
PM				30.60	121.78	30.60			Kiln Feed	3,075,680	TPY
PM10				25.70	102.29	25.70			Clinker	1,880,000	TPY
PM2.5				13.77	54.80	13.77			Operation	7,959	hrs/yr

Notes

8 Pollutant emissions from 2002 clinker cooler stack test
9 PM10 estimated at 84% of PM emissions with fabric filters using AP-42 Table 11.6-5
10 PM2.5 estimated at 45% of PM emissions with fabric filters using AP-42 Table 11.6-5

Kiln Preheaters & Booster Heaters (External Combustion)

Annual Emissions:

Unit ID	Exhaust Point ID	Description	Fuel	Fuel Rate 1000 gal/yr	PM tons/yr	PM10 tons/yr	PM2.5 tons/yr	SO2 tons/yr	NO_X tons/yr	CO tons/yr	VOC tons/yr
		Emissions w/ Filterable PM	No. 2 fuel oil	441.375	0.44	0.24	0.18	31.34	4.41	1.10	0.08
		Condensible PM	No. 2 fuel oil	441.375	0.29	0.29	0.29				
		Total Emissions			0.73	0.53	0.47	31.34	4.41	1.10	0.08

Notes:
Burner firing rate, each 6.1 MW/hr / 0.2931 MW/MMBtu = 20.8 MMBtu/hr (startup only)
Controlled PM emissions from natural gas combustion are negligible; PM emissions are included elsewhere in the finish mill baghouse emission estimates.

Emissions Basis:

Pollutant	Emission Factor	EF Units	Source of EF
PM	2	lb/1000gal	AP-42 Table 1.3-1
PM10	1.08	lb/1000gal	AP-42 Table 1.3-7
PM2.5	0.83	lb/1000gal	AP-42 Table 1.3-7
Condensible	1.3	lb/1000gal	AP-42 Table 1.3-2
SO_2	142	lb/1000gal	AP-42 Table 1.3-1
NO_X	20	lb/1000gal	AP-42 Table 1.3-1
CO	5	lb/1000gal	AP-42 Table 1.3-1
VOC	0.34	lb/1000gal	AP-42 Table 1.3-3

Process Group	Emission Point ID	Description	Control Device	Material Processed	Oper-ation hrs/yr	Note	Flow ACFM	Grain Loading gr/acf	PM Emis lb/hr	PM Emis TPY	PM10 Fraction	PM10 Emis TPY	PM2.5 Fraction	PM2.5 Emis TPY	Future Source	PM BL Future Equip TPY	PM10 BL Future Equip TPY	PM2.5 BL Future Equip TPY
PCR	32002	Primary Crusher-Rock Box D/C	DC	Limestone	4,392		3,000	0.02	0.51	1.13	0.84	0.95	0.45	0.51	X	1.13	0.95	0.51
PCR	32002	Primary Crusher-Belt 1 D/C	DC	Limestone	4,392		4,500	0.02	0.77	1.69	0.84	1.42	0.45	0.76	X	1.69	1.42	0.76
LCR, RX1	34301	Secondary Crusher D/C	DC	Raw mix	8,732		15,000	0.02	2.57	11.23	0.84	9.43	0.45	5.05	X	11.23	9.43	5.05
RM1	35101	Raw Mill 1 Scrubber	IPS	Raw mix	0	2	10,000	0.02	1.71	0.00	0.84	0.00	0.45	0.00				
RM2	35201	Raw Mill 2 Scrubber	IPS	Raw mix	0	2	10,000	0.02	1.71	0.00	0.84	0.00	0.45	0.00				
K12	43101	Main Kiln Stack	ESPs	CKD	7,959		880,000	0.007	53.71	213.76	0.85	181.70	0.64	136.81				
CC1	45101	Kiln 1 Clinker Cooler D/C	DC	Clinker	7,959		137,500	0.015	17.80	70.84	0.84	59.50	0.45	31.88				
CC2	45201	Kiln 2 Clinker Cooler D/C	DC	Clinker	7,959		137,500	0.011	12.80	50.94	0.84	42.79	0.45	22.92	X	50.94	42.79	22.92
FAX	46012	Fly Ash Silo (W) D/C	DC	Fly ash	8,760		7,000	0.02	1.20	5.26	0.84	4.42	0.45	2.37				
FAX	46013	Fly Ash Transfer D/C	DC	Fly ash	8,760		2,500	0.02	0.43	1.88	0.84	1.58	0.45	0.84				
RX2	46017	Belt 7 Discharge D/C	DC	Raw mix	8,732		4,000	0.02	0.69	2.99	0.84	2.51	0.45	1.35	X	2.99	2.51	1.35
FX1	53102	CM 1 Separator D/C	DC	Cement	5,989		45,000	0.02	7.71	23.10	0.84	19.41	0.45	10.40				
FX2	53202	CM 2 Separator D/C	DC	Cement	5,989		45,000	0.02	7.71	23.10	0.84	19.41	0.45	10.40				
FX3	53302	CM 3 Separator D/C	DC	Cement	5,989		45,000	0.02	7.71	23.10	0.84	19.41	0.45	10.40				
FX4	53402	CM 4 West Separator D/C	DC	Cement	5,989		48,000	0.02	8.23	24.64	0.84	20.70	0.45	11.09				
FX5	53403	CM 4 East Separator D/C	DC	Cement	5,989		48,000	0.02	8.23	24.64	0.84	20.70	0.45	11.09				
DS1	43102	Kiln 1 Feed End D/C	DC	Raw mix	7,959		4,000	0.02	0.69	2.73	0.84	2.29	0.45	1.23				
DS1	43103	Dust Scoop D/C	DC	CKD	7,801		15,000	0.02	2.57	10.03	0.84	8.42	0.45	4.51				
CX1	46008	Silo 8 D/C	DC	Clinker	7,556		5,000	0.02	0.86	3.24	0.84	2.72	0.45	1.46	X	3.24	2.72	1.46
CX1	46011	Silo 11 D/C	DC	Clinker	7,213		5,000	0.02	0.86	3.09	0.84	2.60	0.45	1.39	X	3.09	2.60	1.39
CX2	46018	Kiln 1 Clinker Transport D/C	DC	Clinker	7,959		22,000	0.02	3.77	15.01	0.84	12.61	0.45	6.75				
CX2	46019	Kiln 2 Clinker Transport D/C	DC	Clinker	7,959		16,050	0.02	2.75	10.95	0.84	9.20	0.45	4.93				
CM1	52101	CM 1 Auxillary D/C	DC	Cement	5,989		10,200	0.02	1.75	5.24	0.84	4.40	0.45	2.36	X	5.24	4.40	2.36
CM2	52201	CM 2 Auxillary D/C	DC	Cement	5,989		10,200	0.02	1.75	5.24	0.84	4.40	0.45	2.36				
CM3	52301	CM 3 Auxillary D/C	DC	Cement	5,989		10,200	0.02	1.75	5.24	0.84	4.40	0.45	2.36	X	5.24	4.40	2.36
CM4	52401	CM 4 Auxillary D/C	DC	Cement	5,989		21,000	0.02	3.60	10.78	0.84	9.06	0.45	4.85				
	57001	Buffer Silo Trans. to Belt 8A	DC	Cement	2,818		5,000	0.02	0.86	1.21	0.84	1.01	0.45	0.54	X	1.21	1.01	0.54
	57002	Belt 8A/8B Transfer House	DC	Cement	2,818		6,000	0.02	1.03	1.45	0.84	1.22	0.45	0.65	X	1.45	1.22	0.65
	57003	Belt 8A/9 Transfer House	DC	Cement	2,818		3,000	0.02	0.51	0.72	0.84	0.61	0.45	0.33	X	0.72	0.61	0.33
CMX	62001	Transfer to/from Buffer Silo Belt	DC	Cement	8,760		5,660	0.02	0.97	4.25	0.84	3.57	0.45	1.91	X	4.25	3.57	1.91
CM1	53101	CM 1 Discharge D/C	DC	Cement	5,989		25,000	0.02	4.29	12.83	0.84	10.78	0.45	5.78	X	12.83	10.78	5.78
CM2	53201	CM 2 Discharge D/C	DC	Cement	5,989		25,000	0.02	4.29	12.83	0.84	10.78	0.45	5.78				
CM3	53301	CM 3 Discharge D/C	DC	Cement	5,989		25,000	0.02	4.29	12.83	0.84	10.78	0.45	5.78	X	12.83	10.78	5.78
CM4	53401	CM 4 Discharge D/C	DC	Cement	5,989		16,500	0.02	2.83	8.47	0.84	7.12	0.45	3.81				
CL1	62007	West Truck Loading D/C	DC	Cement	1,592		7,000	0.02	1.20	0.95	0.84	0.80	0.45	0.43	X	0.95	0.80	0.43
CL2	62008	East Truck Loading D/C	DC	Cement	1,592		7,000	0.02	1.20	0.95	0.84	0.80	0.45	0.43	X	0.95	0.80	0.43
CL3	62009	Railcar Loading D/C	DC	Cement	32		7,000	0.02	1.20	0.02	0.84	0.02	0.45	0.01	X	0.02	0.02	0.01
BAG	63001	Bagging D/C (West)	DC	Cement	1,505		6,000	0.02	1.03	0.77	0.84	0.65	0.45	0.35	X	0.77	0.65	0.35
BAG	63002	Bagging D/C (East)	DC	Cement	1,505		6,000	0.02	1.03	0.77	0.84	0.65	0.45	0.35	X	0.77	0.65	0.35
PVC	63003	Packhouse Vacuum	DC	Cement	1,505		120	0.02	0.02	0.02	0.84	0.01	0.45	0.01	X	0.02	0.01	0.01
PBS	63004	Bag Shredder D/C	DC	Cement	0		4,000	0.02	0.69	0.00	0.84	0.00	0.45	0.00	X	0.00	0.00	0.00
PUG	00100	CKD Pelletizer	DC	CKD	4,380	1	7,000	0.02	1.20	2.63	0.84	2.21	0.45	1.18	X	2.63	2.21	1.18
CMB	58001	Transfer from Belt 9 to Barge	DC	Cement	2,818		10,000	0.02	1.71	2.42	0.84	2.03	0.45	1.09	X	2.42	2.03	1.09
	46014	Masonry Silo D/C	DC	Cement	8,760		2,000	0.02	0.34	1.50	0.84	1.26	0.45	0.68	X	1.50	1.26	0.68
	55001	Buffer Silo #6 D/C	DC	Cement	8,760		5,500	0.02	0.94	4.13	0.84	3.47	0.45	1.86	X	4.13	3.47	1.86
	55002	Buffer Silo #5 D/C	DC	Cement	8,760		5,500	0.02	0.94	4.13	0.84	3.47	0.45	1.86	X	4.13	3.47	1.86

Process Group	Emission Point ID	Description	Control Device	Material Processed	Oper-ation hrs/yr	Note	Flow ACFM	Grain Loading gr/acf	PM Emis lb/hr	PM Emis TPY	PM10 Fraction	PM10 Emis TPY	PM2.5 Fraction	PM2.5 Emis TPY	Future Source	PM BL Future Equip TPY	PM10 BL Future Equip TPY	PM2.5 BL Future Equip TPY
	55003	Buffer Silo #4 D/C	DC	Cement	8,760		5,500	0.02	0.94	4.13	0.84	3.47	0.45	1.86	X	4.13	3.47	1.86
	55004	Buffer Silo #3 D/C	DC	Cement	8,760		5,500	0.02	0.94	4.13	0.84	3.47	0.45	1.86	X	4.13	3.47	1.86
	55005	Buffer Silo #2 D/C	DC	Cement	8,760		5,500	0.02	0.94	4.13	0.84	3.47	0.45	1.86	X	4.13	3.47	1.86
	55006	Buffer Silo #1 D/C	DC	Cement	8,760		5,500	0.02	0.94	4.13	0.84	3.47	0.45	1.86	X	4.13	3.47	1.86
	62002	Customer Silos 1,9 D/C	DC	Cement	8,760		5,500	0.02	0.94	4.13	0.84	3.47	0.45	1.86	X	4.13	3.47	1.86
	62003	Customer Silos 2,10,11 D/C	DC	Cement	8,760		5,500	0.02	0.94	4.13	0.84	3.47	0.45	1.86	X	4.13	3.47	1.86
	62004	Customer Silos 3,4,12 D/C	DC	Cement	8,760		5,500	0.02	0.94	4.13	0.84	3.47	0.45	1.86	X	4.13	3.47	1.86
	62005	Customer Silos 5,13 D/C	DC	Cement	8,760		5,500	0.02	0.94	4.13	0.84	3.47	0.45	1.86	X	4.13	3.47	1.86
	62006	Customer Silos 6,7,8,14,15,16	DC	Cement	8,760		5,500	0.02	0.94	4.13	0.84	3.47	0.45	1.86	X	4.13	3.47	1.86
KCM	62010	K-Cement Railcar Loading	DC	Cement	0	2	1,800	0.02	0.31	0.00	0.84	0.00	0.45	0.00				
		Grand Total							193.21	659.91		556.46		337.57		173.55	145.78	78.10
		Total Without Kilns & Coolers							108.90	324.37		272.47		145.97				
														Equipment to be shut down		150.82	126.69	67.87

Notes

1 CKD pelletizer was replaced with a pugmill and 4500 acfm DC in 2006
2 Equipment is not operational or does not exist
3 Exempt equipment is not included

Emission Factor Calculation Sheet (Fugitives)

Material Transfer Operations		**PM**	**PM-10**	**PM-2.5**
k (particle size multiplier)		0.74	0.35	0.053

Mean Wind Speed (mph) Albany, NY *(Source: NCDC, long-term average)*	8.9	**PM EF (lb/ton handled)**	**PM-10 EF (lb/ton handled)**	**PM-2.5 EF (lb/ton handled)**
Limestone Average Moisture Content (%)	3	2.84E-03	1.34E-03	2.03E-04
Bauxite Average Moisture Content (%)	12	4.08E-04	1.93E-04	2.92E-05
Coal Average Moisture Content (%) As Rcvd	3.2	2.60E-03	1.23E-03	1.86E-04
Coke Average Moisture Content (%)	3.3	2.49E-03	1.18E-03	1.78E-04
Gypsum Average Moisture Content (%)	15	2.98E-04	1.41E-04	2.14E-05
Iron Average Moisture Content (%)	9	6.10E-04	2.89E-04	4.37E-05
Clinker Average Moisture Content (%)	0.05	8.77E-01	4.15E-01	6.28E-02
Additives Average Moisture Content (%)	10	5.26E-04	2.49E-04	3.77E-05
Raw Mix Average Moisture Content (%)	4	1.90E-03	8.98E-04	1.36E-04
CKD (Dry) Moisture Content (%)	0.05	8.77E-01	4.15E-01	6.28E-02
CKD (Conditioned) Moisture Content (%)	10	5.26E-04	2.49E-04	3.77E-05
Overburden Average Moisture Content (%)	2.1	4.68E-03	2.21E-03	3.35E-04

Material transfer factors from AP-42 Section 13.2.4.3 (Aggregate Handling and Storage Piles, 11/06)

E = k * 0.0032 * (U/5)^1.3 / (M/2)^1.4

E = transfer emission factor (lb/ton)
k = particle size multiplier
U = mean wind speed (mph)
M = material moisture content (%)

Crushing Operations	**Reference**	**PM EF (lb/ton)**	**PM-10 EF (lb/ton)**	**PM-2.5 EF (lb/ton)**
Primary crusher	1	0.0012	0.00054	0.00010

1) AP-42 Table 11.19.2-2 (Crushed Stone Processing, 8/04) (wet crushing = controlled)

Area	Emission Point ID	Description	Material	Control Type	Efficiency %	Throughput tons/yr	TSP Factor lbs/ton	TSP tons/yr	PM_{10} Factor lbs/ton	PM_{10} tons/yr	$PM_{2.5}$ Factor lbs/ton	$PM_{2.5}$ tons/yr
Primary Crushing		Truck unloading to crusher hopper	Limestone	None		4,966,404	2.84E-03	7.05	1.34E-03	3.34	2.03E-04	0.51
Primary Crushing		Primary crusher	Limestone	None		4,966,404	0.0012	2.98	0.00054	1.34	0.0001	0.25
Primary Crushing	NP20	Belt 1 to Belt 2 transfer point	Limestone	Covered	25	4,966,404	2.84E-03	5.29	1.34E-03	2.50	2.03E-04	0.38
Secondary Crushing	32001	Belt 2 drop to storage piles	Limestone	Spray system	50	4,966,404	2.84E-03	3.53	1.34E-03	1.67	2.03E-04	0.25
Secondary Crushing		Bauxite unloading	Bauxite	None		44,926	4.08E-04	0.01	1.93E-04	0.00	2.92E-05	0.00
Secondary Crushing		Gypsum unloading	Gypsum	None		117,352	2.98E-04	0.02	1.41E-04	0.01	2.14E-05	0.00
Secondary Crushing		Iron unloading	Iron Ore	None		43,650	6.10E-04	0.01	2.89E-04	0.01	4.37E-05	0.00
Secondary Crushing		Rock storage piles reclaim to Belt 3	Limestone	U/G Enclosure	90	2,421,832	2.84E-03	0.34	1.34E-03	0.16	2.03E-04	0.02
Secondary Crushing		Bauxite transfer to Stamler Feeder	Bauxite	None		44,978	4.08E-04	0.01	1.93E-04	0.00	2.92E-05	0.00
Secondary Crushing		Bauxite feeder to Belt 3	Bauxite	U/G Enclosure	90	44,978	4.08E-04	0.00	1.93E-04	0.00	2.92E-05	0.00
Secondary Crushing		Gypsum storage pile reclaim to Belt 3	Gypsum	U/G Enclosure	90	117,352	2.98E-04	0.00	1.41E-04	0.00	2.14E-05	0.00
Secondary Crushing	34101	Coal rail shaker/unloading hopper	Coal & Coke	Enclosure	50	322,748	2.60E-03	0.21	1.23E-03	0.10	1.86E-04	0.01
Secondary Crushing		Coal cracker	Coal & Coke	None		322,748	0.0012	0.19	0.00054	0.09	0.0001	0.02
Secondary Crushing	NP21	Coal Belt 4	Coal & Coke	None		322,748	2.60E-03	0.42	1.23E-03	0.20	1.86E-04	0.03
Secondary Crushing		Coal Belt 5	Coal	None		255,454	2.60E-03	0.33	1.23E-03	0.16	1.86E-04	0.02
Secondary Crushing	33005	Belt 5 drop to coal pile	Coal	Telescope chute	90	255,454	2.60E-03	0.03	1.23E-03	0.02	1.86E-04	0.00
Secondary Crushing		Coke Belt 6	Coke	None		67,293	2.49E-03	0.08	1.18E-03	0.04	1.78E-04	0.01
Secondary Crushing		Belt 6 drop to coke pile	Coke	None		67,293	2.49E-03	0.08	1.18E-03	0.04	1.78E-04	0.01
Secondary Crushing		Coal reclaim hopper	Coal	None		303,635	2.60E-03	0.39	1.23E-03	0.19	1.86E-04	0.03
Secondary Crushing	NP22	Coal Belt 6A	Coal	None		303,635	2.60E-03	0.39	1.23E-03	0.19	1.86E-04	0.03
Secondary Crushing	NP23	Auxilliary hopper/feeder (Coke & Iron)	Coke	None		118,307	2.49E-03	0.15	1.18E-03	0.07	1.78E-04	0.01
Secondary Crushing	NP24	Feeder to Belt 7 (Coke & Iron)	Coke	None		118,307	2.49E-03	0.15	1.18E-03	0.07	1.78E-04	0.01
Secondary Crushing		Raw Silos	Limestone	Enclosed in building	90	2,421,832	2.84E-03	0.34	1.34E-03	0.16	2.03E-04	0.02
Secondary Crushing		Raw Silos	Bauxite	Enclosed in building	90	44,978	4.08E-04	0.00	1.93E-04	0.00	2.92E-05	0.00
Secondary Crushing		Raw Silos	Iron Ore	Enclosed in building	90	51,014	6.10E-04	0.00	2.89E-04	0.00	4.37E-05	0.00
Secondary Crushing		Raw Silos	Gypsum	Enclosed in building	90	117,352	2.98E-04	0.00	1.41E-04	0.00	2.14E-05	0.00
Secondary Crushing		Coal Silos	Coal & Coke	Enclosed in building	90	364,598	2.60E-03	0.05	1.23E-03	0.02	1.86E-04	0.00
Secondary Crushing	50001	Conveyor 12 drop to aggregate surge pile	Limestone	Spray system	50	16,291	2.84E-03	0.01	1.34E-03	0.01	2.03E-04	0.00
Raw Mill 1		Raw Mill 1 additive belt	Additives	Enclosed in building	90	47,996	5.26E-04	0.00	2.49E-04	0.00	3.77E-05	0.00
Raw Mill 1		Raw Mill 1 feed belt	Raw Mix	Enclosed in building	90	1,416,133	1.90E-03	0.13	8.98E-04	0.06	1.36E-04	0.01
Raw Mill 2		Raw Mill 2 additive belt	Additives	Enclosed in building	90	47,996	5.26E-04	0.00	2.49E-04	0.00	3.77E-05	0.00
Raw Mill 2		Raw Mill 2 feed belt	Raw Mix	Enclosed in building	90	1,416,133	1.90E-03	0.13	8.98E-04	0.06	1.36E-04	0.01
CKD System	NP41	Waste dust silo truck loadout	CKD	Water spray	95	35,303	8.77E-01	0.77	4.15E-01	0.37	6.28E-02	0.06
CKD System		CKD Pugmill truck loading	CKD	None		155,842	5.26E-04	0.04	2.49E-04	0.02	3.77E-05	0.00

Area	Emission Point ID	Description	Material	Control Type	Efficiency %	Throughput tons/yr	TSP Factor lbs/ton	TSP tons/yr	PM_{10} Factor lbs/ton	PM_{10} tons/yr	$PM_{2.5}$ Factor lbs/ton	$PM_{2.5}$ tons/yr
CKD System		CKD unloading (landfill)	CKD	None		155,842	5.26E-04	0.04	2.49E-04	0.02	3.77E-05	0.00
Fuel Preparation		Coal Silo 1 to Belt C235	Coal & Coke	Enclosed in building	90	182,299	2.60E-03	0.02	1.23E-03	0.01	1.86E-04	0.00
Fuel Preparation		Belt C235 to feeder (Coal Mill 2)	Coal & Coke	Enclosed in building	90	182,299	2.60E-03	0.02	1.23E-03	0.01	1.86E-04	0.00
Fuel Preparation		Coal Silo 2 to Belt C135	Coal & Coke	Enclosed in building	90	182,299	2.60E-03	0.02	1.23E-03	0.01	1.86E-04	0.00
Fuel Preparation		Belt C135 to feeder (Coal Mill 1)	Coal & Coke	Enclosed in building	90	182,299	2.60E-03	0.02	1.23E-03	0.01	1.86E-04	0.00
Clinker Handling	NP40	Clinker drop to storage hall	Clinker	Enclosed & vented*	99	564,000	8.77E-01	2.47	4.15E-01	1.17	6.28E-02	0.18
Barge Unloading		Gypsum barge unloading hopper	Gypsum	None		138,061	2.98E-04	0.02	1.41E-04	0.01	2.14E-05	0.00
Barge Unloading	34401	Gypsum unloading belt	Gypsum	Water spray	50	138,061	2.98E-04	0.01	1.41E-04	0.00	2.14E-05	0.00
Barge Unloading		Gypsum belt drop to pile	Gypsum	Water spray	50	138,061	2.98E-04	0.01	1.41E-04	0.00	2.14E-05	0.00
Barge Unloading		Gypsum truck loading	Gypsum	None		138,061	2.98E-04	0.02	1.41E-04	0.01	2.14E-05	0.00
							Totals:	25.84		12.15		1.89

Notes
* Clinker storage hall vented to clinker cooler air intake. Estimate 99% capture of fugitive emissions.

Emission Point ID	Pile Material	Material Category	Moisture Content (%)	Throughput (tons/yr)	Storage Capacity (tons)	Active Days (n) (days/yr)	Silt Content (s) percent	Base Radius (ft)	Pile Height (ft)	PILE AREA (A) (acres)	Wind Speed > 12 mph (f) percent	Rain Days (p) (days/yr)	Control Efficiency (%)	TSP Emission Factor (lb/acre/day)	TSP Wind Emissions (T/yr)	PM10 Wind Emissions (T/yr)	PM2.5 Wind Emissions (T/yr)
NP01	Kalkberg	Limestone	3	1,674,059	150,000	365	1.6	162.5	127	2.42	10	146	0	1.13	0.50	0.25	0.04
NP02	Beecraft	Limestone	3	81,834	100,000	365	1.6	162.5	127	2.42	10	146	0	1.13	0.50	0.25	0.04
NP03	Coeymans	Limestone	3	2,148,236	300,000	365	1.6	162.5	127	2.42	10	146	0	1.13	0.50	0.25	0.04
NP04	Callanan Aggregate	Limestone	3	1,062,275	350,000	365	1.6	162.5	127	2.42	10	146	0	1.13	0.50	0.25	0.04
NP05	Aggregate (Surge)	Limestone	3	16,291	50,000	365	1.6	120	90	1.30	10	146	0	1.13	0.27	0.13	0.02
NP06	Gypsum	Gypsum	15	117,352	2,000	365	3.9	40	16	0.12	10	0	50	2.29	0.05	0.03	0.00
NP10	Bauxite	Bauxite	12	44,978	2,000	365	4	40	16	0.12	10	0	50	2.35	0.05	0.03	0.00
NP07	Iron	Iron ore	9	51,014	2,500	365	5.4	30	15	0.07	10	0	50	3.17	0.04	0.02	0.00
NP08	Coal	Coal	3	303,635	100,000	365	4.6	238	100	4.43	10	146	0	3.24	2.62	1.31	0.20
NP09	Coke	Coke	3	60,963	35,000	365	4.9	140	30	1.45	10	146	0	3.45	0.91	0.46	0.07
TBA	Gypsum (Barge)	Gypsum	15	138,061	60,000	365	3.9	140	45	1.48	10	146	0	2.75	0.74	0.37	0.06
	Totals														6.68	3.34	0.50

Equation for Wind Erosion:

Reference: Control of Open Fugitive Dust Sources, EPA-450/3-88-008, p. 4-17

Ef = 1.7*(s/1.5)*(f/15)*((365-p)/235)*(1-(C/100))	TSP (lbs/acre/day)	PM10 fraction =	0.5
E = A*n*Ef/2000	TSP (tons/yr)	PM2.5 fraction (AP-42) =	0.075

s = Silt content of the aggregate (%) — Typical silt contents of materials from AP-42 Table 13.2.4-1

f = Percent of time that the unobstructed wind speed exceeds 12 mph at the mean pile height

p = Number of days with >= 0.01 in. of precipitation per year

C = Overall control efficiency (%)

A = Size of the pile (acres)

n = Number of days per year the pile is continuously active

Notes: Gypsum, iron, and bauxite piles are located under covered storage; wind effects are reduced by 50% due to partial enclosure; materials are not exposed to rain.

Quarry Miscellaneous Emissions Summary

Operation	Annual Emissions TSP Emissions (Ton/yr)	PM10 Emissions (Ton/yr)	PM2.5 Emissions (Ton/yr)
Drilling	0.38	0.20	0.01
Blasting	0.95	0.49	0.03
Bulldozing	13.38	2.99	1.41
Loading/Unloading	17.64	8.35	1.26
Total	32.36	12.03	2.71

Quarry Drilling

Emission Point ID	Material	Drill Footage (ft/yr)	Average Depth (ft/hole)	Number of Holes (holes/yr)	TSP Emission Factor (lb/hole)	Control Efficiency (%)	TSP Emissions (T/yr)	PM10 Emissions (T/yr)	PM2.5 Emissions (T/yr)
NP92	Limestone	295,364	50	5,907	1.3	90	0.38	0.20	0.01

Notes
TSP emission factor from AP-42 Table 11.9-4
Assume PM10 and PM2.5 fractions are similar to emissions from blasting given below
Control efficiency based on drill rigs using dust collectors or water/methanol dust suppression

Quarry Blasting

Emission Point ID	Material	Number of Blasts (blasts/yr)	Average Blast Area, A (sq ft)	TSP Emission Factor (lb/blast)	Control Efficiency (%)	TSP Emissions (T/yr)	PM10 Emissions (T/yr)	PM2.5 Emissions (T/yr)
NP93	Limestone	152	9,250	12.45	0	0.95	0.49	0.03

Notes
TSP emission factor (lb/blast) from AP-42 Table 11.9-1
0.000014 x (A)^1.5
PM10 fraction is 0.52 from AP-42 Table 11.9-1
PM2.5 fraction is 0.03 from AP-42 Table 11.9-1

Bulldozing Overburden

Emission Point ID	Material	Silt Content s (%)	Moisture Content M (%)	Dozing Hours (hrs/yr)	TSP Emission Factor (lb/hr)	TSP Emission Factor (lb/hr)	Control Efficiency (%)	TSP Emissions (T/yr)	PM10 Emissions (T/yr)	PM2.5 Emissions (T/yr)
NP94	Overburden	7.5	2.1	4,392	24.38	5.45	75	13.38	2.99	1.41

Notes
Assume overburden bulldozing hours are approximately the same as hours for primary crusher operation
Assume 75% dust control with watering
TSP emission factor (lb/hr) from AP-42 Table 11.9-1
5.7 x (s)^1.2 / (M)^1.3
PM10 emission factor (lb/hr) from AP-42 Table 11.9-1
0.75 x 1.0 x (s)^1.5 / (M)^1.4
PM2.5 fraction of TSP is 0.105 from AP-42 Table 11.9-1

Truck Loading & Unloading

Emission Point ID	Description	Material	Control %	Throughput tons/yr	TSP Factor lbs/ton	TSP tons/yr	PM_{10} Factor lbs/ton	PM_{10} tons/yr	$PM_{2.5}$ Factor lbs/ton	$PM_{2.5}$ tons/yr
NP94	Truck loading	Overburden		55,344	4.68E-03	0.13	2.21E-03	0.06	3.35E-04	0.01
	Truck unloading	Overburden		55,344	4.68E-03	0.13	2.21E-03	0.06	3.35E-04	0.01
NP95	Truck loading	Limestone (total)		8,603,508	2.84E-03	12.22	1.34E-03	5.78	2.03E-04	0.88
NP95	Truck unloading	Limestone (waste)		3,637,104	2.84E-03	5.17	1.34E-03	2.44	2.03E-04	0.37
	Total					17.64		8.35		1.26

Note
Truck unloading of limestone to be crushed is included with emissions at primary crusher hopper

Location	Material	Quantity Transported (tons/yr)	Vehicle Type	Vehicle Weight (Empty)	Load Capacity (tons)	Total Trips
Quarry	New Scotland	3,637,104	Truck	68	91	39,968
Quarry	Coeymans	2,148,236	Truck	68	91	23,607
Quarry	Kalkberg	1,674,059	Truck	68	91	18,396
Quarry	Callanan Aggregate	1,062,275	Truck	68	91	11,673
Quarry	Beecraft	81,834	Truck	68	91	899
Quarry	Overburden	55,344	Truck	68	91	608

Plant	Fly Ash	112,274	Truck	20	25	4,491
Plant	Iron	43,650	Truck	20	25	1,746
Plant	Bauxite	44,926	Truck	20	25	1,797
Barge/Plant	Gypsum	138,061	Truck	93	50	2,761
Plant	Cement bulk	477,452	Truck	20	25	19,098
Plant	Cement bags	115,611	Truck	20	25	4,624
Plant	CKD (sales)	35,303	Truck	20	25	1,412
Plant	CKD (landfill)	155,842	Truck	20	25	6,234

All Roads Emission Summary

Road Type	Area	Total Mileage (Mi/yr)	Annual Emissions TSP Emissions (Ton/yr)	PM10 Emissions (Ton/yr)	PM2.5 Emissions (Ton/yr)
Paved	Plant	47,057	15.61	3.04	0.76
Unpaved	Quarry	127,269	193.80	55.11	5.51
Unpaved	Plant	18,506	22.65	6.44	0.64
Total			232.05	64.59	6.92

Paved Roads

Route No.	Material Hauled	Round Trip (mi)	Silt Loading (g/m2)	Truck Weight Empty (Tons)	Truck Weight Load (Tons)	Truck Weight Loaded (Tons)	Avg Weight (Tons)	Material Thruput (T/yr)	Material Trips (#/yr)	Total Mileage (Mi/yr)	TSP E Factor lb/VMT	PM10 E Factor lb/VMT	PM2.5 E Factor lb/VMT	Control Efficiency (%)	TSP Emissions (Ton/yr)	PM10 Emissions (Ton/yr)	PM2.5 Emissions (Ton/yr)
PR1	Fly Ash	1.5	8.2	20	25	45	32.5	112,274	4,491	6,736	6.63	1.29	0.32	90	2.23	0.44	0.11
PR2	Iron	1.5	8.2	20	25	45	32.5	43,650	1,746	2,619	6.63	1.29	0.32	90	0.87	0.17	0.04
PR3	Cement bulk	1.5	8.2	20	25	45	32.5	477,452	19,098	28,647	6.63	1.29	0.32	90	9.50	1.85	0.46
PR4	Cement bags	1.5	8.2	20	25	45	32.5	115,611	4,624	6,937	6.63	1.29	0.32	90	2.30	0.45	0.11
PR5	CKD sales	1.5	8.2	20	25	45	32.5	35,303	1,412	2,118	6.63	1.29	0.32	90	0.70	0.14	0.03
	Total									47,057					15.61	3.04	0.76

Notes:

Emissions based on AP-42 Section 13.2.1 (11/06), Equation (2).

E = [k * (sL/2)^0.65 * (W/3)^1.5 - C] * (1 - P/4N)

where E = emission factor, lb/VMT	k (PM-30) =	0.082	lb/VMT
k = particle size multiplier	k (PM-10) =	0.016	lb/VMT
sL = road surface silt loading, g/m^2	k (PM-2.5) =	0.0024	lb/VMT
W = average vehicle weight, tons	C (PM-30) =	0.00047	lb/VMT
C = 1980's vehicle exhaust, brake & tire wear, lb/VMT	C (PM-10) =	0.00047	lb/VMT
P = number of days with >= 0.01 in precipitation	C (PM-2.5) =	0.00036	lb/VMT
N = number of days in the averaging period (365)	P =	136	days (Albany average)

ASSUMPTION: 90% control efficiency assumed due to watering and sweeping (per Fugitive Dust Plan).

Unpaved Roads

Route No.	Material Hauled	Round Trip (mi)	Surface Silt Content (%)	Truck Weights Empty (Tons)	Truck Weights Capacity	Truck Weights Loaded (Tons)	Truck Weight	Material Thruput (T/yr)	Material Trips (#/yr)	Total Mileage (Mi/yr)	TSP E Factor lb/VMT	PM10 E Factor lb/VMT	PM2.5 E Factor lb/VMT	Control Efficiency (%)	TSP Emissions (Ton/yr)	PM10 Emissions (Ton/yr)	PM2.5 Emissions (Ton/yr)
UR1	New Scotland	1.6	8.3	68	91	159	113.5	3,637,104	39,968	63,949	12.18	3.46	0.35	75	97.38	27.69	2.77
UR2	Coeymans	1.0	8.3	68	91	159	113.5	2,148,236	23,607	23,607	12.18	3.46	0.35	75	35.95	10.22	1.02
UR3	Kalkberg	1.25	8.3	68	91	159	113.5	1,674,059	18,396	22,995	12.18	3.46	0.35	75	35.02	9.96	1.00
UR4	Callanan Aggregate	1.25	8.3	68	91	159	113.5	1,062,275	11,673	14,592	12.18	3.46	0.35	75	22.22	6.32	0.63
UR5	Beecraft	1.6	8.3	68	91	159	113.5	81,834	899	1,439	12.18	3.46	0.35	75	2.19	0.62	0.06
UR6	Overburden	1.13	8.3	68	91	159	113.5	55,344	608	687	12.18	3.46	0.35	75	1.05	0.30	0.03
	Subtotal (Quarry)									127,269					193.80	55.11	5.51
UR7	Gypsum	3.5	8.3	93	50	143	118.0	138,061	2,761	9,664	12.40	3.53	0.35	75	14.98	4.26	0.43
UR8	CKD (landfill)	0.5	8.3	20	25	45	32.5	155,842	6,234	3,117	6.94	1.97	0.20	75	2.70	0.77	0.08
UR9	Bauxite	2.7	8.3	20	25	45	32.5	44,926	1,797	4,852	6.94	1.97	0.20	75	4.21	1.20	0.12
UR10	Iron	0.5	8.3	20	25	45	32.5	43,650	1,746	873	6.94	1.97	0.20	75	0.76	0.22	0.02
	Subtotal (Plant)									18,506					22.65	6.44	0.64
	TOTAL									145,775					216.44	61.55	6.15

Notes:

E = k * (s/12)^a * (W/3)^b * (365 - P)/365 — for industrial unpaved roads

where
E = emission factor, lb/VMT
k = particle size multiplier
s = surface material silt content, %
W = average vehicle weight, tons
P = number of days with >= 0.01 in precipitation
a, b = constants for specific partical size

Constant	PM-30	PM-10	PM-2.5
k	4.9	1.5	0.15
a	0.7	0.9	0.9
b	0.45	0.45	0.45

P = 136 days (Albany average)

Emission factors from AP-42 Section 13.2.2 (11/06), Equations (1a) & (2). Silt content based on stone quarrying haul road (Table 13.2.2-1).
A control efficiency of 75% was used to account for natural surface moisure or watering as needed at an equivalent surface moisture ratio of 2 (Figure 13.2.2-2).