Richard J. Berry, Mayor

Environmental Health Department
Air Quality Program
Regulatory Review

Mary Lou Leonard, Director

To: Permit File, Enforcement File

From: Isreal L. Tavarez, Environmental Health Manager

Date: January 4, 2017

Subject: Permit application #3292 and Certificate of Registration **CDS #NM/001/02403**

Location: C & C Services Commercial Construction LLC
2901 2nd St SW
Albuquerque, NM 87105
13S UTM 348845 E, 3879677 N

Proposal: An application was received by the Department from C & C Services Commercial Construction LLC for the C & C Services facility located at 2901 2nd St SW, Albuquerque, NM 87105 on August 9, 2016. The application is to install and operate one (1) 300 ton per hour portable concrete, asphalt, and gravel crushing and screening unit. The unit will be powered by one (1) 499 hp diesel-fired generator set. The application seeks to restrict the facility to 2,808 hours of operation per year.

Applicability: ***Source Registration, 20.11.40 NMAC***
Any source which emits more than 2000 lbs of any air contaminant per year must obtain a Registration Certificate from the Department.

Authority-to-Construct, 20.11.41 NMAC
20.11.41.2.C(1) – Applicable as the applicant will be installing equipment which is subject to 20.11.63 NMAC, *New Source Performance Standards for Stationary Sources*.

Permit Fees, 20.11.2 NMAC
The review fees and annual fees below were adjusted for the Consumer Price Index on January 1, 2016.

20.11.2.18.C(1) – Proposed sources with a proposed allowable emission rate equal to or greater than one ton per year and less than five tons per year: $816.00 ($408.00 – small business)
20.11.2.18.D(1) – Review fee for 40 CFR 60 standards: $1,088.00
20.11.2.18.D(3) – Review fee for 40 CFR 63 standards: $1,088.00
The $2,584.00 review fee was paid on 8/12/2016

Annual emissions fee:
20.11.2.21.B – Annual emission fees for sources issued a permit pursuant to 20.11.41 NMAC: $335.00 per year or $48.00 per ton, whichever is greater. The annual emission fees are estimated to be $432.00 per year.

Emission Unit #	CO TPY	NOx TPY	SO2 TPY	VOC TPY	TSP TPY
Totals	0.22	0.46	1.44	4.02	3.83
Total = 9 tpy	**0**	**0**	**1**	**4**	**4**

Federal Program Applicability, 40 CFR 60 and 40 CFR 63
The portable crushing and screening plant is subject to Federal New Source Performance Standards (NSPS) 40 CFR 60 Subpart OOO – Standards of Performance for Nonmetallic Mineral Processing Plants and Subpart A – General Provisions since Process Equipment Units #4, 5, and 6 were constructed, reconstructed, or modified after August 31, 1983 and are capable of processing greater than 150 tons per hour of material.

Unit #11 is subject to NSPS 40 CFR 60 Subpart IIII - Standards of Performance for Stationary Compression Ignition Internal Combustion Engines, and Subpart A - General Provisions. Unit #11 will commence construction after July 11, 2005 and will be manufactured after April 1, 2006. Accordingly, Unit #11 shall comply with all applicable requirements of 40 CFR 60 Subparts A and IIII.

- The owner or operator of the facility must purchase and install an NSPS 40 CFR 60 Subpart IIII engine to meet model year 2011 or newer emission standards.

- In accordance with 40 CFR 60 Subpart IIII §60.4204(b), owners and operators of 2007 model year and later non-emergency stationary CI ICE with a displacement of less than 30 liters per cylinder must comply with the emission standards for new CI engines in §60.4201, for their 2007 model year and later stationary CI ICE, as applicable. Unit #11 shall comply with the emission standards for new nonroad CI engines in 40 CFR 89.112, 40 CFR 89.113, 40 CFR 1039.101, 40 CFR 1039.102, 40 CFR 1039.104, 40 CFR 1039.105, 40 CFR 1039.107, and 40 CFR 1039.115, as applicable, for all pollutants, for the same model year and maximum engine power.

National Emissions Standard for Hazardous Air Pollutants (NESHAP) found in 40 CFR 63 Subpart ZZZZ – National Emission Standards for Hazardous Air Pollutants for Source Category: Stationary Reciprocating Internal Combustion Engines apply and this facility shall comply with the specific requirements found in this subpart as well as the general requirements of 40 CFR 63 Subpart A - General Provisions. The permittee shall comply with the specific requirements of Subpart ZZZZ applicable to new engines.

- In accordance with 40 CFR 63 Subpart ZZZZ §63.6590(c), an affected source that is a new or reconstructed stationary RICE located at an area source "must meet the requirements of this part by meeting the requirements of 40 CFR 60 Subpart IIII, for compression ignition engines." The permittee shall comply with the specific requirements of Subpart IIII applicable to new stationary compression ignition internal combustion engines meeting the definition of a new engine.

Visible Air Contaminants, 20.11.5 NMAC, 40 CFR 60 Subpart OOO
40 CFR 60 Subpart OOO §60.672(b): Process Equipment Units #4 and 6 and all affected transfer points shall not cause or allow fugitive emissions that exceed 7 percent opacity.

40 CFR 60 Subpart OOO §60.672(b): Process Equipment Unit #5 shall not cause or allow fugitive emissions that exceed 15 percent opacity.

20.11.5.13.C NMAC - Unit #11 shall not cause or allow visible air emissions from any stationary diesel powered engine to exceed 20 percent opacity for any six (6) minute timed average. During the first twenty (20) minutes of cold start-up, the visible emissions shall not exceed 40 percent opacity for any (6) minute timed average. No increase of load shall be applied so as to cause an emission having an opacity greater than 40 percent during any time interval.

Source Surveillance; Administration and Enforcement, 20.11.90 NMAC

20.11.90.13.A – The owner or operator of any stationary source of an air contaminant shall, upon notification by the Director, maintain records of the nature and amounts of emissions, to which an air quality control emission regulation applies, from the source and any other information as may be deemed necessary by the Director to determine whether the source is in compliance with applicable regulations.

20.11.90.13.E – The Director shall establish a periodic visual surveillance system to detect and investigate apparent violations of visible emission limitations and such complaints relating to apparent violations of the regulations as may occur.

20.11.90.14.A – Upon request of the Director, the person responsible for the emission of air contaminants for which limits are established by the 20 NMAC 11 rules shall provide such facilities, utilities, and openings exclusive of instrument and sensing devices, as may be necessary for the proper determination of the nature, extent, quantity and degree of such air contaminants. Such facilities may be either temporary or permanent at the discretion of the person responsible for their provisions; and shall be suitable for determination consistent with emission limits established in these Parts.

Public Notice: Public notice for this permit application was published on September 2, 2016. The public comment period on the permit application ended on October 3, 2016. During the public comment period interest on the application was received from four individuals, Mr. David McCoy, Mr. Willard Hunter, Mr. Donald Clayton and Ms. Elizabeth Vencill. Mr. McCoy, Mr. Clayton and Ms. Vencill requested a public information hearing and/or a public meeting. Mr. McCoy is the Executive Director Citizen Action New Mexico.

Public notice for technical analysis availability and the public information hearing is scheduled for publication on January 12, 2017. The public meeting to discuss the project is scheduled for February 9, 2017 and a public information hearing is scheduled for February 14, 2017.

Compliance: The following permit conditions apply:

a) All equipment shall be maintained as per manufacturer specifications to ensure the emissions remain at or below the permitted levels.

b) This facility shall be constructed and operated in accordance with information provided on the permit application received **August 9, 2016** and in accordance with the legal authority specified above and the conditions of this permit.

c) Prior to any asbestos demolition or renovation work, the Department must be notified and proper permits shall be obtained and Code of Federal Regulations (CFR), Title 40, Part 61 (40 CFR 61) Subpart M may apply.

d) The owner or operator of the facility must purchase and install an NSPS 40 CFR 60 Subpart IIII engine to meet model year 2011 or newer emission standards.

e) Replacement of emission units for which an allowable emissions limit has been established in the permit may be requested by the permittee through a technical permit revision in accordance with 20.11.41.28.B

NMAC.

f) The equipment specified in Condition 1(a) is considered a portable stationary source as defined by 20.11.41.7.GG NMAC and may be relocated to another site provided the requirements are met in Condition 5(k) prior to the relocation.

g) The following equipment located at the facility is restricted to operate as follows:

i. The portable crushing and screening plant shall not exceed 2,808 hours of operation per year based on a 12-month rolling period.

ii. The facility shall operate only between 7:00 AM and 4:00 PM, 9 hours per day, Monday to Saturday, and 52 weeks per year. The facility shall not be operated on Sunday.

iii. Truck hauling shall be restricted to occur only between 7:00 AM and 4:00 PM, 9 hours per day, Monday to Saturday, and 52 weeks per year. Truck hauling shall not be conducted on Sunday.

iv. The portable crushing and screening plant shall be restricted to a maximum hourly throughput of 300 tons per hour not to exceed a material throughput of 842,400 tons per year based on a 12-month rolling total. This condition has been placed in the permit based on air dispersion modeling of the facility at this location to demonstrate compliance with the National Ambient Air Quality Standards and New Mexico Ambient Air Quality Standards for NO_2, CO, SO_2, TSP, PM_{10}, and $PM_{2.5}$.

v. Water shall be added to the raw material storage piles prior to loading into main feed hopper. Watering of raw material storage piles shall be done as necessary, but not less frequently than once daily unless precipitation has occurred in the last 24 hours. This condition is being imposed to maintain a 95% control efficiency of fugitive emissions during crushing, screening, and conveying of materials. Additionally, pursuant to 20.11.20.12 NMAC, "Each person shall use reasonably available control measures or any other effective control measure during active operations or on inactive disturbed surface areas, as necessary to prevent the release of fugitive dust, whether or not the person is required by 20.11.20 NMAC to obtain a fugitive dust control permit. It shall be a violation of 20.11.20 NMAC to allow fugitive dust, track out, or transported material from any active operation, open storage pile, stockpile, paved or unpaved roadway disturbed surface area, or inactive disturbed surface area to cross or be carried beyond the property line, right-of-way, easement or any other area under control of the person generating or allowing the fugitive dust if the fugitive dust may: 1) with reasonable probability injure human health or animal or plant life; 2) unreasonably interfere with the public welfare, visibility or the reasonable use of property; or 3) be visible for a total of 15 minutes or more during any consecutive one hour observation period using the visible fugitive dust detection method in 20.11.20.26 NMAC or an equivalent method approved in writing by the Department."

vi. In addition to watering raw material prior to loading into the main feed hopper, Process Equipment Units #4, 5, and 6 shall be operated with an atomized water spray bar at all times while the facility is in operation.

vii. The owner or operator of the facility shall maintain gravel and millings and shall apply water as necessary to all haul road sections. This condition is being imposed to maintain a 95% control efficiency of fugitive dust emissions from haul roads. Additionally, pursuant to 20.11.20.19.B NMAC, "Owners or operators shall use reasonably available control measures on all unpaved roadways and unpaved parking areas and shall comply with the general provisions established in 20.11.20.12 NMAC.

viii. Unit #11 shall be restricted to a maximum of 2,808 hours of operation based on a 12-month rolling total.

ix. The permittee shall meet the diesel fuel requirements as required by 40 CFR 60 Subpart IIII §60.4207(b).

x. The permittee shall operate and maintain Unit #11 according to the manufacturer's written instructions or procedures developed by the permittee that have been approved by the manufacturer. In addition, the permittee may only change those settings that are allowed by the manufacturer. The permittee must also meet the requirements of 40 CFR Parts 89, 94, and/or 1068 as they apply. This condition is Pursuant to 40 CFR 60 Subpart IIII §60.4211.

h) Changes in plans, specifications, and other representations proposed in the application documents shall not be made if they will increase the potential to emit or cause a change in the method of control of emissions or in the character of emissions. Any such proposed changes shall be submitted as a modification to this permit. No modification shall begin prior to issuance of a permit.

i) The emission of a regulated air pollutant in excess of the quantity, rate, opacity, or concentration specified in an air quality regulation or permit condition that results in an excess emission is a violation of the air quality regulation or permit condition and may be subject to an enforcement action. The owner or operator of a source having an excess emission shall, to the extent practicable, operate the source, including associated air pollution control equipment, in a manner consistent with good air pollution control practices for minimizing emissions. This condition is pursuant to 20.11.49.14 NMAC.

Record Keeping: The following permit conditions apply:

a) Maintain records of the daily, monthly, and annual throughput (in tons) for the facility. Monthly throughput records shall be maintained to calculate yearly throughputs based on a 12-month rolling period.

b) Maintain a daily record of the number of hours of operation for the facility. These records shall include the start and stop times for each day of plant operation. Hours of operation records shall be maintained in order to calculate daily, monthly, and annual hours of operation.

c) Maintain a monthly log of the number of hours of operation for Unit #11 based on a 12-month rolling period.

d) Maintain a daily record of water application to raw material storage piles. If application of water is not required, the record shall indicate why application was not necessary (i.e. recent rain, snowfall, etc.).

e) Maintain records of the application of gravel, millings, and water to vehicle traffic areas and haul roads.

f) Maintain records of the occurrence and duration of any startup, shutdown, or malfunction in the operation of an affected facility pursuant to 40 CFR 60 Subpart A §60.7(a)(7)(b).

g) Pursuant to 40 CFR 60 Subpart OOO §60.674(b), maintain a monthly record of water spray system inspections, including the date of each inspection and any corrective actions taken.

Monitoring: The following permit conditions apply:

a) Monitor the daily, monthly, and annual throughput (in tons) for the facility.

b) Monitor the daily hours of operation of the facility.

c) Install a non-resettable hour meter prior to the startup of Unit #11 and monitor hours of operation based on a 12-month rolling period.

d) Monitor the application of water to raw material storage piles.

e) Monitor the application of dust suppression agents or surfactant to vehicle traffic areas and haul roads.

f) Monitor the water spray system to ensure it is functioning properly and in operation while the facility is operating. Pursuant to 40 CFR 60 Subpart OOO §60.674(b), the owner or operator of any affected facility that uses wet suppression to control emissions from the affected facility must perform monthly periodic inspections to check that water is flowing to discharge spray nozzles in the wet suppression system. The owner or operator must initiate corrective action within 24 hours and complete corrective action as expediently as practical if the owner or operator finds that water is not flowing properly during an inspection of the water spray nozzles.

Reporting: The permittee shall notify the Department in writing of:

a) The anticipated startup of the source not less than thirty (30) days prior to that date (20.11.41.21.A(1) NMAC);

b) The actual date of initial startup of the source within fifteen (15) days after the initial startup date (20.11.41.21.A(3) NMAC). Notification of the actual date of initial startup of each affected facility shall be postmarked within 15 days after such date and submitted to the Department. This shall be conducted in accordance with 40 CFR 60 Subpart A §60.7(a)(3);

c) All information labeled "TBD" cited under Condition 1(a) within thirty (30) days of installation;

d) Notification of the anticipated date for conducting the opacity observations required by 40 CFR 60 Subpart OOO §60.675(a)(2);

e) Written reports of the results of all performance tests conducted to demonstrate compliance with the opacity observations made using EPA Method 9 to demonstrate compliance with 40 CFR 60 Subpart OOO §60.672(b) and performance tests conducted to demonstrate compliance with the opacity results shall be received by the Department within 30 days of completion of the compliance test;

f) Any change in control or ownership, name, address, or contact information. The permittee may request an administrative permit revision in accordance with 20.11.41.28.A NMAC;

g) Any permit update or correction as required by 20.11.41 NMAC no more than 60 days after the permittee knows or should have known about the condition that requires updating or correction of the permit (20.11.41.21.A(6) NMAC);

h) Replacement of emission units for which an allowable emissions limit has been established in the permit may be requested through a technical permit revision in accordance with 20.11.41.28.B NMAC;

i) An annual (January 1 through December 31 of the previous year) emissions inventory for the source together with descriptions of any reconfiguration of process technology and air pollution equipment by March 15 every year. The emissions inventory shall include annual hours of operation and the annual material throughput in tons. The emissions inventory shall be based on the emission factors provided in the application received on August 9, 2016;

j) Any relocation of the aggregate plant at least 45 days prior to the date the permittee proposes to commence operations at a new location within Bernalillo County. The relocation application must be submitted on a form provided by the Department and shall include an ambient air dispersion modeling analysis demonstrating compliance with National Ambient Air Quality Standards (NAAQS) and New Mexico Ambient Air Quality Standards (NMAAQS) at the new location, unless the requirement is waived in

writing by the Department. Operation and relocation of the plant at a new location shall not commence until the Department has approved the request for relocation.

k) The permittee of a source having an excess emission shall provide the Department with the following reports on forms provided by the Department:

i. INITIAL REPORT: The permittee shall file an initial report, no later than the end of the next regular business day after the time of discovery of an excess emission pursuant to 20.11.49.15.A(1) NMAC;

ii. FINAL REPORT: The permittee shall file a final report, no later than 10 days after the end of the excess emission. If the period of an excess emission extends beyond 10 days, the permittee shall submit the final report to the department within 72 hours of the date and time the excess emission ceased. This condition is pursuant to 20.11.49.15.A(2) NMAC and 20.11.49.15.C NMAC; and,

iii. ALTERNATIVE REPORTING: If the facility is subject to the reporting requirements of 40 CFR Parts 60, 61, and 63 and the federal requirements duplicate the requirements of 20.11.49.15 NMAC, then the federal reporting requirements shall suffice. This condition is pursuant to 20.11.49.15.D NMAC.

Compliance Testing: The following compliance testing is required for the facility:

Unit Specific Compliance Testing

Unit Number	Initial Compliance Test	Frequency of Compliance Tests
4, 5, 6 and affected transfer points	Yes, for opacity	Not required*
11	Not required*	Not required*

*Compliance tests have not been imposed for this unit at this time, but may be imposed if inspections of the source indicate non-compliance with permit conditions.

Actions Taken:

- August 9, 2016 - Application received by the Department.
- August 30, 2016 - Application deemed complete by the Department.
- September 2, 2016 – Public notice on the permit application published in Albuquerque Journal marking the beginning of public comment period on the application.

Process Equipment Table

Process Equipment Unit #	Unit Description	Manufacturer	Model Number	Serial Number	Date of Manufacture	Date of Installation	Rated Process Capacity	Unit Subject to NSPS or NESHAP
1	Raw Material Batch Drop (concrete, aggregate)	N/A	N/A	N/A	N/A	N/A	150 ton/hr	No
2	Raw Material Batch Drop (asphalt)	N/A	N/A	N/A	N/A	N/A	150 ton/hr	No
3	Bulk Loading of Main Feed Hopper (at crusher)	N/A	N/A	N/A	N/A	N/A	300 ton/hr	Yes
4	Screen	TBD*	TBD*	TBD*	TBD*	TBD*	300 ton/hr	Yes
5	Portable Impact Crusher	TBD*	TBD*	TBD*	TBD*	TBD*	300 ton/hr	Yes
6	Conveyor from Crusher (continuous drop finished pile formation)	TBD*	TBD*	TBD*	TBD*	TBD*	300 ton/hr	Yes
7	Loadout from Finished Pile	N/A	N/A	N/A	N/A	N/A	300 ton/hr	No
8	Finished Pile Formation (concrete, aggregate)	N/A	N/A	N/A	N/A	N/A	150 ton/hr	No
9	Finished Pile Formation (asphalt)	N/A	N/A	N/A	N/A	N/A	150 ton/hr	No
10	Haul Roads	N/A	N/A	N/A	N/A	N/A	N/A	No
11	Diesel-Fired Generator	TBD*	TBD*	TBD*	TBD*	TBD*	499 hp	Yes

Controlled Emission Totals														
Process Equipment Unit	NOx Emissions		CO Emissions		VOC Emissions		SOx Emissions		TSP Emissions		PM10 Emissions		PM2.5 Emissions	
	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
1	--	--	--	--	--	--	--	--	0.16	0.23	0.077	0.11	0.012	0.016
2	--	--	--	--	--	--	--	--	0.16	0.23	0.077	0.11	0.012	0.016
3	--	--	--	--	--	--	--	--	0.33	0.46	0.15	0.22	0.023	0.033
4	--	--	--	--	--	--	--	--	0.38	0.53	0.13	0.18	0.045	0.063
5	--	--	--	--	--	--	--	--	0.081	0.11	0.036	0.051	0.012	0.017
6	--	--	--	--	--	--	--	--	0.045	0.063	0.017	0.023	0.0060	0.0084
7	--	--	--	--	--	--	--	--	0.33	0.46	0.15	0.22	0.023	0.033
8	--	--	--	--	--	--	--	--	0.16	0.23	0.077	0.11	0.012	0.016
9	--	--	--	--	--	--	--	--	0.16	0.23	0.077	0.11	0.012	0.016
10	--	--	--	--	--	--	--	--	0.91	1.27	0.22	0.31	0.022	0.031
11	0.33	0.46	2.86	4.02	0.15	0.22	1.02	1.44	0.011	0.015	0.011	0.015	0.011	0.015
Totals	**0.33**	**0.46**	**2.86**	**4.02**	**0.15**	**0.22**	**1.02**	**1.44**	**2.73**	**3.83**	**1.03**	**1.45**	**0.19**	**0.27**

Details and calculation examples from each type of source included in proceeding pages

Aggregate Handling and Storage Pile Emissions - Uncontrolled

Unit #	k = particle size multiplier[1]			U = mean wind speed (mph)[2]	M = material moisture content (%)[3]	Emission Factor (lb/ton)[4]			Hours	Process Rate (tph)	Control Efficiency (%)	TSP Emissions		PM10 Emissions		PM2.5 Emissions	
	TSP	PM10	PM2.5			TSP	PM10	PM2.5				lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
1	0.74	0.35	0.053	8.9	0.7	0.022	0.010	0.0016	8760	150	--	3.27	14.32	1.55	6.77	0.23	1.03
2	0.74	0.35	0.053	8.9	0.7	0.022	0.010	0.0016	8760	150	--	3.27	14.32	1.55	6.77	0.23	1.03
3	0.74	0.35	0.053	8.9	0.7	0.022	0.010	0.0016	8760	300	--	6.54	28.63	3.09	13.54	0.47	2.05
7	0.74	0.35	0.053	8.9	0.7	0.022	0.010	0.0016	8760	300	--	6.54	28.63	3.09	13.54	0.47	2.05
8	0.74	0.35	0.053	8.9	0.7	0.022	0.010	0.0016	8760	150	--	3.27	14.32	1.55	6.77	0.23	1.03
9	0.74	0.35	0.053	8.9	0.7	0.022	0.010	0.0016	8760	150	--	3.27	14.32	1.55	6.77	0.23	1.03

Aggregate Handling and Storage Pile Emissions - Controlled

Unit #	k = particle size multiplier[1]			U = mean wind speed (mph)[2]	M = material moisture content (%)[3]	Emission Factor (lb/ton)[4]			Hours*	Process Rate (tph)	Control Efficiency (%)[5]	TSP Emissions		PM10 Emissions		PM2.5 Emissions	
	TSP	PM10	PM2.5			TSP	PM10	PM2.5				lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
1	0.74	0.35	0.053	8.9	0.7	0.022	0.010	0.0016	2808	150	95	0.16	0.23	0.077	0.11	0.012	0.016
2	0.74	0.35	0.053	8.9	0.7	0.022	0.010	0.0016	2808	150	95	0.16	0.23	0.077	0.11	0.012	0.016
3	0.74	0.35	0.053	8.9	0.7	0.022	0.010	0.0016	2808	300	95	0.33	0.46	0.15	0.22	0.023	0.033
7	0.74	0.35	0.053	8.9	0.7	0.022	0.010	0.0016	2808	300	95	0.33	0.46	0.15	0.22	0.023	0.033
8	0.74	0.35	0.053	8.9	0.7	0.022	0.010	0.0016	2808	150	95	0.16	0.23	0.077	0.11	0.012	0.016
9	0.74	0.35	0.053	8.9	0.7	0.022	0.010	0.0016	2808	150	95	0.16	0.23	0.077	0.11	0.012	0.016

[1] k = particle size multiplier from AP-42 Section 13.2.4

[2] U = mean wind speed = 8.9 mph from NOAA data fro Albuquerque through 2011 provided by AQD/SBAP

[3] M = material moisture content = 0.7% for stone quarrying and processing from AP-42 Table 13.2.4-1

[4] E = k (0.0032) [U/5]^1.3 / [M/2]^1.4 from AP-42 Section 13.2.4

[5] 95% control efficiency based on daily watering of stockpiles to maintain a high moisture content of materials

*2808 reflects 9 hrs/day, 6 days/wk, 52 wk/yr

Example Calculation for Unit #1 Controlled TSP Emissions:

Emission factor (lb/ton) = k (0.0032) [U/5]^1.3 / [M/2]^1.4

E = (0.74*0.0032)*(((8.9/5)^1.3)/((0.7/2)^1.4)) = 0.022 lb/ton

(0.022 lb/ton) * (150 ton/hr) = 3.3 lb/hr (1-0.95) = 0.16 lb/hr

(0.16 lb/hr) * (2808 hr/yr) / (2000 lb/ton) = 0.23 ton/yr

Table 13.2.4-1. TYPICAL SILT AND MOISTURE CONTENTS OF MATERIALS AT VARIOUS INDUSTRIES[a]

Industry	No. Of Facilities	Material	Silt Content (%)			Moisture Content (%)		
			No. Of Samples	Range	Mean	No. Of Samples	Range	Mean
Iron and steel production	9	Pellet ore	13	1.3 - 13	4.3	11	0.64 - 4.0	2.2
		Lump ore	9	2.8 - 19	9.5	6	1.6 - 8.0	5.4
		Coal	12	2.0 - 7.7	4.6	11	2.8 - 11	4.8
		Slag	3	3.0 - 7.3	5.3	3	0.25 - 2.0	0.92
		Flue dust	3	2.7 - 23	13	1	—	7
		Coke breeze	2	4.4 - 5.4	4.9	2	6.4 - 9.2	7.8
		Blended ore	1	—	15	1	—	6.6
		Sinter	1	—	0.7	0	—	—
		Limestone	3	0.4 - 2.3	1.0	2	ND	0.2
Stone quarrying and processing	2	Crushed limestone	2	1.3 - 1.9	1.6	2	0.3 - 1.1	0.7
		Various limestone products	8	0.8 - 14	3.9	8	0.46 - 5.0	2.1
Taconite mining and processing	1	Pellets	9	2.2 - 5.4	3.4	7	0.05 - 2.0	0.9
		Tailings	2	ND	11	1	—	0.4
Western surface coal mining	4	Coal	15	3.4 - 16	6.2	7	2.8 - 20	6.9
		Overburden	15	3.8 - 15	7.5	0	—	—
		Exposed ground	3	5.1 - 21	15	3	0.8 - 6.4	3.4
Coal-fired power plant	1	Coal (as received)	60	0.6 - 4.8	2.2	59	2.7 - 7.4	4.5
Municipal solid waste landfills	4	Sand	1	—	2.6	1	—	7.4
		Slag	2	3.0 - 4.7	3.8	2	2.3 - 4.9	3.6
		Cover	5	5.0 - 16	9.0	5	8.9 - 16	12
		Clay/dirt mix	1	—	9.2	1	—	14
		Clay	2	4.5 - 7.4	6.0	2	8.9 - 11	10
		Fly ash	4	78 - 81	80	4	26 - 29	27
		Misc. fill materials	1	—	12	1	—	11

[a] References 1-10. ND = no data.

The quantity of particulate emissions generated by either type of drop operation, per kilogram (kg) (ton) of material transferred, may be estimated, with a rating of A, using the following empirical expression:[11]

$$E = k(0.0016) \frac{\left(\frac{U}{2.2}\right)^{1.3}}{\left(\frac{M}{2}\right)^{1.4}} \text{ (kg/megagram [Mg])} \quad (1)$$

$$E = k(0.0032) \frac{\left(\frac{U}{5}\right)^{1.3}}{\left(\frac{M}{2}\right)^{1.4}} \text{ (pound [lb]/ton)}$$

where:

E = emission factor
k = particle size multiplier (dimensionless)
U = mean wind speed, meters per second (m/s) (miles per hour [mph])
M = material moisture content (%)

The particle size multiplier in the equation, k, varies with aerodynamic particle size range, as follows:

Aerodynamic Particle Size Multiplier (k) For Equation 1				
< 30 µm	< 15 µm	< 10 µm	< 5 µm	< 2.5 µm
0.74	0.48	0.35	0.20	0.053[a]

[a] Multiplier for < 2.5 µm taken from Reference 14.

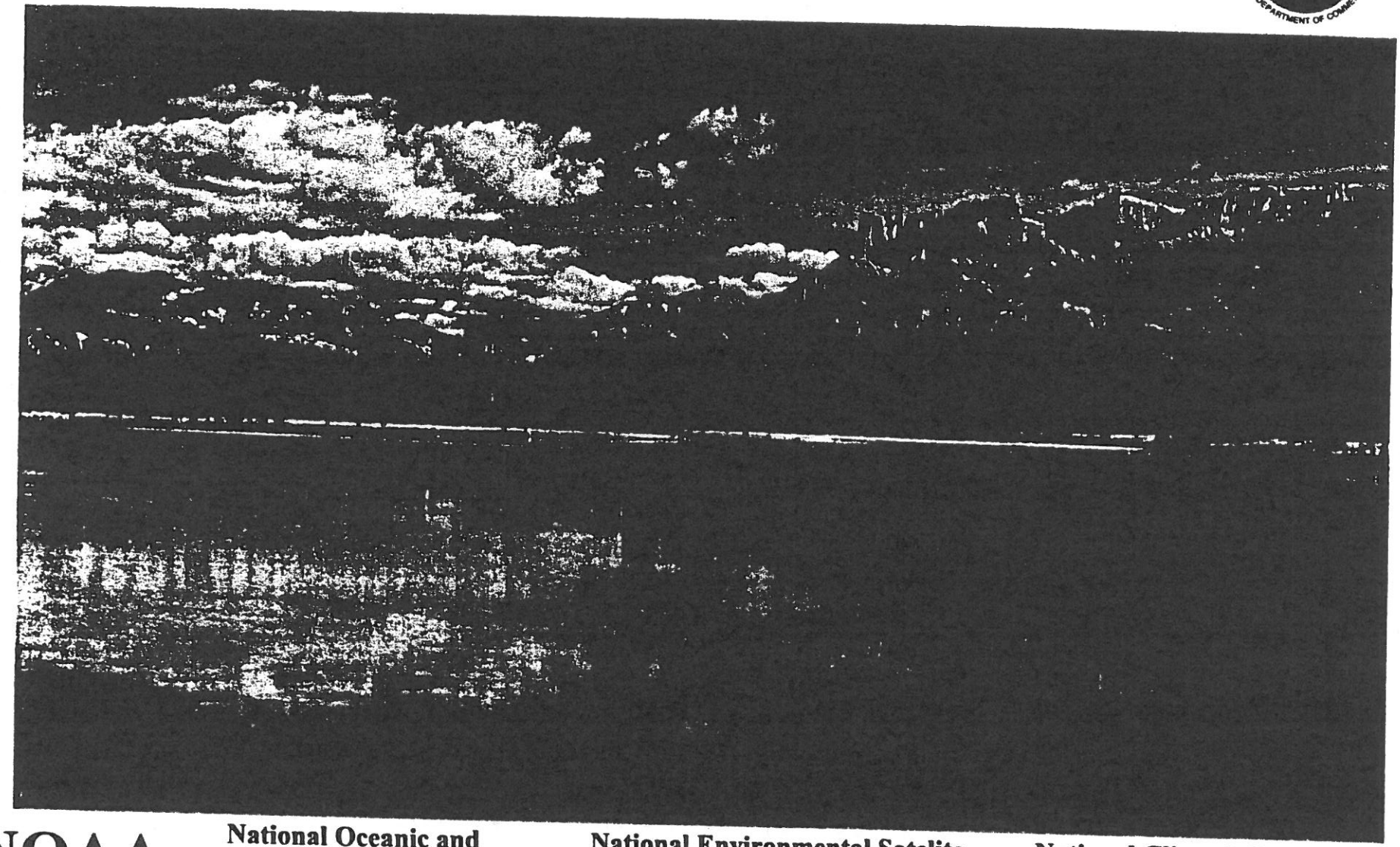
The equation retains the assigned quality rating if applied within the ranges of source conditions that were tested in developing the equation, as follows. Note that silt content is included, even though silt content does not appear as a correction parameter in the equation. While it is reasonable to expect that silt content and emission factors are interrelated, no significant correlation between the 2 was found during the derivation of the equation, probably because most tests with high silt contents were conducted under lower winds, and vice versa. It is recommended that estimates from the equation be reduced 1 quality rating level if the silt content used in a particular application falls outside the range given:

Ranges Of Source Conditions For Equation 1			
Silt Content (%)	Moisture Content (%)	Wind Speed	
		m/s	mph
0.44 - 19	0.25 - 4.8	0.6 - 6.7	1.3 - 15

To retain the quality rating of the equation when it is applied to a specific facility, reliable correction parameters must be determined for specific sources of interest. The field and laboratory procedures for aggregate sampling are given in Reference 3. In the event that site-specific values for

Comparative Climatic Data

For the United States Through 2012



NOAA **National Oceanic and Atmospheric Administration**

National Environmental Satelite, Data and Information Service

National Climatic Data Center
Asheville, NC

WIND - AVERAGE SPEED (MPH)

DATA THROUGH 2012	YRS	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANN
HELENA, MT	72	6.6	7.2	8.2	9.1	8.8	8.5	7.8	7.4	7.4	7.1	7.1	6.7	7.7
KALISPELL, MT	50	5.4	5.3	6.7	7.6	7.3	6.9	6.2	6.2	5.9	5.1	5.2	4.8	6.1
MISSOULA, MT	68	5.0	5.4	6.7	7.6	7.4	7.2	6.9	6.7	6.0	5.1	5.0	4.7	6.1
GRAND ISLAND, NE	63	11.7	11.7	13.1	14.0	12.6	11.7	10.4	10.3	10.8	11.2	11.7	11.6	11.7
LINCOLN, NE	40	9.6	9.9	11.3	12.1	10.4	9.8	9.1	9.0	9.3	9.9	9.8	9.5	10.0
NORFOLK, NE	36	11.3	11.3	12.3	13.0	11.4	10.4	9.5	9.2	10.0	10.8	11.1	11.0	10.9
NORTH PLATTE, NE	60	9.2	9.8	11.5	12.5	11.4	10.3	9.4	9.2	9.5	9.6	9.4	9.0	10.1
OMAHA EPPLEY AP, NE	76	10.9	11.1	12.2	12.6	10.9	10.1	8.8	8.8	9.4	9.8	10.9	10.7	10.5
OMAHA (NORTH), NE	9	9.9	9.2	10.5	10.2	8.9	8.3	7.5	7.6	8.6	9.0	9.7	9.8	9.1
SCOTTSBLUFF, NE	61	10.5	10.9	11.9	12.4	11.8	10.5	9.3	8.9	9.4	9.7	10.0	10.4	10.5
VALENTINE, NE	44	9.3	9.4	10.5	11.1	11.0	9.9	9.1	9.3	9.9	9.5	9.8	9.2	9.8
ELKO, NV	57	5.2	5.7	6.6	7.2	6.8	6.7	6.2	5.9	5.4	5.0	5.1	5.0	5.9
ELY, NV	71	10.1	10.2	10.7	10.9	10.7	10.6	10.3	10.4	10.3	10.0	9.9	9.9	10.3
LAS VEGAS, NV	64	7.3	8.4	10.0	11.0	10.7	10.7	9.9	9.5	8.9	8.1	7.7	7.3	9.1
RENO, NV	70	5.6	6.2	7.8	8.2	8.0	7.7	7.2	6.6	5.8	5.4	5.5	5.3	6.6
WINNEMUCCA, NV	56	7.4	8.0	8.6	8.6	8.6	8.5	8.4	7.8	7.6	7.3	7.2	7.4	8.0
CONCORD, NH	70	7.2	7.9	8.1	7.8	7.0	6.5	5.7	5.4	5.6	6.0	6.6	7.0	6.7
MT. WASHINGTON, NH	77	46.0	44.4	41.2	36.0	29.6	27.3	25.3	24.7	28.8	34.0	39.2	44.4	35.1
ATLANTIC CITY AP, NJ	54	10.6	11.1	11.5	11.2	10.0	8.9	8.3	7.8	8.2	8.7	9.8	10.2	9.7
NEWARK, NJ	68	11.2	11.5	11.9	11.2	10.0	9.5	8.9	8.7	9.0	9.4	10.2	10.8	10.2
ALBUQUERQUE, NM	73	8.0	8.8	9.9	10.7	10.5	9.8	8.9	8.1	8.4	8.2	7.9	7.6	8.9
CLAYTON, NM	20	11.9	12.4	13.1	14.3	13.2	12.9	11.4	10.6	11.6	11.9	12.1	12.2	12.3
ROSWELL, NM	39	7.7	8.6	10.0	10.2	9.9	9.7	8.6	7.9	8.0	7.9	7.6	7.6	8.6
ALBANY, NY	74	9.8	10.1	10.6	10.5	9.0	8.3	7.5	7.0	7.4	8.0	9.1	9.3	8.9
BINGHAMTON, NY	61	11.1	11.2	11.3	11.1	9.8	9.3	8.4	8.2	8.8	9.7	10.4	10.9	10.0
BUFFALO, NY	73	13.8	13.1	13.1	12.3	11.4	10.8	10.2	9.7	10.2	11.1	12.2	13.1	11.8
ISLIP, NY	29	9.8	10.3	10.4	9.9	8.8	8.3	7.7	7.3	7.9	8.4	9.4	9.7	9.0
NEW YORK C.PARK, NY	74	10.3	10.6	10.7	10.0	8.7	8.0	7.5	7.3	7.9	8.6	9.5	9.8	9.1
NEW YORK (JFK AP), NY	54	13.0	13.3	13.5	12.7	11.5	10.7	10.2	10.0	10.4	11.0	12.1	12.7	11.8
NEW YORK (LAGUARDIA AP), NY	64	13.7	13.8	13.8	12.8	11.6	11.0	10.4	10.3	11.0	11.6	12.7	13.3	12.2
ROCHESTER, NY	72	11.6	11.1	11.0	10.7	9.3	8.6	8.0	7.7	8.1	8.8	10.1	10.7	9.6
SYRACUSE, NY	63	10.5	10.5	10.7	10.4	8.9	8.3	7.9	7.5	8.2	8.7	10.0	10.3	9.3
ASHEVILLE, NC	48	9.1	9.1	8.8	8.4	6.7	5.8	5.6	5.1	5.4	6.5	7.7	8.4	7.2
CAPE HATTERAS, NC	54	11.5	11.5	11.5	11.5	10.5	10.5	9.9	9.3	10.1	10.5	10.4	10.9	10.7
CHARLOTTE, NC	63	7.8	8.2	8.8	8.6	7.5	6.9	6.6	6.4	6.6	6.7	6.9	7.3	7.4

Screening, Crushing, and Conveyor Emissions - Uncontrolled												
Unit	Emission Factor (lb/ton)			Hours	Process Rate (tph)	Control Efficiency (%)	TSP Emissions		PM10 Emissions		PM2.5 Emissions	
	TSP	PM10	PM2.5				lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
4 [1]	0.025	0.0087	0.0030	8760	300	--	7.50	32.85	2.61	11.43	0.90	3.94
5 [2]	0.0054	0.0024	0.0008	8760	300	--	1.62	7.10	0.72	3.15	0.24	1.05
6 [3]	0.0030	0.0011	0.0004	8760	300	--	0.90	3.94	0.33	1.45	0.12	0.53
Screening, Crushing, and Conveyor Emissions - Controlled												
Unit	Emission Factor (lb/ton)[4]			Hours*	Process Rate (tph)	Control Efficiency (%)[4]	TSP Emissions		PM10 Emissions		PM2.5 Emissions	
	TSP	PM10	PM2.5				lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
4 [1]	0.025	0.0087	0.0030	2808	300	95	0.38	0.53	0.13	0.18	0.045	0.063
5 [2]	0.0054	0.0024	0.0008	2808	300	95	0.081	0.11	0.036	0.051	0.012	0.017
6 [3]	0.0030	0.0011	0.0004	2808	300	95	0.045	0.063	0.017	0.023	0.0060	0.0084

[1] Emission factors for TSP and PM10 obtained from AP-42 Table 11.19.2-2 for Screening. Emission factor for PM2.5 obtained using AP-42 Apendix B.2 - Generalized Particle Size Distributions. Category 3 for unprocessed ores and aggregate has a maximum PM2.5 value as 35% of PM10 value. (0.0087 * 0.35) = 0.0030 lb/ton

[2] Emission factors for TSP and PM10 obtained from AP-42 Table 11.19.2-2 for Tertiary Crushing. Emission factor for PM2.5 obtained using AP-42 Apendix B.2 - Generalized Particle Size Distributions. Category 3 for unprocessed ores and aggregate has a maximum PM2.5 value as 35% of PM10 value. (0.0024 * 0.35) = 0.0008 lb/ton

[3] Emission factors for TSP and PM10 obtained from AP-42 Table 11.19.2-2 for Conveyor Transfer Point. Emission factor for PM2.5 obtained using AP-42 Apendix B.2 - Generalized Particle Size Distributions. Category 3 for unprocessed ores and aggregate has a maximum PM2.5 value as 35% of PM10 value. (0.0024 * 0.35) = 0.0004 lb/ton

[4] 95% control efficiency based on use of water spray bars and daily watering of stockpiles to maintain a high moisture content of materials

*2808 reflects 9 hrs/day, 6 days/wk, 52 wk/yr

Example Calculation for Unit #4 Controlled TSP Emissions:

Emission factor (lb/ton) = 0.025 lb/ton

(0.025 lb/ton) * (300 ton/hr) = 7.5 lb/hr (1-0.95) = 0.38 lb/hr

(0.38 lb/hr) * (2808 hr/yr) / (2000 lb/ton) = 0.53 ton/yr

Table 11.19.2-2 (English Units). EMISSION FACTORS FOR CRUSHED STONE PROCESSING OPERATIONS (lb/Ton)[a]

Source [b]	Total Particulate Matter [r,s]	EMISSION FACTOR RATING	Total PM-10	EMISSION FACTOR RATING	Total PM-2.5	EMISSION FACTOR RATING
Primary Crushing (SCC 3-05-020-01)	ND		ND[n]		ND[n]	
Primary Crushing (controlled) (SCC 3-05-020-01)	ND		ND[n]		ND[n]	
Secondary Crushing (SCC 3-05-020-02)	ND		ND[n]		ND[n]	
Secondary Crushing (controlled) (SCC 3-05-020-02)	ND		ND[n]		ND[n]	
Tertiary Crushing (SCC 3-050030-03)	0.0054[d]	E	0.0024[o]	C	ND[n]	
Tertiary Crushing (controlled) (SCC 3-05-020-03)	0.0012[d]	E	0.00054[p]	C	0.00010[q]	E
Fines Crushing (SCC 3-05-020-05)	0.0390[e]	E	0.0150[e]	E	ND	
Fines Crushing (controlled) (SCC 3-05-020-05)	0.0030[f]	E	0.0012[f]	E	0.000070[q]	E
Screening (SCC 3-05-020-02, 03)	0.025[c]	E	0.0087[l]	C	ND	
Screening (controlled) (SCC 3-05-020-02, 03)	0.0022[d]	E	0.00074[m]	C	0.000050[q]	E
Fines Screening (SCC 3-05-020-21)	0.30[g]	E	0.072[g]	E	ND	
Fines Screening (controlled) (SCC 3-05-020-21)	0.0036[g]	E	0.0022[g]	E	ND	
Conveyor Transfer Point (SCC 3-05-020-06)	0.0030[h]	E	0.00110[h]	D	ND	
Conveyor Transfer Point (controlled) (SCC 3-05-020-06)	0.00014[i]	E	4.6×10^{-5}[i]	D	1.3×10^{-5}[q]	E
Wet Drilling - Unfragmented Stone (SCC 3-05-020-10)	ND		8.0×10^{-5}[j]	E	ND	
Truck Unloading -Fragmented Stone (SCC 3-05-020-31)	ND		1.6×10^{-5}[j]	E	ND	
Truck Loading - Conveyor, crushed stone (SCC 3-05-020-32)	ND		0.00010[k]	E	ND	

a. Emission factors represent uncontrolled emissions unless noted. Emission factors in lb/Ton of material of throughput. SCC = Source Classification Code. ND = No data.

b. Controlled sources (with wet suppression) are those that are part of the processing plant that employs current wet suppression technology similar to the study group. The moisture content of the study group without wet suppression systems operating (uncontrolled) ranged from 0.21 to 1.3 percent, and the same facilities operating wet suppression systems (controlled) ranged from 0.55 to 2.88 percent. Due to carry over of the small amount of moisture required, it has been shown that each source, with the exception of crushers, does not need to employ direct water sprays. Although the moisture content was the only variable measured, other process features may have as much influence on emissions from a given source. Visual observations from each source under normal operating conditions are probably the best indicator of which emission factor is most appropriate. Plants that employ substandard control measures as indicated by visual observations should use the uncontrolled factor with an appropriate control efficiency that best reflects the effectiveness of the controls employed.

c. References 1, 3, 7, and 8

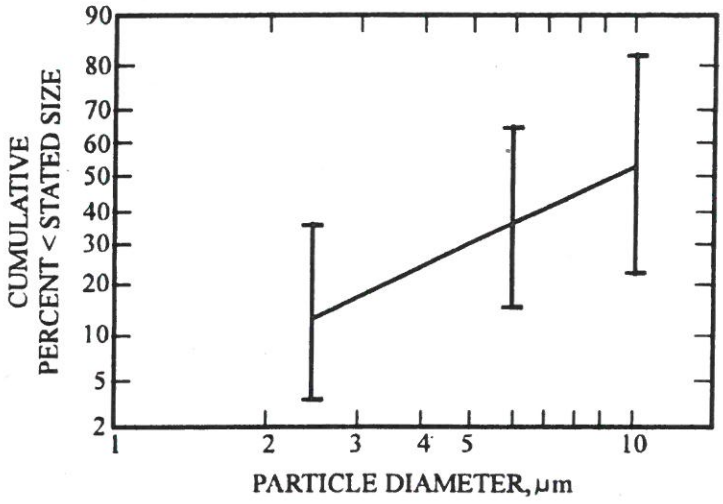
d. References 3, 7, and 8

Table B.2.2 (cont.).

Category: 3
Process: Mechanically Generated
Material: Aggregate, Unprocessed Ores

Category 3 covers material handling and processing of aggregate and unprocessed ore. This broad category includes emissions from milling, grinding, crushing, screening, conveying, cooling, and drying of material. Emissions are generated through either the movement of the material or the interaction of the material with mechanical devices.

REFERENCES: 1-2,4,7



Particle Size, µm	Cumulative % ≤ Stated Size (Uncontrolled)	Minimum Value	Maximum Value	Standard Deviation
1.0[a]	4			
2.0[a]	11			
2.5	15	3	35	7
3.0[a]	18			
4.0[a]	25			
5.0[a]	30			
6.0	34	15	65	13
10.0	51	23	81	14

[a] Value calculated from data reported at 2.5, 6.0, and 10.0 µm. No statistical parameters are given for the calculated value.

Haul Road Emissions - Uncontrolled

Unit	s = surface material silt content (%)[1]	W = mean vehicle weight (tons)[2]	k = constant (lb/VMT)[3]			a = constant[3]			b = constant[3]			Emission Factor (lb/VMT)[4]			Miles per Year[5]	Hours	TSP Emissions		PM10 Emissions		PM2.5 Emissions	
			TSP	PM10	PM2.5	TSP	PM10	PM2.5	TSP	PM10	PM2.5	TSP	PM10	PM2.5			lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
10	3.9	27.5	4.9	1.5	0.15	0.7	0.9	0.9	0.45	0.45	0.45	6.05	1.5	0.15	26280	8760	18.14	79.45	4.44	19.43	0.44	1.94

Haul Road Emissions - Controlled

Unit	s = surface material silt content (%)[1]	W = mean vehicle weight (tons)[2]	k = constant (lb/VMT)[3]			a = constant[3]			b = constant[3]			Emission Factor (lb/VMT)			Miles per Year[6]	Hours*	TSP Emissions		PM10 Emissions		PM2.5 Emissions	
			TSP	PM10	PM2.5	TSP	PM10	PM2.5	TSP	PM10	PM2.5	TSP	PM10	PM2.5			lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
10	3.9	27.5	4.9	1.5	0.15	0.7	0.9	0.9	0.45	0.45	0.45	6.05	1.5	0.15	8424	2808	18.14	25.47	4.44	6.23	0.44	0.62

Control Effic. (%)[7]	TSP Emissions		PM10 Emissions		PM2.5 Emissions	
	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
95	0.91	1.27	0.22	0.31	0.022	0.031

[1] s = 3.9% from AP-42 Section 13.2.2 Unpaved Rads - Related Information spreadsheet that provides surface material silt content by state and from AP-42 Table 13.2.4-1 that provides a mean silt content of 3.9% for various limestone products

[2] W = 27.5 tons = dump truck full weight: 40 tons, sand and gravel weight 25 tons/load, dump truck empty weight 15 tons for mean weight, trucks full upon entry and empty upon exit (40 t + 15 t)/2 = 27.5 t

[3] k, a, and b constants obtained from AP-42 Table 13.2.2-2

[4] E = k (s/12)^a (W/3)^b from AP-42 Section 13.2.2; VMT = vehicle miles traveled

[5] Maximum processing: (300 tons/hr) x (8760 hrs/yr) = 2,628,000 tons/yr
(2,628,000 tons/yr) / (25 tons/truckload) = 105,120 truckloads/yr
(105,120 truckloads/yr) x (0.25 miles/roundtrip) = 26,280 mi/yr

[6] Controlled maximum processing = (300 tons/hr) x (2808 hrs/yr) = 842,400 tons/yr
(842,400 tons/yr) / (25 tons/truckload) = 33,696 truckloads/yr
(33,696 truckloads/yr) x (0.25 miles/roundtrip) = 8,424 mi/yr

[7] 95% control efficiency based off of controlled vehicle speed, maintained gravel and millings on haul road section, and water of haul roads.

*2808 reflects 9 hrs/day, 6 days/wk, 52 wk/yr

Example Calculation for Unit #10 Controlled TSP Emissions:

Emission factor (lb/VMT) = k (s/12)^a (W/3)^b

E = 4.9 * (((3.9/12)^0.7) * ((27.5/3)^0.45)) = 6.05 lb/VMT

(6.05 lb/VMT) * (8424 mi/yr) / (2808 hr/yr) = 18.14 lb/hr (1-0.95) = 0.91 lb/hr

(0.91 lb/hr) * (2808 hr/yr) / (2000 lb/ton) = 1.27 ton/yr

The following empirical expressions may be used to estimate the quantity in pounds (lb) of size-specific particulate emissions from an unpaved road, per vehicle mile traveled (VMT):

For vehicles traveling on unpaved surfaces at industrial sites, emissions are estimated from the following equation:

$$E = k\,(s/12)^a (W/3)^b \qquad (1a)$$

and, for vehicles traveling on publicly accessible roads, dominated by light duty vehicles, emissions may be estimated from the following:

$$E = \frac{k\,(s/12)^a (S/30)^d}{(M/0.5)^c} - C \qquad (1b)$$

where k, a, b, c and d are empirical constants (Reference 6) given below and

E = size-specific emission factor (lb/VMT)
s = surface material silt content (%)
W = mean vehicle weight (tons)
M = surface material moisture content (%)
S = mean vehicle speed (mph)
C = emission factor for 1980's vehicle fleet exhaust, brake wear and tire wear.

The source characteristics s, W and M are referred to as correction parameters for adjusting the emission estimates to local conditions. The metric conversion from lb/VMT to grams (g) per vehicle kilometer traveled (VKT) is as follows:

1 lb/VMT = 281.9 g/VKT

The constants for Equations 1a and 1b based on the stated aerodynamic particle sizes are shown in Tables 13.2.2-2 and 13.2.2-4. The PM-2.5 particle size multipliers (k-factors) are taken from Reference 27.

Table 13.2.2-2. CONSTANTS FOR EQUATIONS 1a AND 1b

Constant	Industrial Roads (Equation 1a)			Public Roads (Equation 1b)		
	PM-2.5	PM-10	PM-30*	PM-2.5	PM-10	PM-30*
k (lb/VMT)	0.15	1.5	4.9	0.18	1.8	6.0
a	0.9	0.9	0.7	1	1	1
b	0.45	0.45	0.45	-	-	-
c	-	-	-	0.2	0.2	0.3
d	-	-	-	0.5	0.5	0.3
Quality Rating	B	B	B	B	B	B

*Assumed equivalent to total suspended particulate matter (TSP)
"-" = not used in the emission factor equation

Table 13.2.2-2 also contains the quality ratings for the various size-specific versions of Equation 1a and 1b. The equation retains the assigned quality rating, if applied within the ranges of source conditions, shown in Table 13.2.2-3, that were tested in developing the equation:

Table 13.2.2-3. RANGE OF SOURCE CONDITIONS USED IN DEVELOPING EQUATION 1a AND 1b

Emission Factor	Surface Silt Content, %	Mean Vehicle Weight		Mean Vehicle Speed		Mean No. of Wheels	Surface Moisture Content, %
		Mg	ton	km/hr	mph		
Industrial Roads (Equation 1a)	1.8-25.2	1.8-260	2-290	8-69	5-43	4-17[a]	0.03-13
Public Roads (Equation 1b)	1.8-35	1.4-2.7	1.5-3	16-88	10-55	4-4.8	0.03-13

[a] See discussion in text.

As noted earlier, the models presented as Equations 1a and 1b were developed from tests of traffic on unpaved surfaces. Unpaved roads have a hard, generally nonporous surface that usually dries quickly after a rainfall or watering, because of traffic-enhanced natural evaporation. (Factors influencing how fast a road dries are discussed in Section 13.2.2.3, below.) The quality ratings given above pertain to the mid-range of the measured source conditions for the equation. A higher mean vehicle weight and a higher than normal traffic rate may be justified when performing a worst-case analysis of emissions from unpaved roads.

The emission factors for the exhaust, brake wear and tire wear of a 1980's vehicle fleet (C) was obtained from EPA's MOBILE6.2 model [23]. The emission factor also varies with aerodynamic size range

AP 42 Section 13.2.2 Unpaved Roads - Related Information

Paved Roads, Unpaved Roads, Aggregate Handling and Storage, and Industrial Wind Erosion - November 2006

- Policy Guidance on the Use of the November 1, 2006, Update to AP-42 for Re-entrained Road Dust for SIP Development and Transportation Conformity (PDF 255K) This memo provides additional details about the changes made to the AP-42 methods for road dust and how and when to use them in PM2.5 SIPs and transportation plan and transportation improvement program (TIP) conformity determinations. It also reaffirms that PM10 road dust estimates are unchanged from the previous version. This guidance supersedes the AP-42 portions of EPA's February 24, 2004, guidance, which addressed both MOBILE6.2 and AP-42. August 2, 2007.
- Analysis of the Fine Fraction of Particulate Matter in Fugitive Dust. (PDF 1.3M) Final Report for Western Governors' Association Western Regional Air Partnership (WRAP). October 12, 2005. Posted as supporting documentation for the draft AP42 sections 13.2.1 Paved Roads, 13.2.2 Unpaved Roads, 13.2.4 Aggregate Handling and Storage Piles, and 13.2.5 Industrial Wind Erosion. March 22, 2006.
- MS Excel spreadsheets that show all of the data for the wind tunnel tests that support the proposed PM2.5/PM-10 ratios.
  Wrap Phase 1 (XLS 270K)
  Wrap Phase 2 (XLS 330K)
- This spreadsheet contains a list of Surface Material Silt Content by state. EPA has used these values in the preparation of the National Emission Inventory. In the absence of locally derived surface material silt content, users may choose to use the values in this table as default values.
  r13s0202_dec03.xls - December 2003 (XLS 18K)
- This spreadsheet program is for calculating emissions factors which are temporally and spatially resolved. Information required for use of the spreadsheet program includes monthly Class A pan evaporation values, hourly meteorological data for precipitation, humidity and snow cover, vehicle traffic information, and road surface material information.
  r13s0202sample.wk4 - October 1998 (WK4 5M)
  r13s0202sample.xls - October 1998 (XLS 1.25M)

AP 42 Emissions Factors by Chapter

Unpaved Road Surface Material Silt C

comment

State	Unpaved Road Surface Material Silt Content (%)
Alabama	3.9
Alaska	3.8
Arizona	3.0
Arkansas	3.9
California	2.6
Colorado	1.5
Connecticut	3.9
Delaware	3.9
DC	0.0
Florida	3.9
Georgia	3.9
Hawaii	3.8
Idaho	3.9
Illinois	2.6
Indiana	2.6
Iowa	2.5
Kansas	3.9
Kentucky	3.9
Louisiana	3.9
Maine	3.9
Maryland	3.9
Massachusetts	3.9
Michigan	3.9
Minnesota	2.6
Mississippi	2.7
Missouri	3.9
Montana	6.5
Nebraska	6.6
Nevada	4.2
New Hampshire	1.7
New Jersey	3.9
New Mexico	3.9
New York	4.3
North Carolina	4.7
North Dakota	5.1
Ohio	3.9
Oklahoma	3.1
Oregon	4.4
Pennsylvania	7.2
Rhode Island	3.3
South Carolina	3.9
South Dakota	3.9
Tennessee	3.1
Texas	2.0
Utah	5.6
Vermont	3.9
Virginia	3.9
Washington	3.2
West Virginia	3.9
Wisconsin	3.9
Wyoming	4.2
	7.1
	3.8

Table 13.2.4-1. TYPICAL SILT AND MOISTURE CONTENTS OF MATERIALS AT VARIOUS INDUSTRIES[a]

Industry	No. Of Facilities	Material	Silt Content (%)			Moisture Content (%)		
			No. Of Samples	Range	Mean	No. Of Samples	Range	Mean
Iron and steel production	9	Pellet ore	13	1.3 - 13	4.3	11	0.64 - 4.0	2.2
		Lump ore	9	2.8 - 19	9.5	6	1.6 - 8.0	5.4
		Coal	12	2.0 - 7.7	4.6	11	2.8 - 11	4.8
		Slag	3	3.0 - 7.3	5.3	3	0.25 - 2.0	0.92
		Flue dust	3	2.7 - 23	13	1	—	7
		Coke breeze	2	4.4 - 5.4	4.9	2	6.4 - 9.2	7.8
		Blended ore	1	—	15	1	—	6.6
		Sinter	1	—	0.7	0	—	—
		Limestone	3	0.4 - 2.3	1.0	2	ND	0.2
Stone quarrying and processing	2	Crushed limestone	2	1.3 - 1.9	1.6	2	0.3 - 1.1	0.7
		Various limestone products	8	0.8 - 14	3.9	8	0.46 - 5.0	2.1
Taconite mining and processing	1	Pellets	9	2.2 - 5.4	3.4	7	0.05 - 2.0	0.9
		Tailings	2	ND	11	1	—	0.4
Western surface coal mining	4	Coal	15	3.4 - 16	6.2	7	2.8 - 20	6.9
		Overburden	15	3.8 - 15	7.5	0	—	—
		Exposed ground	3	5.1 - 21	15	3	0.8 - 6.4	3.4
Coal-fired power plant	1	Coal (as received)	60	0.6 - 4.8	2.2	59	2.7 - 7.4	4.5
Municipal solid waste landfills	4	Sand	1	—	2.6	1	—	7.4
		Slag	2	3.0 - 4.7	3.8	2	2.3 - 4.9	3.6
		Cover	5	5.0 - 16	9.0	5	8.9 - 16	12
		Clay/dirt mix	1	—	9.2	1	—	14
		Clay	2	4.5 - 7.4	6.0	2	8.9 - 11	10
		Fly ash	4	78 - 81	80	4	26 - 29	27
		Misc. fill materials	1	—	12	1	—	11

[a] References 1-10. ND = no data.

Non-Emergency Engine Emissions - Uncontrolled

Unit	Size/Process (hp)	Emission Factor Source	Emission Factor (g/hp*hr)							Hours	NOx Emissions		CO Emissions		NMHC Emissions		SOx Emissions		TSP Emissions		PM10 Emissions		PM2.5 Emissions	
			NOx	CO	NMHC	SOx	TSP	PM10	PM2.5		lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
11	499	NSPS Non-Emergency Diesel Engines v10/2013	0.3	2.6	0.14	0.93	0.01	0.01	0.01	8760	0.33	1.45	2.86	12.53	0.15	0.03	1.02	4.48	0.011	0.048	0.011	0.048	0.011	0.048

Non-Emergency Engine Emissions - Controlled

Unit	Size/Process (hp)	Emission Factor Source	Emission Factor (g/hp*hr)							Hours*	NOx Emissions		CO Emissions		NMHC Emissions		SOx Emissions		TSP Emissions		PM10 Emissions		PM2.5 Emissions	
			NOx	CO	NMHC	SOx	TSP	PM10	PM2.5		lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
11	499	NSPS Non-Emergency Diesel Engines v10/2013	0.3	2.6	0.14	0.93	0.01	0.01	0.01	2808	0.33	0.46	2.86	4.02	0.15	0.22	1.02	1.44	0.011	0.015	0.011	0.015	0.011	0.015

*2808 reflects 9 hrs/day, 6 days/wk, 52 wk/yr

Example Calculation for Unit #11 Controlled TSP Emissions:

Emission factor (g/hp*hr) = 0.01 g/hp*hr

(0.01 g/hp*hr) * (499 hp) / (453.592 g/lb) = 0.011 lb/hr

(0.011 lb/hr) * (2808 hr/yr) / (2000 lb/ton) = 0.015 ton/yr

Federal New Source Performance Standards (NSPS) for Stationary NON - EMERGENCY Diesel Engines (40CFR 60.4201 & 60.4204) in Grams Per Horsepower Hour (g/hp-hr) for Engines with a displacement of < 10 Liters Per Cylinder

Horsepower / kW	Tier (CFR Section)	Year Of Manufacture	CO (g/hp-hr)	NOx (g/hp-hr)	NMHC (g/hp-hr)	NOx + NMHC[1] (g/hp-hr)	SOx[2] (g/hp-hr)	Particulate Matter (g/hp-hr)	Notes
< 11 Hp < 8 kW	1 (60.4204)	Pre 2007[4]	6.0			7.8	0.93*	0.75	* Use AP-42 Section 3.3 if <600Hp, Section 3.4 if >600Hp, as shown on this table, or manufacturer's factors. Manufacturer's factors shall be used when larger than AP-42 factors.
	2 (60.4201) - (89.112)	2007	6.0			5.6	0.93*	0.6	
	4 (60.4201) - (1039.102)	2008 - 2014	6.0			5.6	0.93*	0.3	
	4 (60.4201) - (1039.101)	2015 +	6.0			5.6	0.93*	0.3	
≥ 11 Hp < 25 Hp ≥ 8 kW < 19 kW	1 (60.4204)	Pre 2007[4]	4.9			7.1	0.93*	0.6	
	2 (60.4201) - (89.112)	2007	4.9			5.6	0.93*	0.6	
	4 (60.4201) - (1039.102)	2008 - 2014	4.9			5.6	0.93*	0.3	
	4 (60.4201) - (1039.101)	2015 +	4.9			5.6	0.93*	0.3	
≥ 25 Hp < 50 Hp ≥ 19 kW < 37 kW	1 (60.4204)	Pre 2007[4]	4.1			7.1	0.93*	0.6	
	2 (60.4201) - (89.112)	2007	4.1			5.6	0.93*	0.45	
	4 (60.4201) - (1039.102)	2008 - 2012	4.1			5.6	0.93*	0.22	
	4 (60.4201) - (1039.101)	2013 +	4.1			3.5	0.93*	0.02	
≥ 50 Hp < 75 Hp	1 (60.4204)	Pre 2007[4]	**	6.9	**		0.93*	**	** Use AP-42 Section 3.3 factors for CO, NMHC, and PM as shown on this table, or manufacturer's factors. Manufacturer's factors shall be used when larger than AP-42 factors.
≥ 37 kW < 56 kW	2 (60.4201) - (89.112)	2007	3.7			5.6	0.93*	0.3	
	3 (60.4201) - (89.112) & 4 (1039.102)	2008 - 2011	3.7			3.5	0.93*	0.3 (0.02 by 2012+)	Option #2
	4 (60.4201) - (1039.102)	2008 - 2012	3.7			3.5	0.93*	0.22	Option #1
	4 (60.4201) - (1039.102) & (1039.101)	2013 +	3.7			3.5	0.93*	0.02	
≥ 75 Hp < 100 Hp ≥ 56 kW < 75 kW	1 (60.4204)	Pre 2007[4]	**	6.9	**		0.93*	**	
	2 (60.4201) - (89.112)	2007	3.7			5.6	0.93*	0.3	
	3 (60.4201) - (89.112)	2008 - 2011	3.7			3.5	0.93*	0.3	
	4 (60.4201) - (1039.102)	2012 -2013	3.7	0.3***	0.14***	3.5***	0.93*	0.01	***Phase in/out[3] [1039.102(c)(1)]
	4 (1039.102) & (1039.101)	2014 +	3.7	0.3	0.14		0.93*	0.01	
≥ 100 Hp < 175 Hp ≥ 75 kW < 130 kW	1 (60.4204)	Pre 2007[4]	**	6.9	**		0.93*	**	
	3 (60.4201) - (89.112)	2007 - 2011	3.7			3.0	0.93*	0.22	
	4 (60.4201) - (1039.102)	2012 -2013	3.7	0.3***	0.14***	3.0***	0.93*	0.01	***Phase in/out[3] [1039.102(c)(1)]
	4 (60.4201) - (1039.102) & (1039.101)	2014 +	3.7	0.3	0.14		0.93*	0.01	
≥ 175 Hp ≤ 750 Hp ≥ 130 kW ≤ 560 kW	1 (60.4204)	Pre 2007[4]	8.5	6.9	1.0		0.93*	0.4	
	3 (60.4201) - (89.112)	2007 - 2010	2.6			3.0		0.15	
	4 (60.4201) - (1039.102)	2011 - 2013	2.6	0.3***	0.14***	3.0***	0.93*for < 600Hp or 3.67* for > 600Hp	0.01	***Phase in/out[3] [1039.102(c)(1)]
	4 (60.4201) - (1039.102) & (1039.101)	2014+	2.6	0.3	0.14			0.01	
> 750 > 560 kW	1 (60.4204)	Pre 2007[4]	8.5	6.9	1.0		3.67*	0.4	
	2 (60.4201) - (89.112)	2007- 10****	2.6			4.8	3.67*	0.15	
		**** 2007 – 2010 Model Year Engines > 3,000 Hp shall meet the Pre 2007 standards							
	4 (60.4201) - (1039.102)	2011 - 2014	2.6	2.6	0.3		3.67*	0.075	
	4 (60.4201) - (1039.101)	2015 +	2.6	2.6	0.14		3.67*	0.03	

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