

Short term fugitive Dust Emissions

Maximum construction activity occurs in month 21.

- 1 month of dirt moving
- 22 construction days per month
- 10 construction hours per day
- 60% average load factor for equipment listed (CEQA)

Dirt Piling or Material Handling

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

USEPA AP42 Chapter 13.2.4 (Aggregate Handling And Storage Piles)

- 0.35 k for PM₁₀
- 0.053 k for PM_{2.5}
- 6.25 U = Mean Wind speed (mph) average for Bakersfield Airport 2000-2004
- 19 M = Moisture content of surface material (%) (average of soil borings taken onsite at 5 ft)
- 0.00006 lb/ton of PM₁₀
- 0.00001 lb/ton of PM_{2.5}

Equipment	Quantity	Hours/Day	Material Handled (ton/day)	Material Handled (ton)	Watering Control Efficiency	PM10 Emissions (lb/hr)	PM10 Emissions (lb/day)	PM2.5 Emissions (lb/hr)	PM2.5 Emissions (lb/day)
Backhoe	1	6	58202	1,280,437	67%	0.2050	1.2298	0.0426	0.2558
Total						0.2050	1.2298	0.0426	0.2558

Water efficiency from CEQA Table 11-4 watering 3 times daily or using chemical suppressants (South Coast Air Quality Management District, 1993, CEQA Air Quality Handbook, Table 11-4: Mitigation for PM10 Emissions - Construction.)

49323 yd³/day 58202 ton/day
 1,085,116 yd³ 1,280,437 tons 2360 density of soil (lb/yd³)
 (USDA NRCS Physical Soil Properties from Kern County for Lockern-Buttonwillow clay)
 134.25 acres = 1,085,116 cubic yds, assume depth of soils moved is 1.67 yd
 (assume 25% of entire site in month 21)

Cover Storage Pile

SCAQMD Table A9-9-E

$$E = 1.7 * G / 1.5 * (365 - H) / 235 * I / 15 * J$$

PM10 Emission factor from wind erosion of storage piles per day per acre

- 50 G = Silt content (%) (from onsite soil boring B-4)
- 37 H = Mean number of days per year with at least 0.01 inches of precipitation (from WRCC for Bakersfield Airport Station)
- 0.3 I = Percentage of time that the unobstructed wind speed exceeds 12 mph at mean pile height
- 0.5 J = Fraction of TSP that is PM10 = 0.5
- 0.791 lb/acre/day

wind speed percentage and average based on 2000-04 (5 yrs) of wind speed data as recorded at Bakersfield Airport station

Source	Quantity	Size of Pile (acre)	Hours/Day	Watering Control Efficiency	PM10 Emissions (lb/hr)	PM10 Emissions (lb/day)	PM2.5 Emissions (lb/hr)	PM2.5 Emissions (lb/day)
Cover Storage Pile	25	0.25	24	67%	0.07	1.63	0.014	0.339

Water efficiency from CEQA Table 11-4 watering 3 times daily or using chemical suppressants (South Coast Air Quality Management District, 1993, CEQA Air Quality Handbook, Table 11-4: Mitigation for PM10 Emissions - Construction.)
 pile size and number are assumed

Travel on unpaved road

$$F = 2.1 * G / 12 * H / 30 * (J/3)^{0.7} * (I/4)^{0.5} * (365 - K) / 365$$

SCAQMD Table A9-9-D

Emission factor for vehicle travel on unpaved roads (lb/VMT)

- 4 G = Surface silt loading (%) (value for gravel road)
- 4 H = Mean vehicle speed (mph)
- value listed in table I = Mean number of wheels on vehicle
- value listed in table J = Mean vehicle weight (ton)
- 37 K = Mean number of days per year with at least 0.01 inches of precipitation (from WRCC for Bakersfield Airport Station)

Vehicle Type	No. Of Unit	Round Trips /Day/ Unit	Round Trip Distance (mile)	Daily VMT (all units)	Mean Vehicle Weight (tons)	Number of Wheels on Vehicle	PM10 EF (lbs/VMT)	Watering Control Efficiency	PM10 Emissions (lb/hr)	PM10 Emissions (lb/day)	PM2.5 Emissions (lb/hr)
Concrete Pumper Truck	1	2	0.75	1.5	30	10	0.66	67%	0.03	0.33	0.01
Dump Truck	0			0.0	15	10	0.41	67%	0.00	0.00	0.00
Service Truck - 1 ton	0			0.0	15	10	0.41	67%	0.00	0.00	0.00
Pile Driver Truck	0			0.0	15	10	0.41	67%	0.00	0.00	0.00
Truck - Fuel/Lube	0			0.0	15	10	0.41	67%	0.00	0.00	0.00
Tractor Truck 5th Wheel	0			0.0	11	10	0.33	67%	0.00	0.00	0.00
Trucks - Pickup 3/4 ton	5	10	0.5	25.0	3	4	0.08	67%	0.07	0.69	0.01
Trucks - 3 ton	2	2	0.5	2.0	11	10	0.33	67%	0.02	0.22	0.00
Truck - Water	1	4	1	4.0	25	10	0.59	67%	0.08	0.77	0.02
Air Compressor 185 CFM	0			0.0	0.5	2	0.02	67%	0.00	0.00	0.00

Air Compressor 750 CFM	4	1	0.01	0.0	0.5	2	0.02	67%	0.00	0.00	0.00
Articulating Boom Platform	0			0.0	5	10	0.19	67%	0.00	0.00	0.00
Bulldozer D10R	0			0.0	35	2	0.33	67%	0.00	0.00	0.00
Bulldozer D4C	0			0.0	15	2	0.18	67%	0.00	0.00	0.00
Concrete Trowel Machine	0			0.0	15	8	0.37	67%	0.00	0.00	0.00
Concrete Vibrators	0			0.0	0.25	0	0.00	67%	0.00	0.00	0.00
Cranes - Mobile 35 ton	7	1	0.1	0.7	25	12	0.64	67%	0.01	0.15	0.00
Cranes - Mobile 45 ton	0			0.0	35	2	0.33	67%	0.00	0.00	0.00
Crane - Mobile 65 ton	6	1	0.1	0.6	45	2	0.39	67%	0.01	0.08	0.00
Cranes 100 / 150 ton cap	4	0	0	0.0	50	12	1.04	67%	0.00	0.00	0.00
Diesel Powered Welder	3	0	0	0.0	0.5	2	0.02	67%	0.00	0.00	0.00
Backhoe/loader	1	4	0.25	1.0	11	4	0.21	67%	0.01	0.07	0.00
Earth Scraper	0			0.0	40	4	0.51	67%	0.00	0.00	0.00
Loader	0			0.0	25	4	0.37	67%	0.00	0.00	0.00
Motor Grader	0			0.0	20	6	0.39	67%	0.00	0.00	0.00
Excavator - Trencher	0			0.0	17	4	0.28	67%	0.00	0.00	0.00
Fired Heaters	5	0	0	0.0	0.25	0	0.00	67%	0.00	0.00	0.00
Forklift	3	5	0.5	7.5	10	4	0.19	67%	0.05	0.48	0.01
Fusion Welder	0			0.0	0.25	2	0.01	67%	0.00	0.00	0.00
Heavy Haul / Cranes	5	0	0	0.0	75	2	0.56	67%	0.00	0.00	0.00
Light Plants	6	0	0	0.0	0.5	4	0.02	67%	0.00	0.00	0.00
Portable Compaction Roller	2	0	0	0.0	3	3	0.07	67%	0.00	0.00	0.00
Portable Compaction - Plate	3	0	0	0.0	0.1	0	0.00	67%	0.00	0.00	0.00
Portable Compaction - Ram	0			0.0	0.25	0	0.00	67%	0.00	0.00	0.00
Pumps	2	0	0	0.0	0.1	0	0.00	67%	0.00	0.00	0.00
Portable Power Generators	5	0	0	0.0	0.5	4	0.02	67%	0.00	0.00	0.00
Truck Crane - Greater than 200 ton	4	1	0.1	0.4	50	12	1.04	67%	0.01	0.14	0.00
Truck Crane - Greater than 300 ton	2	0	0	0.0	60	12	1.18	67%	0.00	0.00	0.00
Vibratory Roller 20 ton	0			0.0	20	3	0.27	67%	0.00	0.00	0.00
Total									0.94	9.40	0.20

worker personal vehicles	1029	1	0.5	514.4	3	4	0.08	85%	0.65	6.47	0.14
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Assumed maximum travel speed is 4 mph

Equipment weight from SCAQMD Table A9-9-D-3 and various websites

Water efficiency from CEQA Table 11-4 watering 3 times daily or using chemical suppressants (South Coast Air Quality Management District, 1993, CEQA Air Quality Handbook, Table 11-4: Mitigation for PM10 Emissions - Construction.)

PM2.5 emission factors from updated CEIDARS List with PM2.5 fractions.

PM2.5 numbers obtained by multiplying the PM10 values by fraction in CEIDARS list for appropriate fugitive dust sources.

Water trucks operate at least 4 times per day.

10 Maximum number of construction work hours per day

CEQA Load Factors (Table A9-8-D)

generator	74	crane	43	roller	57.5	average equipment load factor	58
welder	45	pumps	74	loader	54		
compressors	48	light plant	62	backhoe	46.5		
crawler dozer	59	trucks	57	grader	57.5		
drill rig	75	forklift	47.5	scraper	66		

Total Fugitive Dust from Onsite Equipment - Month 21

	PM ₁₀ Emissions (lb/day)	PM _{2.5} Emissions (lb/day)
Dirt Piling	1.2298	0.2558
Storage Piles	1.6313	0.3393
Travel on Unpaved Roads	0.3364	3.3641
TOTAL	3.20	3.96

Annual Fugitive Dust Emissions

Maximum annual fugitive dust activity occurs in months 17-28.

- 7 months of soil disturbance
- 10 total construction hours per work day
- 22 construction days per month
- 60% average load factor for equipment listed (CEQA)

Dirt Piling or Material Handling

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

USEPA AP42 Chapter 13.2.4 (Aggregate Handling And Storage Piles)

- 0.35 k for PM₁₀
- 0.053 k for PM_{2.5}
- 6.25 U = Mean Wind speed (mph) average for Bakersfield Airport 2000-2004
- 19 M = Moisture content of surface material (%) (average of soil borings taken onsite at 5 ft)
- 0.00006 lb/ton of PM₁₀
- 0.00001 lb/ton of PM_{2.5}

Equipment	Annual Material Handled (ton)	Watering Control Efficiency	PM10 Emissions (tons/yr)	PM2.5 Emissions (tons/yr)
Scraper	1,691,750	67%	0.018	0.003
Loader	1,522,575	67%	0.016	0.002
Backhoe	169,175	67%	0.002	0.000
	3,383,500	Total	0.036	0.005

Water efficiency from CEQA Table 11-4 watering 3 times daily or using chemical suppressants (South Coast Air Quality Management District, 1993, CEQA Air Quality Handbook, Table 11-4: Mitigation for PM10 Emissions - Construction.)
assume scraper handles 50% of dirt, loader 45%, and backhoe 5%

18,619 yd³/day 21,971 ton/day 2360 density of soil (lb/yd³)
2,867,373 yd³ 3,383,500 tons (USDA NRCS Physical Soil Properties from Kern County
Lockern-Buttonwillow clay soil)

354.75 acres = 2,867,373 cubic yds, assume depth of soils moved is 1.67 yd
(assume 75% of entire site in 12 month period)

Cover Storage Pile

SCAQMD Table A9-9-E

$$E = 1.7 * G/1.5 * (365-H)/235 * I/15 * J$$

PM10 Emission factor from wind erosion of storage piles per day per acre

- 50 G = Silt content (%) (from soil boring B-4)
- 37 H = Mean number of days per year with at least 0.01 inches of precipitation (from WRCC for Bakersfield Airport Station)
- 0.3 I = Percentage of time that the unobstructed wind speed exceeds 12 mph at mean pile height
- 0.5 J = Fraction of TSP that is PM10 = 0.5
- 0.791 lb/acre/day

wind speed percentage and average based on 2000-04 (5 yrs) of wind speed data as recorded at Bakersfield Airport station

Source	Quantity	Size of Pile (acre)	Days / year	Watering Control Efficiency	PM10 Emissions (tons/yr)	PM2.5 Emissions (tons/yr)
Cover Storage Pile	40	0.25	365	67%	0.48	0.099

Water efficiency from CEQA Table 11-4 watering 3 times daily or using chemical suppressants (South Coast Air Quality Management District, 1993, CEQA Air Quality Handbook, Table 11-4: Mitigation for PM10 Emissions - Construction.)
pile size and number are assumed

Days per year accounts for weekend days also, not just work days

Travel on unpaved road

$$F = 2.1 * G/12 * H/30 * (J/3)^{0.7} * (I/4)^{0.5} * (365-K)/365$$

SCAQMD Table A9-9-D

Emission factor for vehicle travel on unpaved roads (lb/VMT)

- 4 G = Surface silt loading (%) (value for gravel road)
- 4 H = Mean vehicle speed (mph)
- value listed in table I = Mean number of wheels on vehicle
- value listed in table J = Mean vehicle weight (ton)
- 37 K = Mean number of days per year with at least 0.01 inches of precipitation (from WRCC for Bakersfield Airport Station)

Vehicle Type	Quantity per year	Round Trips /Day/ Unit	Round Trip Distance (mile)	Annual VMT (all units)	Mean Vehicle Weight (tons)	Number of Wheels on Vehicle	PM10 EF (lbs/VMT)	Watering Control Efficiency	PM10 Emissions (tons/yr)	PM2.5 Emissions (tons/yr)
Concrete Pumper Truck	6	2	0.75	990.0	30	10	0.66	67%	0.109	0.023
Dump Truck	0			0.0	15	10	0.41	67%	0.000	0.000
Service Truck - 1 ton	0			0.0	15	10	0.41	67%	0.000	0.000
Pile Driver Truck	0			0.0	15	10	0.41	67%	0.000	0.000
Truck - Fuel/Lube	0			0.0	15	10	0.41	67%	0.000	0.000
Tractor Truck 5th Wheel	0			0.0	11	10	0.33	67%	0.000	0.000
Trucks - Pickup 3/4 ton	60	10	0.5	79200.0	3	4	0.08	67%	1.096	0.232
Trucks - 3 ton	24	2	0.5	6336.0	11	10	0.33	67%	0.344	0.073
Truck - Water	12	4	1	12672.0	25	10	0.59	67%	1.223	0.259
Air Compressor 185 CFM	0			0.0	0.5	2	0.02	67%	0.000	0.000
Air Compressor 750 CFM	48	1	0.01	126.7	0.5	2	0.02	67%	0.000	0.000
Articulating Boom Platform	0			0.0	5	10	0.19	67%	0.000	0.000
Bulldozer D10R	0			0.0	35	2	0.33	67%	0.000	0.000
Bulldozer D4C	0			0.0	15	2	0.18	67%	0.000	0.000
Concrete Trowel Machine	12	1	0.25	396.0	15	8	0.37	67%	0.024	0.005
Concrete Vibrators	0			0.0	0.25	0	0.00	67%	0.000	0.000

Cranes - Mobile 35 ton	80	1	0.1	2112.0	25	12	0.64	67%	0.223	0.047
Cranes - Mobile 45 ton	0			0.0	35	2	0.33	67%	0.000	0.000
Crane - Mobile 65 ton	70	1	0.1	1848.0	45	2	0.39	67%	0.120	0.026
Cranes 100 / 150 ton cap	48	0	0	0.0	50	12	1.04	67%	0.000	0.000
Diesel Powered Welder	41	0	0	0.0	0.5	2	0.02	67%	0.000	0.000
Backhoe/loader	6	4	0.25	792.0	11	4	0.21	67%	0.027	0.006
Earth Scraper	0			0.0	40	4	0.51	67%	0.000	0.000
Loader	0			0.0	25	4	0.37	67%	0.000	0.000
Motor Grader	0			0.0	20	6	0.39	67%	0.000	0.000
Excavator - Trencher	0			0.0	17	4	0.28	67%	0.000	0.000
Fired Heaters	53	0	0	0.0	0.25	0	0.00	67%	0.000	0.000
Forklift	36	5	0.5	23760.0	10	4	0.19	67%	0.764	0.162
Fusion Welder	0			0.0	0.25	2	0.01	67%	0.000	0.000
Heavy Haul / Cranes	32	0	0	0.0	75	2	0.56	67%	0.000	0.000
Light Plants	84	0	0	0.0	0.5	4	0.02	67%	0.000	0.000
Portable Compaction Roller	10	0	0	0.0	3	3	0.07	67%	0.000	0.000
Portable Compaction - Plate	18	0	0	0.0	0.1	0	0.00	67%	0.000	0.000
Portable Compaction - Ram	0			0.0	0.25	0	0.00	67%	0.000	0.000
Pumps	24	0	0	0.0	0.1	0	0.00	67%	0.000	0.000
Portable Power Generators	60	0	0	0.0	0.5	4	0.02	67%	0.000	0.000
Truck Crane - Greater than 200 ton	42	1	0.1	1108.8	50	12	1.04	67%	0.190	0.040
Truck Crane - Greater than 300 ton	27	0	0	0.0	60	12	1.18	67%	0.000	0.000
Vibratory Roller 20 ton	0			0.0	20	3	0.27	67%	0.000	0.000
Total									4.124	0.874
worker personal vehicles	946	1	0.5	473.2	3	4	0.08	85%	0.003	0.001

worker personal vehicle data from Table 2-26, Estimated Monthly Construction Workforce from AFC, average for months 17-28 divided by 1.25 employees per vehicle

Assumed maximum travel speed is 4 mph

Equipment weight from SCAQMD Table A9-9-D-3 and various websites

Water efficiency from CEQA Table 11-4 watering 3 times daily or using chemical suppressants (South Coast Air Quality Management District, 1993, CEQA Air Quality Handbook, Table 11-4: Mitigation for PM10 Emissions - Construction.)

except for worker vehicles - parking area will be graveled and main road onsite will be paved

PM2.5 emission factors from updated CEIDARS List with PM2.5 fractions.

PM2.5 numbers obtained by multiplying the PM10 values by fraction in CEIDARS list for appropriate fugitive dust sources.

Water trucks operate at least 4 times per day.

Total Annual Fugitive Dust from Onsite Equipment - Months 17 - 28

	PM ₁₀ Emissions (tons/yr)	PM _{2.5} Emissions (tons/yr)
Dirt Piling	0.0357	0.0054
Storage Piles	0.4763	0.0991
Travel on Unpaved Roads	4.1274	0.8750
TOTAL	4.64	0.98