

Appendix G  
Maximum and Average Daily Emissions  
Calculations



**Operational Emissions Summary - Maximum Daily**

**Proposed Project Emissions - Maximum Daily**

	Proposed Plant - Onsite	Proposed Plant - Offsite Vehicles	Proposed Project Total
	lb/day	lb/day	lb/day
ROG	85.64	3.10	88.74
NOx	41.60	136.83	178.43
SOx	10.92	0.45	11.37
CO	417.22	20.00	437.22
PM10	75.83	3.97	79.79
PM2.5	64.53	2.10	66.64

**Existing Plant Emissions - Maximum Daily**

	Existing Plant - Onsite	Existing Plant - Offsite Vehicles	Existing Plant Total
	lb/day	lb/day	lb/day
ROG	50.33	4.88	55.21
NOx	44.99	125.35	170.34
SOx	2.86	0.23	3.09
CO	262.91	22.40	285.32
PM10	44.24	4.01	48.25
PM2.5	44.24	2.97	47.22

**Maximum Daily Emissions Increase**

	Proposed Project Emissions	Existing Plant Emissions	Daily Emissions Increase	SCAQMD Threshold	Exceed threshold?
	lb/day	lb/day	lb/day	lb/day	
ROG	88.74	55.21	33.53	55	No
NOx	178.43	170.34	8.10	55	No
SOx	11.37	3.09	8.28	150	No
CO	437.22	285.32	151.91	550	No
PM10	79.79	48.25	31.54	150	No
PM2.5	66.64	47.22	19.42	55	No

**Operational Emissions Summary - Average Daily**

**Proposed Project Emissions - Average Daily**

	Proposed Plant - Onsite	Proposed Plant - Offsite Vehicles	Proposed Project Total
	lb/day	lb/day	lb/day
ROG	51.77	1.87	53.64
NOx	25.24	82.07	107.31
SOx	6.56	0.27	6.83
CO	250.05	12.68	262.73
PM10	45.21	2.41	47.62
PM2.5	38.71	1.28	39.98

**Existing Plant Emissions - Average Daily**

	Existing Plant - Onsite	Existing Plant - Offsite Vehicles	Existing Plant Total
	lb/day	lb/day	lb/day
ROG	21.29	2.84	24.13
NOx	19.01	72.36	91.37
SOx	1.28	0.14	1.42
CO	115.83	13.61	129.45
PM10	19.72	2.34	22.06
PM2.5	19.72	1.73	21.45

**Average Daily Emissions Increase**

	Proposed Project Emissions	Existing Plant Emissions	Daily Emissions Increase
	lb/day	lb/day	lb/day
ROG	53.64	24.13	29.52
NOx	107.31	91.37	15.94
SOx	6.83	1.42	5.42
CO	262.73	129.45	133.28
PM10	47.62	22.06	25.56
PM2.5	39.98	21.45	18.53

**Operational Emissions - Onsite Equipment**

**Asphalt Plant #1 Existing Operation Emissions - Annual Emissions from SCAQMD Website**

	Onsite Equipment Emissions					Average
	2009	2010	2011	2012	2013	
	ton/year	ton/year	ton/year	ton/year	ton/year	ton/year
ROG	4.568	3.451	3.53	4.214	3.665	3.886
Nox	5.078	3.102	3.591	2.109	3.469	3.470
Sox	0.433	0.038	0.287	0.012	0.399	0.234
CO	37.517	8.152	24.893	0.703	34.434	21.140
PM10	5.07	0.962	3.333	4.385	4.249	3.600
PM2.5	5.07	0.962	3.333	4.385	4.249	3.600

Note:

Onsite equipment historical data were obtained from SCAQMD website, emission data for the facility. [http://www3.aqmd.gov/webappl/fim/prog/emission.aspx?fac\\_id=116480](http://www3.aqmd.gov/webappl/fim/prog/emission.aspx?fac_id=116480)

PM10 and PM2.5 were assumed to be the same as the TSP emissions

**Asphalt Plant #1 Existing Operation Emissions - Derived Emission Factors (lb/ton HMA)**

	2009	2010	2011	2012	2013	Average
Production Rate	ton HMA/year	ton HMA/year	ton HMA/year	ton HMA/year	ton HMA/year	ton HMA/year
	181727	114860	120914	160058	168635	<b>149238.8</b>
Derived Emission Rate	lb/ton HMA	lb/ton HMA	lb/ton HMA	lb/ton HMA	lb/ton HMA	lb/ton HMA
ROG	0.050	0.060	0.058	0.053	0.043	<b>0.053</b>
Nox	0.056	0.054	0.059	0.026	0.041	<b>0.047</b>
Sox	0.005	0.001	0.005	0.000	0.005	<b>0.003</b>
CO	0.413	0.142	0.412	0.009	0.408	<b>0.277</b>
PM10	0.056	0.017	0.055	0.055	0.050	<b>0.047</b>
PM2.5	0.056	0.017	0.055	0.055	0.050	<b>0.047</b>

**Asphalt Plant #1 Existing Operation Emissions - Maximum Daily Emissions**

	Emission Factor	Maximum Daily Emissions
	lb/ton HMA	lb/day
ROG	0.053	50.33
NOx	0.047	44.99
SOx	0.003	2.86
CO	0.277	262.91
PM10	0.047	44.24
PM2.5	0.047	44.24

Maximum Daily Production Rate

950 ton HMA/day

**Asphalt Plant #1 Existing Operation Emissions - Average Daily Emissions**

	Average Annual Emission	Average Daily Emissions
	ton/year	lb/day
ROG	3.886	21.29
NOx	3.470	19.01
SOx	0.234	1.28
CO	21.140	115.83
PM10	3.600	19.72
PM2.5	3.600	19.72

**Vehicle Emissions - Maximum Daily Emissions**

**Existing Operation**

Material Type	Qty/day (Tons)	Truck Load Capacity (tons)	Round Trip Distance (mi)	# of round trips/day	VMT/day	% CNG VMT	%Diesel VMT	CNG VMT	Diesel VMT
RAP	95	12	2	8	16	20%	80%	3	13
Oil	48	25	143	2	272	0%	100%	-	272
Aggregates	808	18	100	45	4,486	0%	100%	-	4,486
HMA	950	12	20	79	1,583	20%	80%	317	1,267
Total VMT					6,357	-	-	320	6,037

**Existing Vehicle Emissions**

Emission Source	VMT/day	Vehicle Emission Factors (g/mile)						Emissions (lb/day)					
		ROG	CO	NOx	SOx	PM <sub>10</sub>	PM <sub>2.5</sub>	ROG	CO	NOx	SOx	PM <sub>10</sub>	PM <sub>2.5</sub>
Existing Condition (diesel Vehicles)	6,037	0.356	1.353	9.216	0.016	0.288	0.217	4.7324	18.0128	122.6594	0.2156	3.8283	2.8900
Existing Condition (CNG Vehicles)	320	0.110	2.707	3.500	0.016	0.127	0.064	0.0777	1.9085	2.4678	0.0114	0.0894	0.0455
Existing Condition (worker)	900	0.036	1.251	0.110	0.003	0.047	0.020	0.0718	2.4819	0.2190	0.0068	0.0929	0.0390
Total Existing Vehicle Emissions								4.8819	22.403	125.346	0.234	4.011	2.975

Note:

number of worker 12

round trip distance of worker 75 miles/RT

Except for CNG trucks, emission factors are from the ARB EMFAC2014 model for SCAQMD. Worker commute vehicles were assumed to be gasoline fueled automobiles, and haul trucks were modeled as heavy heavy-duty diesel trucks.

**Proposed Vehicle Operation**

Material Type	Qty/yr (Tons/day)	Truck Load Capacity (tons)	Round Trip Distance (mi)	# of round trips/day	VMT/day	% CNG VMT	%Diesel VMT	CNG VMT	Diesel VMT
RAP	1,552	18	2	86	172	90%	10%	155	17
Oil	96	25	143	4	549	0%	100%	-	549
Aggregates	1,552	18	100	86	8,622	0%	100%	-	8,622
HMA	3,200	18	20	178	3,556	90%	10%	3,200	356
Total VMT					12,899	-	-	3,355	9,544

**Proposed Plant Vehicle Emissions**

	VMT/day	Vehicle Emission Factors (g/mile)						Emissions (lb/day)					
		ROG	CO	NOx	SOx	PM <sub>10</sub>	PM <sub>2.5</sub>	ROG	CO	NOx	SOx	PM <sub>10</sub>	PM <sub>2.5</sub>
Proposed Project (diesel vehicles)	9,544	0.131	0.510	5.266	0.016	0.139	0.075	2.761	10.732	110.795	0.329	2.935	1.587
Proposed Project (CNG vehicles)	3,355	0.041	1.020	3.500	0.016	0.127	0.064	0.301	7.546	25.889	0.116	0.937	0.477
Proposed Project (worker)	900	0.020	0.870	0.075	0.003	0.047	0.020	0.040	1.727	0.149	0.006	0.093	0.039
Total Existing Vehicle Emissions								3.102	20.004	136.834	0.451	3.965	2.102

Note:

number of worker 12

round trip distance of worker 75 miles/RT

Except for CNG trucks, emission factors are from the ARB EMFAC2014 model for SCAQMD. Worker commute vehicles were assumed to be gasoline fueled automobiles, and haul trucks were modeled as heavy heavy-duty diesel trucks.

## Vehicle Emissions - Average Daily Emissions

### Existing Operation

Material Type	Qty/yr (Tons)	Truck Load Capacity (tons)	Round Trip Distance (mi)	# of round trips/yr	VMT/year	% CNG VMT	%Diesel VMT	CNG VMT	Diesel VMT
RAP	20,000	12	2	1667	3,333	20%	80%	667	2,667
Oil	10,000	25	143	400	57,200	0%	100%	-	57,200
Aggregates	170,000	18	100	9444	944,444	0%	100%	-	944,444
HMA	200,000	12	20	16667	333,333	20%	80%	66,667	266,667
Total VMT					1,338,311	-	-	67,333	1,270,978

### Existing Vehicle Emissions

Emission Source	VMT/year	Vehicle Emission Factors (g/mile)							Emissions (ton/year)						
		ROG	CO	NOx	SOx	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>	ROG	CO	NOx	SOx	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>
Existing Condition (diesel Vehicles)	1,270,978	0.356	1.353	9.216	0.016	0.288	0.217	1697.545	0.4982	1.896	12.912	0.023	0.403	0.304	2378.24
Existing Condition (CNG Vehicles)	67,333	0.110	2.707	3.500	0.016	0.127	0.064	1522.796	0.0082	0.201	0.260	0.001	0.009	0.005	113.02
Existing Condition (worker)	280,800	0.036	1.251	0.110	0.003	0.047	0.020	338.761	0.0112	0.387	0.034	0.001	0.014	0.006	104.85
Total Existing Vehicle Emissions									0.5175	2.484	13.205	0.025	0.427	0.315	2596.12
Total Existing Vehicle Emissions									Average Emissions (lb/day)						
									2.836	13.612	72.359	0.137	2.339	1.727	14225.317

Note:

Operating hours 8 hours/day  
 Operating days 312 days/year  
 number or worker 12  
 round trip distance of worker 75 miles/RT

Except for CNG trucks, emission factors are from the ARB EMFAC2014 model for SCAQMD. Worker commute vehicles were assumed to be gasoline fueled automobiles, and haul trucks were modeled as heavy heavy-duty diesel trucks.

### Proposed Vehicle Operation

Material Type	Qty/yr (Tons)	Truck Load Capacity (tons)	Round Trip Distance (mi)	# of round trips/yr	VMT/year	% CNG VMT	%Diesel VMT	CNG VMT	Diesel VMT
RAP	339,500	18	2	18861	37,722	90%	10%	33,950	3,772
Oil	21,000	25	143	840	120,120	0%	100%	-	120,120
Aggregates	339,500	18	100	18861	1,886,111	0%	100%	-	1,886,111
HMA	700,000	18	20	38889	777,778	90%	10%	700,000	77,778
Total VMT					2,821,731	-	-	733,950	2,087,781

### Proposed Plant Vehicle Emissions

Emission Source	VMT/year	Vehicle Emission Factors (g/mile)							Emissions (ton/year)						
		ROG	CO	NOx	SOx	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>	ROG	CO	NOx	SOx	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>
Proposed Project (diesel vehicles)	2,087,781	0.131	0.510	5.266	0.016	0.139	0.075	1638.8	0.302	1.174	12.118	0.036	0.321	0.174	3,771.6
Proposed Project (CNG vehicles)	733,950	0.041	1.020	3.500	0.016	0.127	0.064	1522.8	0.033	0.825	2.832	0.013	0.103	0.052	1,232.0
Proposed Project (worker)	328,500	0.020	0.870	0.075	0.003	0.047	0.020	312.924	0.007	0.315	0.027	0.001	0.017	0.007	113.3
Total Existing Vehicle Emissions									0.342	2.314	14.977	0.050	0.441	0.233	5,116.9
Total Existing Vehicle Emissions									Average Emissions (lb/day)						
									1.875	12.681	82.066	0.273	2.414	1.276	28037.557

Note:

Operating hours 10 hours/day  
 Operating days 365 days/year  
 number or worker 12  
 round trip distance of worker 75 miles/RT

Except for CNG trucks, emission factors are from the ARB EMFAC2014 model for SCAQMD. Worker commute vehicles were assumed to be gasoline fueled automobiles, and haul trucks were modeled as heavy heavy-duty diesel trucks.

## Alternative Fuel (CNG) Vehicle Emission Factors

### Summary of LNG or CNG Heavy Duty Trucks Emissions Comparing to Similar Diesel Trucks and Derived Emission Factors

Pollutant	percent change compared to similar diesel trucks - Natural Gas Garbage Trucks (1)	Percent change used in EPA Smartway Truck Tool (2)	ARB Emission Factors (3)	Emission Factor Used For Analysis	Note:
ROG	-69% to -83%	NA	NA	Assumed 69% reduction from diesel	least reduction rate
CO	-11% to +200%	NA	NA	Assumed 200% increase from diesel	highest increase rate
NOx	-32% to -97%	-17%	3.5 g/mile	3.5 g/mile	ARB Emission Factor
SOx	NA	NA	NA	Assumed same as diesel	Assumed the same as diesel trucks
PM10	-85% to -94%	-86%	0.029	0.029 g/mile	ARB Emission Factor
PM2.5	-85% to -94%	-86%	NA	0.029 g/mile, Assumed same as PM10	ARB Emission Factor
CO2e	-21% to +5%	NA	NA	See Below	derived from the Climate Registry default emission factor

Date Source:

1. Greening Garbage Trucks: New Technologies for Cleaner Air, Inform Inc, 2003. Table 15.
2. SmartWay 2.0.11 Truck Tool – Technical Documentation, EPA, January 2012. Values are from Section 2.3.
3. ARB Methods to Find the Cost-Effectiveness of Funding Air Quality Projects, Emission Factor Tables (ARB, 2010). Table 5.

2015 Climate Registry Default Emission Factors of LNG Vehicles, updated April 2015

<http://www.theclimateregistry.org/wp-content/uploads/2015/04/2015-TCR-Default-EF-April-2015-FINAL.pdf>

Vehicle/Fuel Type	Default CO <sub>2</sub> EF (kg/scf or kg/gal)	Converted CO <sub>2</sub> EF (g/mile)	Default N <sub>2</sub> O EF (g/mi)	Default CH <sub>4</sub> EF (g/mi)	CO <sub>2</sub> e (g/mi)
HD LNG	4.46	1427.26	0.175	1.966	1522.8
GWP		1	310	21	

Fuel economy data used in derivation of the CO<sub>2</sub> emission factors (Based on factors used in SmartWay 2.0.11 Truck Tool – Technical Documentation, EPA, January 2012.)

- 5.98 miles per gallon diesel      Class 8a
- 4.75 miles per gallon gasoline      (25.9% lower than diesel vehicles)
- 3.12 miles per gallon LNG      (Assumed the same fuel economy as diesel vehicles, applied a factor of 1.52 to convert gasoline volume to LNG)



## Operational Emissions Summary - GHG

### GHG Emissions Summary - Stationary Sources

	Oniste Equipment	Electricity Use	Amortized Construction	Total	SCAQMD Threshold (MT/year)	Exceed Threshold?
	MT/year	MT/year	MT/year	MT/year		
Existing Condition	3404.0	92.4	0	3496.4	10,000	NO
Proposed Project	11914.1	135.1	52.9	12102.1		
Increase	8510.1	42.7	52.9	8605.7		

Note:

GHG emissions from existing equipment operation are not available from historical reporting data. It was estimated by scaling the GHG emissions from the proposed plant.

Existing plant production 200,000 tons/year

Proposed plant production 700,000 tons/year

Proposed project onsite emissions include GHG from drum dryer and the oil heater. GHG from other equipment is expected to be minimal.

### GHG Emissions -Offsite Vehicle Emissions

	Offsite Vehicle	
	ton/year	MT/year
Existing Condition	2596.1	2355.2
Proposed Project	5116.9	4642.0
Increase	2520.7	2286.8

Note: Diesel Vehicle emissions were estimated with ARB EMFAC2014. CNG vehicle emission factors were from the 2105 default emission factors of Climate Registry

### Emissions Calculations Details

#### GHG Emissions from Onsite Equipment

Dryer	New Plant
Production (ton/year)	700,000
CO2 (lb/ton)	33
CH4 (lb/ton)	0.012
CO2e (lb/ton)	33.252
CO2e Emissions (MT/year)	10,558.18

Emission factor from EPA AP-42 Table 11.1-8

#### Global Warming Potential

CO2	1
CH4	21
N2O	310

Oil heater	New Plant
Rating (MMBtu/hr)	2.9
Operating Hours	8760
CO2 (g/mmBtu)	53060
CH4 (g/mmBtu)	0.95
N2O (g/mmBtu)	0.95
CO2e (g/mmBtu)	53374.45
CO2e Emissions (MT/year)	1355.92

Emission factor from 2015 default emission factors of Climate Registry.

#### GHG Emission Factors for Electricity

Global Warming Potential	Emission Factor			
	CO2	CH4	N2O	CO2e
	lb/MWH	lb/MWH	lb/MWH	lb/MWH
	650.31	0.0312	0.00567	
	1	25	298	652.78

Note:

GHG emission factors were EPA eGRID2012 Summary Tables, October 2015.

#### Electricity Use Emissions

	Demand (MW)	Hours	Electricity Usage (MWH/year)	GHG Emissions (MT/year)
Existing Plant	0.125	2496	312.0	92.4
Proposed Plant	0.35	3640	456.3	135.1

## Asphalt Plant - New Plant Emissions

### Emissions Summary - Facility wide Summary

Emission rates	Maximum Daily Emissions (lb/day)	Average Daily Emissions (lb/day)	Annual Emissions (ton/year)
ROG	85.64	51.77	9.45
NOx	41.60	25.24	4.61
SOx	10.92	6.56	1.20
CO	417.22	250.05	45.63
PM10	75.83	45.21	8.25
PM2.5	64.53	38.71	7.06

### Emissions from Each Equipment / Process

#### Emissions Summary - dryer

Emission rates	Maximum Daily Emissions (lb/day)	Average Daily Emissions (lb/day)	Annual Emissions (ton/year)
ROG	76.80	46.03	8.40
NOx	40.83	24.47	4.47
SOx	10.88	6.52	1.19
CO	416.00	249.32	45.50
PM10	58.29	34.93	6.38
PM2.5	58.29	34.93	6.38

#### Emissions Summary - Loadout

Emission rates	Maximum Daily Emissions (lb/day)	Average Daily Emissions (lb/day)	Annual Emissions (ton/year)
ROG	1.88	1.12	0.21
NOx	NA	NA	NA
SOx	NA	NA	NA
CO	0.65	0.39	0.07
PM10	0.25	0.15	0.03
PM2.5	0.25	0.15	0.03

#### Emissions Summary - Oil Heater

Emission rates	Maximum Daily Emissions (lb/day)	Average Daily Emissions (lb/day)	Annual Emissions (ton/year)
ROG	0.38	0.38	0.07
NOx	0.77	0.77	0.14
SOx	0.04	0.04	0.01
CO	0.01	0.01	0.00
PM10	0.52	0.52	0.09
PM2.5	0.52	0.52	0.09

#### Emissions Summary - Silo Filling

Emission rates	Maximum Daily Emissions (lb/day)	Average Daily Emissions (lb/day)	Annual Emissions (ton/year)
ROG	5.85	3.51	0.64
NOx	NA	NA	NA
SOx	NA	NA	NA
CO	0.57	0.34	0.06
PM10	0.28	0.17	0.03
PM2.5	0.28	0.17	0.03

#### Emissions Summary - Asphalt Cement Storage Tanks (total of 3 tanks)

Emission rates	Maximum Daily Emissions (lb/day)	Average Daily Emissions (lb/day)	Annual Emissions (ton/year)
ROG	0.73	0.73	0.13
NOx	NA	NA	NA
SOx	NA	NA	NA
CO	NA	NA	NA
PM10	NA	NA	NA
PM2.5	NA	NA	NA

#### Emissions Summary f - Fugitive Dust (Transfer Points and Stock Pile)

Emission rates	Maximum Daily Emissions (lb/day)	Average Daily Emissions (lb/day)	Annual Emissions (ton/year)
ROG	NA	NA	NA
NOx	NA	NA	NA
SOx	NA	NA	NA
CO	NA	NA	NA
PM10	16.49	9.44	1.72
PM2.5	5.20	2.94	0.54

Note: Fugitive dust emissions include sources of conveyor transfer points, scalping screen, front loader, and stock pile,

## Asphalt Plant - New Plant Emissions

### Dryer Emissions - Criteria Pollutants/GHG

#### Natural Gas Fired Drum Mix Asphalt Plant With Fabric Filter AP-42 Section 11.1

Number of dryer	1
Max Hourly Production	400 Tons/hr
Max Daily Production	3,200 Tons/day
Average Daily Production	1,918 Tons/day
Average Monthly Production	58,333 tons/month
Annual Production	700,000 Tons/yr (Proposed Throughput Limit)
Maximum working days	31 days/month
maximum Operating hours	10 hours/day
Operating hours	7 days/week

Pollutant	Emission Factor (lb/ton)	Max. Emissions (lb/hr)	Max. Emissions (lb/day)	Average Emissions (lb/day)	Emissions (ton/yr)
VOC <sup>d</sup>	0.024	9.60	76.80	46.03	8.40
NOx <sup>b</sup>	0.013	5.10	40.83	24.47	4.47
SO <sub>2</sub> <sup>a</sup>	0.0034	1.36	10.88	6.52	1.19
CO <sup>a</sup>	0.13	52.00	416.00	249.32	45.50
PM (total) <sup>c</sup>	0.01821	7.29	58.29	34.93	6.38
PM-10 (total) <sup>c</sup>	0.01821	7.29	58.29	34.93	6.38
PM-2.5 <sup>c</sup>	0.01821	7.29	58.29	34.93	6.38

Notes:

<sup>a</sup>AP-42, Table 11.1-7 and Table 11.1-8, Emission Factors for CO and SO<sub>2</sub>, from Drum Mix Hot Asphalt Plants, 3/04

<sup>b</sup>Nox emissions were estimated based on SCAQMD BACT requirements, 36 ppm at 3% O<sub>2</sub>

Dryer Maximum Heat Input Rating:	115 MMBtu/hr
Fd factor	8710 scf/MMBtu
NOx Emission Factor (BACT requirement)	36 ppm @ 3% O <sub>2</sub>
NOx Emission Factor (BACT requirement)	0.044 lb/MMBtu
NOx Emissions	5.103 lb/hr
NOx Emission Factor	0.013 lb/ton

<sup>c</sup>PM emission factors derived from Rule 1155 Limits

PM emissions were estimated based on SCAQMD Rule 1155 for Tier 3 baghouses

Dryer Maximum Heat Input Rating:	115 MMBtu/hr
PM Emission Factor (Rule 1155 Limit)	0.01 gr/scf
Baghouse Flow Rate	85000 scfm
PM Emissions	7.29 lb/hr

PM10 and PM2.5 emissions are assumed to be the same as PM.

<sup>d</sup> VOC emission factor was derived in order to keep the facility-wide VOC emissions below 10 ton per year.

## Asphalt Plant - New Plant Emissions

### Natural Gas Fired Oil Heater

Number of heater	1
Heater Rating	2.9 MMBtu/hour
Fuel Consumption Rate	0.0028 MMscf/hr
Maximum working days	31 days/month
Operating hours	24 hours/day
Natural Gas heat Value	1,020 MMBtu/MMscf
Operating days	365 days/year

Pollutant	Emission Factor (lb/MMscf)	Emission factor units	Maximum Hourly (lb/hr)	Maximum Daily (lb/day)	Annual Emissions (ton/yr)
VOC <sup>a</sup>	5.5	lb/MMscf	0.016	0.38	0.0685
NOx <sup>b</sup>	0.011	lb/MMBtu	0.032	0.77	0.1409
SO <sub>2</sub> <sup>a</sup>	0.6	lb/MMscf	0.002	0.041	0.0075
CO <sup>b</sup>	0.075	lb/MMscf	0.000	0.005	0.0009
PM <sup>a</sup>	7.6	lb/MMscf	0.022	0.52	0.0946
PM-10 <sup>a</sup>	7.6	lb/MMscf	0.022	0.52	0.0946
PM-2.5	7.6	lb/MMscf	0.022	0.52	0.0946

Notes:

<sup>a</sup>AP-42, Table 1.4-2, Emission Factors for Criteria Pollutants and Greenhouse Gases from Natural Gas Combustion, 7/98

PM10 and PM2.5 emissions were assumed to be the same as total PM

<sup>b</sup>NOx and CO emission factors were based on SCAQMD BACT requirements

NOx Rule 1146.1

9 ppm @ 3% O2

NOx Emission Factor (BACT requirement)

20 ppm @ 3% O2

NOx Emission Factor (Rule 1146.1)

0.011 lb/MMBtu

CO Emission Factor (BACT requirement)

100 ppm @ 3% O2

for water tube

CO Emission Factor (BACT requirement)

0.075 lb/MMBtu



## Asphalt Plant - New Plant Emissions

### Load-out Operations

1  
 Max Hourly Production 400 T/hr  
 Max Daily Production 3,200 Tons/day  
 Max Annual Production 700,000 Tons/yr

Pollutant	Uncontrolled Emissions				Controlled Emissions		
	Emission Factor <sup>a</sup> Loadout (lb/ton)	Maximum Hourly (lb/hr)	Maximum Daily (lb/day)	Annual Emissions (ton/yr)	Maximum Hourly (lb/hr)	Maximum Daily (lb/day)	Annual Emissions (ton/yr)
VOC <sup>b</sup>	3.91E-03	1.564	12.5	1.37	0.23	1.88	0.21
NOx	NA	NA	NA	NA	NA	NA	NA
SO <sub>2</sub>	NA	NA	NA	NA	NA	NA	NA
CO <sup>c</sup>	1.35E-03	0.540	4.3	0.47	0.08	0.65	0.07
PM-10 (total) <sup>c</sup>	5.22E-04	0.209	1.7	0.18	0.03	0.25	0.03
PM-2.5 <sup>c</sup>	5.22E-04	0.209	1.7	0.18	0.03	0.25	0.03
PM (total) <sup>c</sup>	5.22E-04	0.209	1.7	0.18	0.03	0.25	0.03

<sup>a</sup>Emission factors are from AP-42 11.1, Hot Mix Asphalt Plants, 3/04

<sup>b</sup>AP-42, Table 11.1-16, Speciation Profiles for Load-out, Silo Filling, & Asphalt Storage--Organic Volatile-Based Compounds, 3/04, (EF=Spec% \* TOC PM EF). VOC 94% Compound/TOC Control Efficiency: 85% based on 90% capture and 95% efficiency based on blue smoke documentation

<sup>c</sup>AP-42, Table 11.1-14, Predictive Emission Factor Equations for Load-Out and Silo Filling Operations, 3/04 PM10 and PM2.5 emissions were assumed to be the same as PM Defaults: (-V) = 0.5

T (°F) = 325

		<u>LOADOUT</u>
Total PM EF = 0.000181+0.00141(-V) <sup>(((0.0251)(T+460)-20.43)</sup>	=	5.219E-04
Organic PM EF = 0.00141(-V) <sup>(((0.0251)(T+460)-20.43)</sup>	=	3.409E-04
TOC PM EF = 0.0172(-V) <sup>(((0.0251)(T+460)-20.43)</sup>	=	4.159E-03
CO PM EF = 0.00558(-V) <sup>(((0.0251)(T+460)-20.43)</sup>	=	1.349E-03

## Asphalt Plant - New Plant Emissions

### Scalping Screens and Transfer Points

Max Hourly Production	400 T/hr	97% T/hr is Aggregate & RAP =	<b>388 T/hr</b>	RAP	50%
Max Daily Production	3,200 Tons/day	97% T/day is Aggregate & RAP =	<b>3,104 T/day</b>	Aggregate	50%
Max Annual Production	700,000 Tons/yr	97% T/yr is Aggregate & RAP =	<b>679,000 T/yr</b>		
Maximum hour	10 hours/day				

Notes:

Percent aggregate & RAP based on raw material minus oil from the data request

### RAP Crusher

Based on SCAQMD PM Emission Factors for Processes/Equipment at Asphalt, Cement, Concrete and Aggregate Product Plants (<http://www.aqmd.gov/docs/default-source/planning/annual-emission-reporting/particulate-matter-emission-factors-for-processes-equipment-at-asphalt-cement-concrete-and-aggregate-product-plants.pdf?sfvrsn=10>)

%RAP of total throughput	<b>50%</b>	194 ton/hr of RAP
		1,552 ton/day of RAP
		339,500 ton/yr of RAP
% Control for transfer points on conveyor:		<b>95%</b> based on SCAQMD guidance

### Crushing Fine Crusher Controlled

Pollutant	Table 11.19.2-2 Emissions Factors UNCONTROLLED (lb/ton)	Uncontrolled Emissions			Controlled Emissions		
		Maximum Hourly (lb/hr)	Maximum Daily (lb/day)	Annual Emissions (ton/yr)	Maximum Hourly (lb/hr)	Maximum Daily (lb/day)	Annual Emissions (ton/yr)
PM (total)	3.90E-02	7.57	75.66	6.62	0.38	3.78	0.33
PM-10	1.50E-02	2.91	29.10	2.55	0.15	1.46	0.13
PM-2.5	5.69E-03	1.10	11.05	0.97	0.06	0.55	0.05

Notes:

PM2.5 emission factors based on PM2.5 to PM ratio in the Mineral Process Loss Appendix A - Updated CEIDARS List with PM2.5 Fractions  
PM2.5 Fraction of Total PM 0.146

Maximum daily emissions assumed that the crusher may work 10 hours per day.

### Conveyor and Scalping Screen Emission Points

#### Conveyor Transfer Points

Transfer from bins to conveyor and from conveyor to scalping screen:	<b>194 T/hr</b>	<b>13</b> Transfer Points (Total RAP and Aggregate)
% Control for transfer points on conveyor:	<b>95%</b> based on SCAQMD guidance	

Pollutant	Table 11.19.2-2 Emission Factors UNCONTROLLED (lb/ton)	Uncontrolled Emissions Per Transfer Point			Controlled Emissions Per Transfer Point			Controlled Total Emissions		
		Maximum Hourly (lb/hr)	Maximum Daily (lb/day)	Annual Emissions (ton/yr)	Maximum Hourly (lb/hr)	Maximum Daily (lb/day)	Annual Emissions (ton/yr)	Maximum Hourly (lb/hr)	Maximum Daily (lb/day)	Annual Emissions (ton/yr)
PM (total)	0.003	5.82E-01	5.82	5.09E-01	2.91E-02	2.91E-01	2.55E-02	3.78E-01	3.78E+00	3.31E-01
PM-10 (total)	1.10E-03	2.13E-01	2.13	1.87E-01	1.07E-02	1.07E-01	9.34E-03	1.39E-01	1.39E+00	1.21E-01
PM-2.5	4.38E-04	8.50E-02	0.85	7.44E-02	4.25E-03	4.25E-02	3.72E-03	5.52E-02	5.52E-01	4.83E-02

Notes:

PM2.5 emission factors based on PM2.5 to PM ratio in the Mineral Process Loss Appendix A - Updated CEIDARS List with PM2.5 Fractions  
PM2.5 Fraction of Total PM 0.146

Maximum daily emissions assumed that the conveyor may work 10 hours per day.

**Aggregate Scalping Screen, AP-42 11.19.2 (8/04)**

Aggregate flow across scalping screen onto conveyor (2 Scalping Screens):  
 Number of screens  
 % Control for transfer points on conveyor:

**194 T/hr**  
**1**  
**95%** based on SCAQMD guidance

Pollutant	Emission Factor Table 11.19.2-2 COARSE SCREENING UNCONTROLLED (lb/ton)	Uncontrolled Emissions Per Transfer Point			Controlled Emissions Per Screen			Controlled Total Emissions		
		Maximum Hourly (lb/hr)	Maximum Daily (lb/day)	Annual Emissions (ton/yr)	Maximum Hourly (lb/hr)	Maximum Daily (lb/day)	Annual Emissions (ton/yr)	Maximum Hourly (lb/hr)	Maximum Daily (lb/day)	Annual Emissions (ton/yr)
PM (total)	0.025	4.850	48.50	4.24E+00	0.243	2.425	0.212	2.43E-01	2.43E+00	2.12E-01
PM-10 (total)	0.0087	1.688	16.88	1.48E+00	0.084	0.844	0.074	8.44E-02	8.44E-01	7.38E-02
PM-2.5	3.65E-03	0.708	7.08	6.20E-01	0.035	0.354	0.031	3.54E-02	3.54E-01	3.10E-02

Notes:

PM2.5 emission factors based on PM2.5 to PM ratio in the Mineral Process Loss Appendix A - Updated CEIDARS List with PM2.5 Fractions  
 PM2.5 Fraction of Total PM 0.146

Maximum daily emissions assumed that the screen may work 10 hours per day.

**Rap Scalping Screen, AP-42 11.19.2 (8/04)**

RAP flow across scalping screen onto conveyor:  
 number of screens  
 % Control for transfer points on conveyor:

**194 T/hr**  
**1**  
**95%** based on SCAQMD guidance

Pollutant	Emission Factor Table 11.19.2-2 COARSE SCREENING UNCONTROLLED (lb/ton)	Uncontrolled Emissions Per Transfer Point			Controlled Emissions Per Screen			Controlled Total Emissions		
		Maximum Hourly (lb/hr)	Maximum Daily (lb/day)	Annual Emissions (ton/yr)	Maximum Hourly (lb/hr)	Maximum Daily (lb/day)	Annual Emissions (ton/yr)	Maximum Hourly (lb/hr)	Maximum Daily (lb/day)	Annual Emissions (ton/yr)
PM (total)	0.025	4.850	48.50	4.24E+00	0.243	2.425	0.212	2.43E-01	2.43E+00	2.12E-01
PM-10 (total)	0.0087	1.688	16.88	1.48E+00	0.084	0.844	0.074	8.44E-02	8.44E-01	7.38E-02
PM-2.5	3.65E-03	0.708	7.08	6.20E-01	0.035	0.354	0.031	3.54E-02	3.54E-01	3.10E-02

Notes:

PM2.5 emission factors based on PM2.5 to PM ratio in the Mineral Process Loss Appendix A - Updated CEIDARS List with PM2.5 Fractions  
 PM2.5 Fraction of Total PM 0.146

Maximum daily emissions assumed that the screen may work 10 hours per day.



## Asphalt Plant - New Plant Emissions

### Open Storage Pile for RAP

Max Hourly Production 400 T/hr  
 Max Daily Production 3,200 Tons/day  
 Max Annual Production 700,000 Tons/yr

Percentage of RAP and Aggregate in Product 97%  
 Percentage of RAP in Total RAP and Aggregates 50%

RAP Storage Amount

**194 T/hr RAP**  
**1,552 T/day RAP**  
**339,500 T/yr RAP**

### PM Emissions from RAP Storage

Pollutant	SCAQMD Emissions Factor (lb/ton)	Maximum Hourly (lb/hr)	Maximum Daily (lb/day)	Annual Emissions (lb/yr)	Annual Emissions (ton/yr)
PM (total) - uncontrolled	0.33	64.02	512.16	112035.00	56.02
PM (total) - controlled	0.0165	3.20	25.61	5601.75	2.80
PM10 - controlled	0.00825	1.60	12.80	2800.88	1.40
PM2.5 - controlled	0.002409	0.47	3.74	817.86	0.41

Notes:

SCAQMD Particulate Matter (PM) Emission Factors For Process/Equipment at Asphalt, Cement, Concrete, and Aggregate Production Plants

E = TP x EF

E = Emissions

TP = annual tonnage of stored material = amount of material loaded into, or out of, the pile

EF = Emission Factor

Controlled PM emissions include a 95% control efficiency as per SCAQMD Particulate Matter (PM) Emission Factors For Process/Equipment at Asphalt, Cement, Concrete, and Aggregate Production Plants

PM10 and PM2.5 emission factors based on Mineral Process Loss, Loading and Unloading Bulk Materials SCAQMD Appendix A - Updated CEIDARS List with PM2.5 Fractions

PM2.5 Fraction of Total PM 0.146  
 PM10 Fraction of Total PM 0.50

## Asphalt Plant - New Plant Emissions

### Asphalt Storage Tanks

Max Annual Production	700,000 Tons/yr
Storage Chemical	
Petroleum oil (1.018 g/cm <sup>3</sup> density)	3% of throughput 21000 tpy
Throughput	4,943,724 gallons per year total (all 3 tanks) 1,647,908 gallons per year per tank
Number of Tanks	3
Tank Height	50 feet
Tank Diameter	12 feet
Liquid Height	45 feet

Annual Working Loss Per Tank (lb/yr)	Breathing Loss Per Tank (lb/yr)	VOC Emissions Per Tank (lb/yr)	Total VOC Emissions of 3 Tanks (ton/yr)	Total VOC Emissions (lb/day)
89.39	0	89.39	0.13	0.735

Notes:

Chemical assumed follow the methodology in AP42 Section 4.4.5 Emissions Factor Documentation for AP-42 Section 11.1 Hot Mix Asphalt Plants February 2004 (<http://www.epa.gov/ttn/chief/ap42/ch11/bgdocs/b11s01.pdf>)

Liquid Density	9.22 lb/gallon
Median liquid molecular weight	1000 g/g-mole
Vapor molecular weight	105 g/g-mole
Antoine's Constants	75350.06 A in K 9.00346 B in K

Conversion

1 ton =	907185 grams
1 cm <sup>3</sup> =	0.000264172 gallons