Appendix 4.2: Detailed Calculations of Emission Factors for Construction Activities

Heavy Construction Operation

For the dust calculations, the emission factor as suggested by the USEPA's Compilation of Air Pollutant Emission Factors, 5th edition, 1995 (AP-42), Section 13.2.3.3, for general heavy construction operations is 2.69 Mg/hectare/month of activity.

Assuming 10 working hours per day and 26 working days per month,

Emission rate	=	$2.69*10^6/(10000*26*10*3600)$	
	=	0.0002873932	$g/m^2/s$

Construction of Haul Roads

For the dust calculations, the emission factor as suggested by the USEPA's Compilation of Air Pollutant Emission Factors, 5th edition, 1995 (AP-42), Section 13.2.3.3, for general heavy construction operations is 2.69 Mg/hectare/month of activity.

Assuming 10 working hours per day and 26 working days per month,

Emission rate (per area)	=	$2.69*10^6/(10000*26*10*3600)$	
	=	0.0002873932	$g/m^2/s$

For the road width of 5m, the emission rate (per line source) would be

=	0.0002873932*5	
=	0.0014369658	$g/m^2/s$

Traffic from Paved Road

For the dust calculations, the emission factor as suggested by the USEPA's Compilation of Air Pollutant Emission Factors, 5th edition, 1995 (AP-42), Section 13.2.1, for traffic dust on paved road can be estimated using the following expression:

$$E = k(sL/2)^{0.65}(W/3)^{1.5}$$

where	E	particulate emission factor, g/veh-km
	k	particulate size multiplier for particle size range and units of interest
	sL	road surface silt loading, g/m2
	W	average weight, ton

In this study,

k	24	g/veh-km	(AP-42, Table 13.2.1-1)
sL	12	g/m2	(AP-42, Table 13.2.1-4)
W	18	ton	(Assumed)
E	1130.4111	g/veh-km	

For a traffic density of 6 veh/hr, the emission rate due to traffic from paved road is

Emission rate	=	3556.86*6/3600/1000	
		0.001884019	g/m/s

Traffic from Unpaved Road

For the dust calculations, the emission factor as suggested by the USEPA's Compilation of Air Pollutant Emission Factors, 5th edition, 1995 (AP-42), Section 13.2.2, for traffic dust on unpaved road can be estimated using the following expression:

$$E = k(s/12)^a(W/3)^b/(M/0.2)^c$$

where	E	particulate emission factor, g/veh-km

s	surface material silt content, %
W	average weight, ton
M	surface material moisture content, %
k,a,b,c	empirical constants

In this study,

k	10	lb/veh-mile	(AP-42, Table 13.2.2-2)
s	4.3	%	(AP-42, Table 11.9-3, which is commonly used in EIA study)
W	18	ton	(Assumed)
M	2.4	%	(AP-42, Table 11.9-3, which is commonly used in EIA study)
a	0.8		(AP-42, Table 13.2.2-2)
b	0.5		(AP-42, Table 13.2.2-2)
c	0.4		(AP-42, Table 13.2.2-2)
E	3.988714	lb/veh-mile	

For a traffic density of 52 veh/hr, the emission rate due to traffic from unpaved road is

Emission rate = 281.9*3.99*52/3600/1000 52

0.0162416 g/m/s

For a conservative design, it is assumed a 20% increase of traffic density for stockpile handling.

Then, the Emission rate would be = 0.0162416 *1.2

= 0.01948992 g/m/s

Concrete Batching Plant

For the dust calculations, the emission factor as suggested by the USEPA's Compilation of Air Pollutant Emission Factors, 5th edition, 1995 (AP-42), Table 11.12-1, for mixer loading is 0.0056 kg/ton of production.

The maximum production rate is 100 m3/day,

Emission rate = 0.0056*(100*2.4/10)*1000/3600

= 0.0373333333 g/s

Wind Erosion

For the dust calculations, the emission factor as suggested by the USEPA's Compilation of Air Pollutant Emission Factors, 5th edition, 1995 (AP-42), Section 13.2.5, for wind erosion is 0.85 Mg/ha/yr.

Assuming 14 non-working hours per day and 365 days per year

Emission rate = $0.85*10^6/(10000*365*14*3600)$

= 0.0000046206 g/m2/s