APPENDIX 3.2

Details of Dust Emission Sources Calculation

Details of Dust Emission Sources for 1-hour TSP Assessment (Tier 1)

Works Area	Sources		Parameter	Remarks
Ocean Park	Heavy construction	Percentage active area, p	100 %	Assume 100% works area for heavy construction
	Source ID: A1 - A19	Mitigation efficiency	91.7 %	Water suppression 4 times a day
		No. of working days per month, d	26 days	
		No. of working hours per day, h	10 hour	From 8:00 to 18:00
		Emission Factor	2.69 Mg/hectare/month of activity	AP42, Section 13.2.3.3
		Emission Rate	2.87393E-04 g/m ² /s (unmitigated)	=2.69*1000000/(10000*d*h*60*60)*p/100
			2.38536E-05 g/m ² /s (mitigated)	
	Wind Erosion for	Percentage active area, p	100 %	
	Working Hours	Mitigation efficiency	91.7 %	Water suppression 4 times a day
	Source ID: A1 - A19	Emission Factor	0.85 Mg/hectare/year	AP42, Table 11.9-4
		Emission Rate	2.69533E-06 g/m ² /s (unmitigated)	=0.85*1000000/(10000*365*24*60*60)*p/100
			2.23713E-07 g/m ² /s (mitigated)	
	Wind Erosion for	Percentage active area, p	100 %	
	Non-Working Hours	Emission Factor	0.85 Mg/hectare/year	AP42, Table 11.9-4
	Source ID: A1 - A19	Emission Rate	2.69533E-06 g/m ² /s (unmitigated)	=0.85*1000000/(10000*365*24*60*60)*p/100

Appendix 3.2 - Details of Dust Emission Sources for 1-hour TSP Assessment (Tier 1)

Haul Road Paved haul road Particle size multiplier, k 3.23 g/VKT within project site Road surface silt loading, sL 12 g/m2	AP-42, Section 13.2.1, Table 13.2.1-1, 01/11 ed.
within project site Road surface silt loading, sL 12 g/m2	AP-42 Section 13.2.1 Table 13.2.1-3 01/11 ed
East and an Mathiata Average truck weight W	
For Laden vehicle Average truck weight, w 36 tons	Full loading of Dump Truck
Emission height 0.5 m	
L1 to L8 and L10 to TSP emission factor, E	E=k x (sL)^0.91x (W)^1.02 (AP-42, section 13.2.1, 01/11 ed.)
L26 1267 g/VKT	
No. of truck trips per day 15 trips/hr	From engineer
No. of operation hour 10 hr	From 8:00 to 18:00
% of dust suppression 97.5 %	Assume as the same as Express Rail Link and Extracted from SP
	License of XRL (Appendix C).
Emission Pate 1 22E 04 a/m/c (mitigated)	
Paved haul road Particle size multiplier, k 3.23 g/VKT	AP-42, Section 13.2.1, Table 13.2.1-1, 01/11 ed.
within project site Road surface silt loading, sL 12 g/m2	AP-42, Section 13.2.1, Table 13.2.1-3, 01/11 ed.
For Linladen Vehicle	Unladen Dump Truck
Source ID: Emission height 0.5 m	
TSP emission factor, E	E=k x (sL)^0.91x (W)^1.02 (AP-42, section 13.2.1, 01/11 ed.)
L27 to L34 and L36 to 160 g/VKT	
L52	
No. of truck trips per day 15 trips/hr	From engineer
	······································
No. of operation hour 10 hr	From 8:00 to 18:00
% of dust suppression 97.5 %	Assume as the same as Express Rail Link and Extracted from SP
	License of XRL (Appendix C).
Emission Rate 1./E-05 g/m/s (mitigated)	

Description	Sources	Parameter	Emission Rate	Remarks
Stockpile of Inert	Material handling and	Percentage open stockpile area, p	20 %	80% stockpiling area is covered by impervious sheets and all dusty
C&D material to be	storage piles	Particle size multiplier, k	0.74	k (particle size < 30µm)
reused on-site	Source ID:	Moisture content, M	5 %	Assume worst case scenario
	S1	Average wind speed, U	3 m/s	from PATH mm5 data grid (28,22) annual average wind speed
		Emission Factor, E	0.000491297 kg/Mg	E=k*0.0016*[(U/2.2)^1.3/(M/2)^1.4]
		Monthly output	752 m3/month	From engineer
				(email on 20140213)
		Maximum hourly output, op	2.9 m3/hr	26 days per month, 10 working hours per day (from 8:00 to 18:00)
			7.2 Mg/hr	Assume capacity of dump truck is 6m ³ and 15 tons
		Area of the Asphalt stockpile, A	430 m ²	
		Emission Rate	2.29326E-06 g/m ² /s (unmitigated)	Unmitigated Emission Rate=E*1000*op/(A*60*60)
			4.58652E-07 g/m ² /s (mitigated)	Mitigated Emission Rate'=E*1000*op/(A*60*60)*p/100
	Wind erosion	Percentage open stockpile area, p	100 % (unmitigated)	
	Source ID: As above		20 % (mitigated)	80% stockpiling area is covered by impervious sheets
		Emission Factor	0.85 Mg/hectare/year	AP42, Section 11.9.4
		Emission Rate	2.69533E-06 g/m ² /s (unmitigated)	=0.85*1000000/(10000*365*24*60*60)*p/100
			5.39066E-07 g/m ² /s (mitigated)	

Details of Dust Emission Sources for 1-hour RSP Assessment (Tier 1)

Works Area	Sources		Parameter	Remarks
Ocean Park	Heavy construction	Percentage active area, p	100 %	Assume 100% works area for heavy construction
	Source ID: A1 - A19	Mitigation efficiency	91.7 %	Water suppression 4 times a day
	, 1	No. of working days per month, d	26 days	
	,	No. of working hours per day, h	10 hour	From 8:00 to 18:00
	,	Emission Factor for TSP	2.69 Mg/hectare/month of activity	AP42, Section 13.2.3.3
	, 1	% content of RSP	30 % of TSP	
	,	Emission Factor for RSP	0.81 Mg/hectare/month of activity	
	, 1	Emission Rate for RSP	8.62179E-05 g/m ² /s (unmitigated)	=2.69*0.3*1000000/(10000*d*h*60*60)*p/100
	,	1	7.15609E-06 g/m ² /s (mitigated)	
	·'	<u> </u>	ļ'	
	Wind Erosion for	Percentage active area, p	100 %	
	Working Hours	Mitigation efficiency	91.7 %	Water suppression 4 times a day
	Source ID: A1 - A19	Emission Factor for TSP	0.85 Mg/hectare/year	AP42, Table 11.9-4
	,	% content of RSP	30 % of TSP	
	,	Emission Factor for RSP	0.26 Mg/hectare/year	
	, 1	Emission Rate for RSP	8.086E-07 g/m ² /s (unmitigated)	=0.85*0.3*1000000/(10000*365*24*60*60)*p/100
	,	1	6.71138E-08 g/m ² /s (mitigated)	
	Wind Exercise for		100.9/	
	Nen Werking Hours	Emission Easter for TSD	0.95 Mg/basters/voor	AD42 Table 11.0.4
	Non-Working nours	Emission Factor for TSF	0.85 Wg/neclare/year	AP42, Table 11.9-4
	Source ID: AT - ATS	% content of RSP	30 % OF ISF	
	,	Emission Factor for hor	0.26 Mg/neclare/year	0.85*0.3*1000000//10000*265*24*60*60*~/100
	, 1	Emission Rate	8.086E-07 g/m²/s (unmitigated)	=0.85 0.3 1000000/(10000 365 24 60 60) p/100

Appendix 3.2 - Details of Dust Emission Sources for 1-hour RSP Assessment (Tier 1)

Works Area	Sources		Parameter		Remarks
Haul Road	Paved haul road	Particle size multiplier, k	0.62	g/VKT	AP-42, Section 13.2.1, Table 13.2.1-1, 01/11 ed.
	within project site	Road surface silt loading, sL	12	g/m2	AP-42, Section 13.2.1, Table 13.2.1-3, 01/11 ed.
	For Laden Vehicle	Average truck weight, W	38	tons	Full loading of Dump Truck
	Source ID:				
		Emission height	0.5	m	
	L1 to L8 and L10 to	TSP emission factor, E			E=k x (sL)^0.91x (W)^1.02 (AP-42, section 13.2.1, 01/11 ed.)
	L26		243	g/VKT	
		No. of truck trips por day	15	tring/hr	Erom engineer
		No. of exerction hour	10	hr	From 8:00 to 18:00
		% of dust suppression	10	0/	Assume as the same as Everess Pail Link and Evtracted from SP
		% of dust suppression	57.5	78	License of XRL (Appendix C)
					License of ATTL (Appendix C).
		Emission Bate	2 53E-05	g/m/s (mitigated)	
			2.002.00	g,,o (gatod)	
	Paved haul road	Particle size multiplier, k	0.62	g/VKT	AP-42, Section 13.2.1, Table 13.2.1-1, 01/11 ed.
	within project site	Road surface silt loading, sL	12	g/m2	AP-42, Section 13.2.1, Table 13.2.1-3, 01/11 ed.
		Average truck weight, W	5	tons	Unladen Dump Truck
	For Unladen Vehicle				
	Source ID:	Emission height	0.5	m	
		TSP emission factor, E			E=k x (sL)^0.91x (W)^1.02 (AP-42, section 13.2.1, 01/11 ed.)
	L27 to L34 and L36 to		31	g/VKT	
	L52				
		No. of truck trips per day	15	trips/hr	From engineer
		No. of operation hour	10	nr v	From 8:00 to 18:00
		% of dust suppression	97.5	70	Assume as the same as express Rail Link and Extracted from SP
					License of ARL (Appendix C).
		Emission Rate	3.2E-06	g/m/s (mitigated)	
				· · · · · · · · · · · · · · · · · · ·	

Description	Sources	Parameter	Emission Rate	Remarks
Stockpile of Inert	Material handling and	Percentage open stockpile area, p	20 %	80% stockpiling area is covered by impervious sheets and all dusty
C&D material to be	storage piles	Particle size multiplier, k	0.35	k (particle size < 30µm)
reused on-site	Source ID:	Moisture content, M	5 %	Assume worst case scenario
	S1	Average wind speed, U	3 m/s	from PATH mm5 data grid (28,22) annual average wind speed
		Emission Factor, E	0.00023237 kg/Mg	E=k*0.0016*[(U/2.2)^1.3/(M/2)^1.4]
		Monthly output	752 m3/month	From engineer
				(email on 20140213)
		Maximum hourly output, op	2.9 m3/hr	26 days per month, 10 working hours per day (from 8:00 to 18:00)
			7.2 Mg/hr	Assume capacity of dump truck is 6m ³ and 15 tons
		Area of the Asphalt stockpile, A	430 m ²	
		Emission Rate	1.08465E-06 g/m ² /s (unmitigated)	Unmitigated Emission Rate=E*1000*op/(A*60*60)
			2.1693E-07 g/m ² /s (mitigated)	Mitigated Emission Rate'=E*1000*op/(A*60*60)*p/100
	Wind erosion	Percentage open stockpile area, p	100 % (unmitigated)	
	Source ID: As above		20 % (mitigated)	80% stockpiling area is covered by impervious sheets
		Emission Factor	0.85 Mg/hectare/year	AP42, Section 11.9.4
		Emission Rate	2.69533E-06 g/m ² /s (unmitigated)	=0.85*1000000/(10000*365*24*60*60)*p/100
			5.39066E-07 g/m ² /s (mitigated)	

Details of Dust Emission Sources for 1-hour FSP Assessment (Tier 1)

Ocean Park

Works Area	Sources		Parameter	Remarks
Ocean Park	Heavy construction	Percentage active area, p	100 %	Assume 100% works area for heavy construction
	Source ID: A1 - A19	Mitigation efficiency	91.7 %	Water suppression 4 times a day
		No. of working days per month, d	26 days	
		No. of working hours per day, h	10 hour	From 8:00 to 18:00
		Emission Factor for TSP	2.69 Mg/hectare/month of activity	AP42, Section 13.2.3.3
		% content of FSP	3 % of TSP	
		Emission Factor for FSP	0.08 Mg/hectare/month of activity	
		Emission Rate for FSP	8.62179E-06 g/m ² /s (unmitigated)	=2.69*0.03*1000000/(10000*d*h*60*60)*p/100
			7.15609E-07 g/m ² /s (mitigated)	
	Wind Erosion for	Percentage active area, p	100 %	
	Working Hours	Mitigation efficiency	91.7 %	Water suppression 4 times a day
	Source ID: A1 - A19	Emission Factor for TSP	0.85 Mg/hectare/year	AP42, Table 11.9-4
		% content of FSP	3 % of TSP	
		Emission Factor for FSP	0.03 Mg/hectare/year	
		Emission Rate for FSP	8.086E-08 g/m ² /s (unmitigated)	=0.85*0.03*1000000/(10000*365*24*60*60)*p/100
			6.71138E-09 g/m ² /s (mitigated)	
	Wind Erasian for	Dereentage estive eree . p	100 %	ļ
	Non Working Hours	Emission Easter for TSP	0.85 Mg/bostare/vear	AP42 Table 11.0.4
	Source ID: A1 A10	entission Factor for Tor		AF42, Table 11.9-4
	Source ID: AT - ATS	% content of FSP	3 % 01 ISF	
		Emission Factor for FSF	0.03 Mg/Neclare/year	0.85*0.03*1000000//10000*265*24*60*60**/100
		Emission Rate	8.086E-08 g/m²/s (unmiligated)	=0.85 0.03 1000000/(10000 365 24 60 60) p/100

Appendix 3.2 - Details of Dust Emission Sources for 1-hour FSP Assessment (Tier 1)

Works Area	Sources		Parameter		Remarks
Haul Road	Paved haul road within project site For Laden Vehicle	Particle size multiplier, k Road surface silt loading, sL Average truck weight, W	0.15 12 38	g/VKT g/m2 tons	AP-42, Section 13.2.1, Table 13.2.1-1, 01/11 ed. AP-42, Section 13.2.1, Table 13.2.1-3, 01/11 ed. Full loading of Dump Truck
	Source ID: L1 to L8 and L10 to L26	Emission height TSP emission factor, E	0.5 59	m g/VKT	E=k x (sL)^0.91x (W)^1.02 (AP-42, section 13.2.1, 01/11 ed.)
		No. of truck trips per day No. of operation hour % of dust suppression Emission Rate	15 10 97.5 6.13E-06	trips/hr hr % g/m/s (mitigated)	From engineer From 8:00 to 18:00 Assume as the same as Express Rail Link and Extracted from SP License of XRL (Appendix C).
	Paved haul road within project site For Unladen Vehicle Source ID: L27 to L34 and L36 to L52	Particle size multiplier, k Road surface silt loading, sL Average truck weight, W Emission height TSP emission factor, E	0.15 12 5 0.5 7	g/VKT g/m2 tons m g/VKT	AP-42, Section 13.2.1, Table 13.2.1-1, 01/11 ed. AP-42, Section 13.2.1, Table 13.2.1-3, 01/11 ed. Unladen Dump Truck E=k x (sL)^0.91x (W)^1.02 (AP-42, section 13.2.1, 01/11 ed.)
		No. of truck trips per day No. of operation hour % of dust suppression	15 10 97.5	trips/hr hr %	From engineer From 8:00 to 18:00 Assume as the same as Express Rail Link and Extracted from SP License of XRL (Appendix C).
		Emission Rate	7.7E-07	g/m/s (mitigated)	

Description	Sources	Parameter	Emission Rate	Remarks
Stockpile of Inert	Material handling and	Percentage open stockpile area, p	20 %	80% stockpiling area is covered by impervious sheets and all dusty
C&D material to be	storage piles	Particle size multiplier, k	0.053	k (particle size < 30µm)
reused on-site	Source ID:	Moisture content, M	5 %	Assume worst case scenario
	S1	Average wind speed, U	3 m/s	from PATH mm5 data grid (28,22) annual average wind speed
		Emission Factor, E	3.51875E-05 kg/Mg	E=k*0.0016*[(U/2.2)^1.3/(M/2)^1.4]
		Monthly output	752 m3/month	From engineer
				(email on 20140213)
		Maximum hourly output, op	2.9 m3/hr	26 days per month, 10 working hours per day (from 8:00 to 18:00)
			7.2 Mg/hr	Assume capacity of dump truck is 6m ³ and 15 tons
		Area of the Asphalt stockpile, A	430 m ²	
		Emission Rate	1.64247E-07 g/m ² /s (unmitigated)	Unmitigated Emission Rate=E*1000*op/(A*60*60)
			3.28494E-08 g/m ² /s (mitigated)	Mitigated Emission Rate'=E*1000*op/(A*60*60)*p/100
	Wind erosion	Percentage open stockpile area, p	100 % (unmitigated)	
	Source ID: As above		20 % (mitigated)	80% stockpiling area is covered by impervious sheets
		Emission Factor	0.85 Mg/hectare/year	AP42, Section 11.9.4
		Emission Rate	2.69533E-06 g/m ² /s (unmitigated)	=0.85*1000000/(10000*365*24*60*60)*p/100
			5.39066E-07 g/m ² /s (mitigated)	