

Appendix 3.2

Calculation of Industrial and Port Backup Emissions

Appendix 3.2 Calculation of Industrial and Port Backup Emissions

Project: HSKNDA
 Location and Details of Port Backup Sites (PBU) and Logistics Facilities Sites (LF)

Scenario: Year 2019 - Year 2030 & Year 2024 - Year 2030

Source ID	Source Type	Coordinates of Centroid		Dimension		Height (m)	Angle (deg)	Emission Factors (g/sq. meter/s)					
		x1 (m)	y1 (m)	x2 (m)	y2 (m)			Daytime Shift (08:00 - 16:00)			Night-time Shift (16:00 - 24:00)/ Morning Shift (24:00 - 08:00)		
								SO2	NOx	RSP	SO2	NOx	RSP
P1	Area	815937.43	834508.19	69	51.86	0.5	109.29	0.000E+00	8.134E-06	3.990E-07	0.000E+00	3.782E-08	5.139E-10
P2	Area	815949.50	834598.40	73.39	95.31	0.5	122.86	0.000E+00	8.134E-06	3.990E-07	0.000E+00	3.782E-08	5.139E-10
P3	Area	816016.41	834728.57	28.84	100.19	0.5	139.9	0.000E+00	8.134E-06	3.990E-07	0.000E+00	3.782E-08	5.139E-10
P4	Area	816102.47	834803.21	113.91	146.27	0.5	139.9	0.000E+00	8.134E-06	3.990E-07	0.000E+00	3.782E-08	5.139E-10
P5	Area	816301.01	834919.22	104.22	111.53	0.5	141.86	0.000E+00	8.134E-06	3.990E-07	0.000E+00	3.782E-08	5.139E-10
P6	Area	816334.84	834937.90	38.14	77.23	0.5	141.86	0.000E+00	8.134E-06	3.990E-07	0.000E+00	3.782E-08	5.139E-10

Remark:
 SO₂ and NO_x emissions are considered in Operation Phase.
 RSP emission is considered in both Construction and Operation Phases.

Appendix 3.2 Calculation of Industrial and Port Backup Emissions

Project: HSKNDA
 Location and Details of Port Backup Sites (PBU) and Logistics Facilities Sites (LF)

Scenario: Year 2031 - Year 2036 & Year 2031 - Year 2039

Source ID	Source Type	Coordinates of Centroid		Dimension		Height (m)	Angle (deg)	Emission Factors (g/sq. meter/s)					
		x1 (m)	y1 (m)	x2 (m)	y2 (m)			Daytime Shift (08:00 - 16:00)			Night-time Shift (16:00 - 24:00)/ Morning Shift (24:00 - 08:00)		
								SO2	NOx	RSP	SO2	NOx	RSP
P1	Area	815937.43	834508.19	69.00	51.86	0.50	109.29	0.000E+00	8.134E-06	3.990E-07	0.000E+00	3.782E-08	5.139E-10
P2	Area	815949.50	834598.40	73.39	95.31	0.50	122.86	0.000E+00	8.134E-06	3.990E-07	0.000E+00	3.782E-08	5.139E-10
P3	Area	816016.41	834728.57	28.84	100.19	0.50	139.90	0.000E+00	8.134E-06	3.990E-07	0.000E+00	3.782E-08	5.139E-10
P4	Area	816102.47	834803.21	113.91	146.27	0.50	139.90	0.000E+00	8.134E-06	3.990E-07	0.000E+00	3.782E-08	5.139E-10
P5	Area	816301.01	834919.22	104.22	111.53	0.50	141.86	0.000E+00	8.134E-06	3.990E-07	0.000E+00	3.782E-08	5.139E-10
P6	Area	816334.84	834937.90	38.14	77.23	0.50	141.86	0.000E+00	8.134E-06	3.990E-07	0.000E+00	3.782E-08	5.139E-10
P7	Area	816122.18	834432.51	32.95	55.43	0.50	180.00	0.000E+00	8.134E-06	3.990E-07	0.000E+00	3.782E-08	5.139E-10
P8	Area	816183.84	834432.51	61.66	48.12	0.50	180.00	0.000E+00	8.134E-06	3.990E-07	0.000E+00	3.782E-08	5.139E-10
P9	Area	816266.42	834432.51	82.58	42.92	0.50	180.00	0.000E+00	8.134E-06	3.990E-07	0.000E+00	3.782E-08	5.139E-10
P10	Area	816255.60	834460.92	60.53	28.41	0.50	180.00	0.000E+00	8.134E-06	3.990E-07	0.000E+00	3.782E-08	5.139E-10
P11	Area	816243.17	834479.75	26.46	18.83	0.50	180.00	0.000E+00	8.134E-06	3.990E-07	0.000E+00	3.782E-08	5.139E-10
P12	Area	816315.59	834534.79	54.17	84.67	0.50	175.97	0.000E+00	8.134E-06	3.990E-07	0.000E+00	3.782E-08	5.139E-10
P13	Area	816237.35	834670.66	41.60	22.97	0.50	139.90	0.000E+00	8.134E-06	3.990E-07	0.000E+00	3.782E-08	5.139E-10
P14	Area	816353.30	834768.31	152.27	46.54	0.50	139.90	0.000E+00	8.134E-06	3.990E-07	0.000E+00	3.782E-08	5.139E-10
P15	Area	816516.01	834970.91	60.41	105.29	0.50	172.88	0.000E+00	8.134E-06	3.990E-07	0.000E+00	3.782E-08	5.139E-10
P16	Area	816589.39	834917.53	66.19	43.22	0.50	172.88	0.000E+00	8.134E-06	3.990E-07	0.000E+00	3.782E-08	5.139E-10
P17	Area	816511.46	835216.34	24.61	33.71	0.50	116.67	0.000E+00	8.134E-06	3.990E-07	0.000E+00	3.782E-08	5.139E-10
P18	Area	816522.59	835281.94	63.62	53.21	0.50	116.67	0.000E+00	8.134E-06	3.990E-07	0.000E+00	3.782E-08	5.139E-10
P19	Area	816373.28	835356.94	45.08	167.09	0.50	116.67	0.000E+00	8.134E-06	3.990E-07	0.000E+00	3.782E-08	5.139E-10

Remark:
 SO₂ and NO_x emissions are considered in Operation Phase.
 RSP emission is considered in both Construction and Operation Phases.

Appendix 3.2 Calculation of Industrial and Port Backup Emissions

Particle Size Distributions of Various Processes

Process	Cumulative % of TSP		
	PM ₁₀	PM _{2.5}	Reference
Concrete batching plant (Uncontrolled)	51%	15%	Category 3 "Mechanically Generated Aggregate, Unprocessed Ores", Page B.2-13, Appendix B.2 Generalized Particle Size Distributions, AP-42, USEPA (Version 1/95)
Haul road	19.2%	4.6%	Table 13.2.1-1, Section 13.2.1, AP-42, USEPA (Version 1/11)
Aggregate Handling (equivalent to Construction)	47.3%	7.2%	Page 13.2.4-4, Section 13.2.4, AP-42, USEPA (Version 11/06)
Utility Boiler (including chimney sources and RED2)	71.0%	52.0%	Table 1.3-4, Section 1.3, AP 42, USEPA (Version 5/10)
Boiler of Proposed Hospital	55.0%	42.0%	Table 1.3-7, Section 1.3, AP 42, USEPA (Version 5/10)

Appendix 3.2 Calculation of Industrial and Port Backup Emission

HSK NDA

Project:
Revision: 1
Prepared: BLG 04/12/2012

Preliminary Indicative Operational Equipment Inventory

Item	Description	Total Equipment Quantity				Day Shift (Nom. 08:00 - 16:00)					Night Shift (Nom. 16:00 - 24:00)					Morning Shift (Nom. 00:00 - 08:00)				
		Rate	Unit	Qty.	Total	Percentage Operational	Operational Equipment	Operational Equipment Utilisation			Percentage Operational	Operational Equipment	Operational Equipment Utilisation			Percentage Operational	Operational Equipment	Operational Equipment Utilisation		
								Running	Idling	Parked			Running	Idling	Parked			Running	Idling	Parked
1.0	OU - Special Industry (PBU+SU)	Total Area (ha)		38																
1.1	Empty Container Storage and Repair Sites	Percentage of Total:		66.00%																
1.1.1	Front Loaders	1	per ha	25.08	26	100.0%	26	50.0%	25.0%	25.0%	0.0%	0	50.0%	25.0%	25.0%	0.0%	0	50.0%	25.0%	25.0%
1.1.2	External HGVs	2	per ha	25.08	51	100.0%	51	5.0%	95.0%	0.0%	0.0%	0	5.0%	95.0%	0.0%	0.0%	0	5.0%	95.0%	0.0%
1.2	Parking Areas	Percentage of Total:		34.00%																
1.2.1	PC/LGVs	16	per ha	12.92	207	100.0%	207	5.0%	5.0%	90.0%	100.0%	207	1.25%	1.25%	97.5%	100.0%	207	1.25%	1.25%	97.5%
1.2.2	MGVs	19	per ha	12.92	246	100.0%	246	5.0%	5.0%	90.0%	100.0%	246	1.25%	1.25%	97.5%	100.0%	246	1.25%	1.25%	97.5%
1.2.3	Container Tractors / HGVs	29	per ha	12.92	375	100.0%	375	5.0%	5.0%	90.0%	100.0%	375	1.25%	1.25%	97.5%	100.0%	375	1.25%	1.25%	97.5%

Appendix 3.2 Calculation of Industrial and Port Backup Emission

HSK NDA

Project:
Revision: 1
Prepared: BLG 04/12/2012

Preliminary Indicative Operational Equipment Inventory

Item	Description	Emission by US Tier3 Emission Standard (g/kW-hr)		Running Emission (g/meter-vehicle)		Estimated hourly distance travelled (m)	Idling Emission (g/h)		Operating Emission (g/s)									
		SO2	NOX	PM	NOX		PM	NOX	PM	Day Shift			Night Shift			Morning Shift		
										SO2	NOX	PM10	SO2	NOX	PM10	SO2	NOX	PM10
1.0	OU - Special Industry (PBU+SU)																	
1.1	Empty Container Storage and Repair Sites																	
1.1.1	Front Loaders		4.0000E+00	2.0000E-01							3.0044E+00	1.5022E-01		0.0000E+00	0.0000E+00		0.0000E+00	0.0000E+00
1.1.2	External HGVs				3.0646E-03	3.1600E-05	2003.20	36.37	0.86		4.3485E-03	4.4838E-05		0.0000E+00	0.0000E+00		0.0000E+00	0.0000E+00
1.2	Parking Areas																	
1.2.1	PC/LGVs				1.4488E-03	1.3333E-05	1437.78	6.27	0.11		5.9886E-03	5.5115E-05		1.4972E-03	1.3779E-05		1.4972E-03	1.3779E-05
1.2.2	MGVs				2.4366E-03	2.0900E-05	1437.78	36.37	0.86		1.1970E-02	1.0267E-04		2.9924E-03	2.5667E-05		2.9924E-03	2.5667E-05
1.2.3	Container Tractors / HGVs				3.0646E-03	3.1600E-05	1437.78	36.37	0.86		2.2949E-02	2.3663E-04		5.7373E-03	5.9158E-05		5.7373E-03	5.9158E-05

Remarks:

Power of front loader or container handling equipment ranges from 122 - 294 kW (Reference to catalogues of . Konecranes, Hyster and Terex). Average power of 208 kW is assumed for front loader or container handling equipment in the assessment.

According to Regulatory Control on Emissions from Non-road Mobile Machinery (NRMMS), US Tier 3 Emission Standard (130skW<225) is adopted for regulated machines. Therefore, emission rate E (g/s) = EF (g/kw-hr per vehicle) x No. of machinery x Power (kW) / 3600 where the factor of 3600 is the conversion factor for hour to second (1 hr = 60 min x 60 sec)

Running Emission is extracted from the EMFAC-HK results for vehicle travelling 10 KPH.

PC/LGVs : Average emission rates of LGV3, LGV4 LGV6

MGVs: Emission rates of HGV7

HGVs: Emission rates of HGV8

Therefore, emission rate E (g/s) = EF (g/m-vehicle per hour) x No. of Vehicle x Distance Travelled (m) / 3600 where the factor of 3600 is the conversion factor for hour to second (1 hr = 60 min x 60 sec)

Distance travelled is assumed to be perimeter of PBU area source and is estimated by assuming the total area as a square, i.e. (Area)^{1/2} x 4

Idling emission is based on "Road Tunnels: Vehicle Emissions and Air Demand for Ventilation" published by Permanent International Association of Road Congress (PIARC, 2012). Emission standard of Euro V is assumed for non-road vehicles.

Therefore, emission rate E (g/s) = EF (g/h per vehicle) x No. of vehicle / 3600 x 3 / 60 where the factor of 3600 is the conversion factor for hour to second (1 hr = 60 min x 60 sec), the factor of 3 / 60 is for the 3-min idling required by Motor Vehicle Idling (Fixed Penalty) Ordinance.

Appendix 3.2 Calculation of Industrial and Port Backup Emission

HSK NDA

Project:
Revision: 1
Prepared: BLG 04/12/2012

Preliminary Indicative Operational Equipment Inventory

Item	Description	Idling Emission (g/s)									Total Emission Rate (g/s)									
		Day Shift			Night Shift			Morning Shift			Day Shift			Night Shift			Morning Shift			
		SO2	NOX	PM	SO2	NOX	PM	SO2	NOX	PM	SO2	NOX	PM10	SO2	NOX	PM10	SO2	NOX	PM10	
1.0	OU - Special Industry (PBU+SU)																			
1.1	<i>Empty Container Storage and Repair Sites</i>																			
1.1.1	Front Loaders										0.0000E+00	3.0044E+00	1.5022E-01	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	
1.1.2	External HGVs		2.4474E-02	5.7871E-04		0.0000E+00	0.0000E+00		0.0000E+00	0.0000E+00	0.0000E+00	2.8822E-02	6.2355E-04	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	
1.2	<i>Parking Areas</i>																			
1.2.1	PC/LGVs		9.0131E-04	1.5813E-05		2.2533E-04	3.9531E-06		2.2533E-04	3.9531E-06	0.0000E+00	6.8899E-03	7.0927E-05	0.0000E+00	1.7225E-03	1.7732E-05	0.0000E+00	1.7225E-03	1.7732E-05	
1.2.2	MGVs		6.2132E-03	1.4692E-04		1.5533E-03	3.6729E-05		1.5533E-03	3.6729E-05	0.0000E+00	1.8183E-02	2.4959E-04	0.0000E+00	4.5457E-03	6.2396E-05	0.0000E+00	4.5457E-03	6.2396E-05	
1.2.3	Container Tractors / HGVs		9.4714E-03	2.2396E-04		2.3678E-03	5.5990E-05		2.3678E-03	5.5990E-05	0.0000E+00	3.2420E-02	4.6059E-04	0.0000E+00	8.1051E-03	1.1515E-04	0.0000E+00	8.1051E-03	1.1515E-04	
											Subtotal (g/s-m²):									
											0.0000E+00	8.1336E-06	3.9902E-07	0.0000E+00	3.7824E-08	5.1389E-10	0.0000E+00	3.7824E-08	5.1389E-10	

Appendix 3.2 Calculation of Industrial and Port Backup Emissions

Particle Size Distribution of Chimney

Particle Size, μm	Average Particle Size (μm)	Percentage %
0.625	0.31	35.0
1	0.81	2.0
1.25	1.13	1.0
2.5	1.88	4.0
6	4.25	7.0
10	8.00	6.0
15	12.50	5.0
30	22.50	40.0

Reference: Table 1.3-7, Section 1.3, AP-42 (Distillate Oil)

Particle Size, μm	Cumulative Mass % Stated Size
0.625	35
1	37
1.25	38
2.5	42
6	49
10	55
15	60
30	100

Particle Size Distribution of Concrete Batching Plant

General Activity		
Particle Size, μm	Average Particle Size (μm)	Percentage %
1	0.50	4.0
2	1.50	7.0
2.5	2.25	4.0
3	2.75	3.0
4	3.50	7.0
5	4.50	5.0
6	5.50	4.0
10	8.00	17.0
30	20.00	49.0

Reference: Table B.2.2 - Category: 3, Appendix B2, AP42

Particle Size, μm	Cumulative % \leq Stated Size (Uncontrolled)
1	4
2	11
2.5	15
3	18
4	25
5	30
6	34
10	51
30	100

Haul Road

Particle Size, μm	Average Particle Size (μm)	Percentage %
2.5	1.25	4.6
10	6.25	14.6
15	12.50	4.6
30	22.50	76.2

Reference: Table 13.2.1-1, Section 13.2.1, AP42

Particle Size Range, μm	Particle Size Multiplier, k (g/VKT)
2.5	0.15
10	0.62
15	0.77
30	3.23

Particle Size Distribution for Off-Road Vehicles and Plants

Particle Size, μm	Average Particle Size (μm)	Percentage %
1	0.50	82.0
2	1.50	6.0
2.5	2.25	2.0
3	2.75	0.0
4	3.50	2.0
5	4.50	1.0
6	5.50	0.0
10	8.00	3.0
30	20.00	4.0

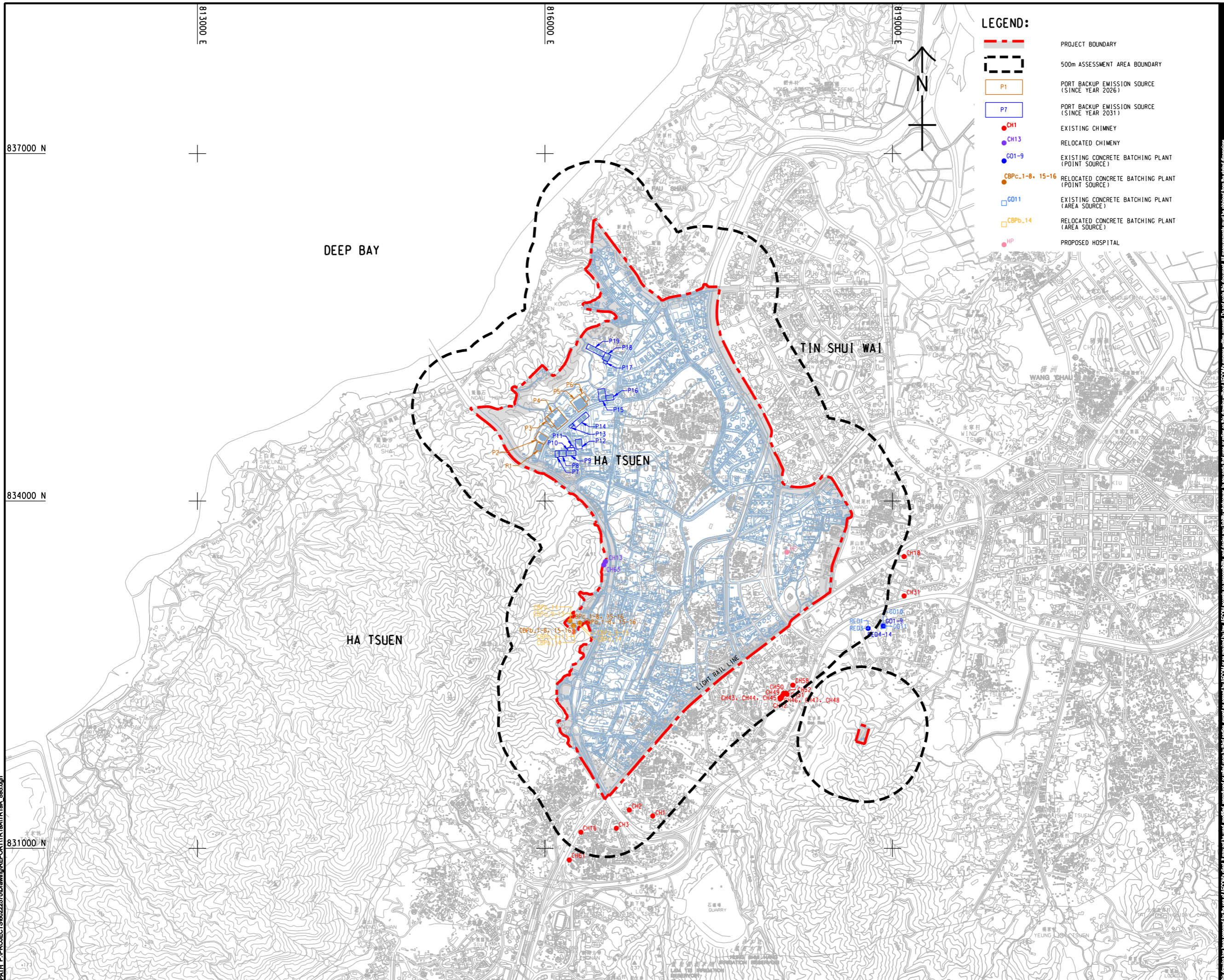
Table B.2.2 - Category: 1, Appendix B2, AP-42

Particle Size, μm	Cumulative % \leq Stated Size (Uncontrolled)
1	82
2	88
2.5	90
3	90
4	92
5	93
6	93
10	96
30	100

Remark:

Particle size distribution of various processes are extracted and presented as above, thus Method 1 of particle dry deposition is applied in AERMOD.

Pld File by: zengfx
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- LEGEND:**
- PROJECT BOUNDARY
 - 500m ASSESSMENT AREA BOUNDARY
 - P1 PORT BACKUP EMISSION SOURCE (SINCE YEAR 2026)
 - P7 PORT BACKUP EMISSION SOURCE (SINCE YEAR 2031)
 - CH1 EXISTING CHIMNEY
 - CH13 RELOCATED CHIMNEY
 - G01-9 EXISTING CONCRETE BATCHING PLANT (POINT SOURCE)
 - CBPc-1-8, 15-16 RELOCATED CONCRETE BATCHING PLANT (POINT SOURCE)
 - G011 EXISTING CONCRETE BATCHING PLANT (AREA SOURCE)
 - CBPc-14 RELOCATED CONCRETE BATCHING PLANT (AREA SOURCE)
 - HP PROPOSED HOSPITAL

AECOM

PROJECT
 項目
HUNG SHUI KIU NEW DEVELOPMENT AREA PLANNING AND ENGINEERING STUDY - INVESTIGATION

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 業主

 土木工程拓展署 規劃署
 Civil Engineering and Development Department Planning Department

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ISSUE/REVISION
 修訂

IR/修訂	DATE/日期	DESCRIPTION/內容摘要	CHK/校核

STATUS
 階段

SCALE
 比例
 A3 1 : 30000

DIMENSION UNIT
 尺寸單位
 METRES

KEY PLAN
 索引圖

PROJECT NO.
 項目編號
 60222570

AGREEMENT NO.
 協議編號
 CE2/2011 (CE)

SHEET TITLE
 圖紙名稱
 LOCATION OF INDUSTRIAL AND PORT BACKUP EMISSION SOURCES

SHEET NUMBER
 圖紙編號
 60222570/TR19A/APPENDIX 3.2.1

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