

Appendix 3.9 Detailed Calculations of Emissions from Industrial Chimney

The ranges of fuel consumption are assumed to be

Max=	4,450	L/hr
Min=	9	L/hr
Average=	339	L/hr
Total=	26,081	L/hr

Max. sulphur content of diesel fuel (%)[#] = 0.5
 Emission factor of SO₂ of AP-42= 71 lb/10³ gal
 Emission factor of NO_x of AP-42= 20 lb/10³ gal
 Emission factor of RSP of AP-42= 2 lb/10³ gal
 Conversion factor from lb/gal to kg/L= 0.12

Total cross-section area for the 77 chimneys= 18.73 m²
 Therefore,

Emission rate of NO_x = 9.282E-01 gm²/s
 Emission rate of SO₂ = 3.295E+00 gm²/s
 Emission rate of RSP = 9.282E-02 gm²/s

Source ID	Easting, x*		Northing, y*		Base elevation mPD	Chimney height* m	Chimney Diameter* m	Exiting Temp K	Cross-section Area m ²	Emission Rate			Velocity m/s	Remarks
	km	km	km	km						NO _x g/s	SO ₂ g/s	RSP g/s		
IN1	810310	825460	5.1	55.3	1.850	473	2.495E+00	8.857E+00	2.495E-01	2.495E-01	8	It is the stack at Shiu Wing Still Mill, the emission refer to the Appendix 7.		
IN2	812300	832110	3.5	19.9	0.355	473	9.187E-02	3.262E-01	9.187E-03	9.187E-03	8			
IN3	812950	825600	6.1	38.0	0.700	473	3.572E-01	1.268E+00	3.572E-02	3.572E-02	8			
IN4	812950	825600	6.1	38.0	0.700	473	3.572E-01	1.268E+00	3.572E-02	3.572E-02	8			
IN5	812950	825600	6.1	38.0	0.700	473	3.572E-01	1.268E+00	3.572E-02	3.572E-02	8			
IN6	814230	825190	6.4	62.9	0.380	473	1.053E-01	3.737E-01	1.053E-02	1.053E-02	8			
IN7	814810	828670	6.1	73.3	0.345	473	8.677E-02	3.080E-01	8.677E-03	8.677E-03	8			
IN8	814830	828690	6.1	102.8	0.610	473	2.713E-01	9.630E-01	2.713E-02	2.713E-02	8			
IN9	814840	828580	6.1	93.4	0.365	473	9.712E-02	3.448E-01	9.712E-03	9.712E-03	8			
IN10	814840	828590	6.1	90.0	0.406	473	1.202E-01	4.266E-01	1.202E-02	1.202E-02	8			
IN11	814850	828380	5.6	57.5	0.308	473	6.916E-02	2.455E-01	6.916E-03	6.916E-03	8			
IN12	814850	828560	6.1	88.1	0.300	473	6.561E-02	2.329E-01	6.561E-03	6.561E-03	8			
IN13	814860	828730	7.0	97.7	0.940	473	6.442E-01	2.287E+00	6.442E-02	6.442E-02	8			
IN14	814890	828390	5.6	72.6	0.510	473	1.896E-01	6.731E-01	1.896E-02	1.896E-02	8			
IN15	814890	828580	6.1	60.9	0.280	473	5.715E-02	2.029E-01	5.715E-03	5.715E-03	8			
IN16	814900	828460	6.1	33.8	0.660	473	3.176E-01	1.127E+00	3.176E-02	3.176E-02	8			
IN17	814900	828850	21.6	97.4	1.150	473	9.641E-01	3.423E+00	9.641E-02	9.641E-02	8			
IN18	814970	829010	13.7	150.4	0.750	473	4.101E-01	1.456E+00	4.101E-02	4.101E-02	8			
IN19	814980	829010	13.7	150.4	0.750	473	4.101E-01	1.456E+00	4.101E-02	4.101E-02	8			
IN20	814990	829020	4.9	78.6	1.220	473	1.085E+00	3.852E+00	1.085E+00	1.085E+00	8			
IN21	815000	829040	4.8	91.9	1.190	473	1.032E+00	3.665E+00	1.032E+01	1.032E+01	8			
IN22	815030	828140	4.7	63.7	0.250	473	4.566E-02	1.617E-01	4.566E-03	4.566E-03	8			
IN23	815040	828280	5.3	48.5	0.559	473	2.278E-01	8.087E-01	2.278E-02	2.278E-02	8			
IN24	815060	828230	5.2	69.9	0.600	473	2.624E-01	9.317E-01	2.624E-02	2.624E-02	8			
IN25	815080	828140	4.5	76.8	0.300	473	6.561E-02	2.329E-01	6.561E-03	6.561E-03	8			
IN26	815080	828760	5.9	68.7	0.460	473	1.543E-01	5.476E-01	1.543E-03	1.543E-03	8			
IN27	815090	828130	4.6	44.0	0.457	473	1.523E-01	5.405E-01	1.523E-02	1.523E-02	8			
IN28	815090	828150	4.7	87.6	0.560	473	2.286E-01	8.116E-01	2.286E-02	2.286E-02	8			
IN29	815100	828070	4.4	64.0	0.546	473	2.173E-01	7.715E-01	2.173E-02	2.173E-02	8			
IN30	815100	828140	4.5	60.0	0.250	473	4.566E-02	1.617E-01	4.566E-03	4.566E-03	8			
IN31	815120	828310	5.2	93.1	0.250	473	4.566E-02	1.617E-01	4.566E-03	4.566E-03	8			
IN32	815120	829270	8.3	21.3	0.356	473	9.239E-02	3.280E-01	9.239E-03	9.239E-03	8			
IN33	815140	828780	6.2	66.0	0.460	473	1.543E-01	5.476E-01	1.543E-02	1.543E-02	8			

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Max=	4,450	L/hr
Min=	9	L/hr
Average=	339	L/hr
Total=	26,081	L/hr

Max. sulphur content of diesel fuel (%)* = 0.5
 Emission factor of SO₂ of AP-42= 71 lb/10³ gal
 Emission factor of NO_x of AP-42= 20 lb/10³ gal
 Emission factor of RSP of AP-42= 2 lb/10³ gal
 Conversion factor from lb/gal to kg/L= 0.12

Total cross-section area for the 77 chimneys= 18.73 m²
 Therefore,

Emission rate of NO_x = 9.282E-01 g/m²/s
 Emission rate of SO₂ = 3.295E+00 g/m²/s
 Emission rate of RSP = 9.282E-02 g/m²/s

Source ID	Easting, x*		Northing, y*	Base elevation mPD	Chimney height* m	Chimney Diameter* m	Exiting Temp K	Cross-section Area m ²	Emission Rate			Velocity m/s	Remarks
	km	km							NO _x g/s	SO ₂ g/s	RSP g/s		
IN34	815160	828790	6.1	65.7	0.965	473	0.731	6.789E-01	2.410E+00	6.789E-02	8	Located within 7km radius of the Project site and included in the assessment.	
IN35	815160	828790	6.1	65.7	0.406	473	0.129	1.202E-01	4.266E-01	1.202E-02	8		
IN36	815300	830100	17.5	8.0	0.250	473	0.049	4.596E-02	1.617E-01	4.596E-03	8		
IN37	815310	830100	17.5	7.0	0.356	473	0.100	9.239E-02	3.280E-01	9.239E-03	8	Demolished but within 7km radius of the Project site which was not included in the assessment.	
IN38	815310	830100	17.5	7.0	0.356	473	0.100	9.239E-02	3.280E-01	9.239E-03	8		
IN39	815470	827580	4.8	58.3	0.450	473	0.159	1.476E-01	5.241E-01	1.476E-02	8		
IN40	815540	827640	5.1	69.8	0.427	473	0.143	1.329E-01	4.719E-01	1.329E-02	8		
IN41	815770	830350	7.2	33.8	0.332	473	0.087	8.035E-02	2.853E-01	8.035E-03	8		
IN42	815810	831110	12.0	24.1	0.630	473	0.312	2.893E-01	1.027E+00	2.893E-02	8		
IN43	815820	831110	10.9	23.6	0.680	473	0.342	3.176E-01	1.127E+00	3.176E-02	8		
IN44	815840	828820	4.4	17.0	0.450	473	0.159	1.476E-01	5.241E-01	1.476E-02	8		
IN45	815970	830990	10.6	13.4	0.373	473	0.109	1.014E-01	3.601E-01	1.014E-02	8		
IN46	815990	827720	5.8	80.9	0.305	473	0.073	6.782E-02	2.407E-01	6.782E-03	8		
IN47	816310	831130	7.8	15.2	0.200	473	0.031	2.916E-02	1.035E-01	2.916E-03	8		
IN48	816500	832280	29.2	12.2	0.254	473	0.051	4.703E-02	1.670E-01	4.703E-03	8		
IN49	816590	831180	12.2	24.4	0.610	473	0.292	2.713E-01	9.630E-01	2.713E-02	8		
IN50	816930	831280	16.5	20.0	0.450	473	0.159	1.476E-01	5.241E-01	1.476E-02	8		
IN51	817420	833200	6.3	6.7	0.090	473	0.006	5.905E-03	2.096E-02	5.905E-04	8		
IN52	817430	833190	7.0	6.7	0.200	473	0.031	2.916E-02	1.035E-01	2.916E-03	8		
IN53	818030	832290	22.2	11.1	0.267	473	0.056	5.197E-02	1.845E-01	5.197E-03	8		
IN54	818030	832300	22.2	11.1	0.267	473	0.056	5.197E-02	1.845E-01	5.197E-03	8		
IN55	818030	832300	22.2	14.9	0.343	473	0.092	8.577E-02	3.045E-01	8.577E-03	8		
IN56	818030	832300	22.2	12.0	0.241	473	0.046	4.234E-02	1.503E-01	4.234E-03	8		
IN57	818040	832300	26.3	11.1	0.305	473	0.073	6.782E-02	2.407E-01	6.782E-03	8		
IN58	818040	832300	26.3	11.1	0.267	473	0.056	5.197E-02	1.845E-01	5.197E-03	8		
IN59	818050	832320	21.6	11.1	0.203	473	0.032	3.004E-02	1.066E-01	3.004E-03	8		
IN60	818060	832340	21.6	11.1	0.241	473	0.046	4.234E-02	1.503E-01	4.234E-03	8		
IN61	818080	832340	23.5	9.4	0.267	473	0.056	5.197E-02	1.845E-01	5.197E-03	8		
IN62	818090	832350	23.5	9.4	0.267	473	0.056	5.197E-02	1.845E-01	5.197E-03	8		
IN63	818100	833610	7.4	24.6	0.350	473	0.096	8.930E-02	3.170E-01	8.930E-03	8		
IN64	818140	832410	22.2	19.8	0.229	473	0.041	3.823E-02	1.357E-01	3.823E-03	8	Located outside 7km radius of the Project site and not included in the assessment.	

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 Therefore,
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 Emission rate of SO₂ = 3.295E+00 g/m²/s
 Emission rate of RSP = 9.282E-02 g/m²/s

Source ID	Easting, x*		Northing, y*		Base elevation mPD	Chimney height* m	Chimney Diameter* m	Exiting Temp K	Cross-section Area m ²	Emission Rate			Velocity m/s	Remarks
	km	km	km	km						NO _x g/s	SO ₂ g/s	RSP g/s		
IN65	818170	832350	33.4	24.8	33.4	0.686	473	0.370	3.431E-01	1.218E+00	3.431E-02	8		
IN66	818170	832370	35.1	24.4	35.1	0.560	473	0.246	2.286E-01	8.116E-01	2.286E-02	8		
IN67	818260	833690	7.9	7.5	7.9	0.508	473	0.203	1.881E-01	6.679E-01	1.881E-02	8		
IN68	818280	833670	7.9	24.8	7.9	0.600	473	0.283	2.624E-01	9.317E-01	2.624E-02	8		
IN69	818510	833800	6.3	27.2	6.3	0.715	473	0.402	3.727E-01	1.323E+00	3.727E-02	8		
IN70	818520	833800	6.3	27.2	6.3	0.715	473	0.402	3.727E-01	1.323E+00	3.727E-02	8		
IN71	818560	833810	6.3	32.0	6.3	0.380	473	0.113	1.053E-01	3.737E-01	1.053E-02	8		
IN72	818790	832900	14.9	26.8	14.9	0.711	473	0.397	3.685E-01	1.308E+00	3.685E-02	8		
IN73	818830	832970	16.9	19.4	16.9	0.355	473	0.099	9.187E-02	3.262E-01	9.187E-03	8		
IN74	819030	832820	26.2	14.2	26.2	0.220	473	0.038	3.528E-02	1.253E-01	3.528E-03	8		
IN75	819030	832620	26.2	14.2	26.2	0.220	473	0.038	3.528E-02	1.253E-01	3.528E-03	8		
IN76	819100	833180	13.6	24.9	13.6	0.450	473	0.159	1.476E-01	5.241E-01	1.476E-02	8		
IN77	819110	833520	12.5	35.8	12.5	0.288	473	0.065	6.047E-02	2.147E-01	6.047E-03	8		
N1	814941.29	828623.99	5.8	45.2	5.8	0.350	473	0.096	8.930E-02	3.170E-01	8.930E-03	8		
N2	815147.88	828756.98	6.0	74.2	6.0	0.460	473	0.166	1.543E-01	5.476E-01	1.543E-02	8		
N3	815783.26	829557.44	5.8	89.9	5.8	0.300	473	0.071	6.561E-02	2.329E-01	6.561E-03	8		
N6	815512.26	828801.82	5.1	99.9	5.1	0.300	473	0.119	1.109E-01	3.936E-01	1.109E-02	8		
N8a	814789.42	828283.38	5.6	42.1	5.6	0.426	473	0.143	1.323E-01	4.697E-01	1.323E-02	8		
N8b	814790.28	828302.56	5.6	37.1	5.6	0.560	473	0.246	2.286E-01	8.116E-01	2.286E-02	8		
N9	814862.2	828400.49	5.6	71.7	5.6	0.510	473	0.204	1.896E-01	6.731E-01	1.896E-02	8		
N10a	815558.36	829869.44	8.2	55.5	8.2	0.543	473	0.232	2.149E-01	7.631E-01	2.149E-02	8		
N10b	815526.04	829851.65	8.2	55.5	8.2	0.600	473	0.283	2.624E-01	9.317E-01	2.624E-02	8		

Located outside 7km radius of the Project site and not included in the assessment.

New observed and included in the assessment.

Notes:
 * - The diesel fuel with less than 0.5% sulphur content would be used.