Appendix C

Vector Plots of Velocity Ratio

Contents

C1 OZP-Compliant Scheme

Figure C1 Vector Plot of VR under NNE Wind

Figure C2 Vector Plot of VR under NE Wind

Figure C3 Vector Plot of VR under ENE Wind

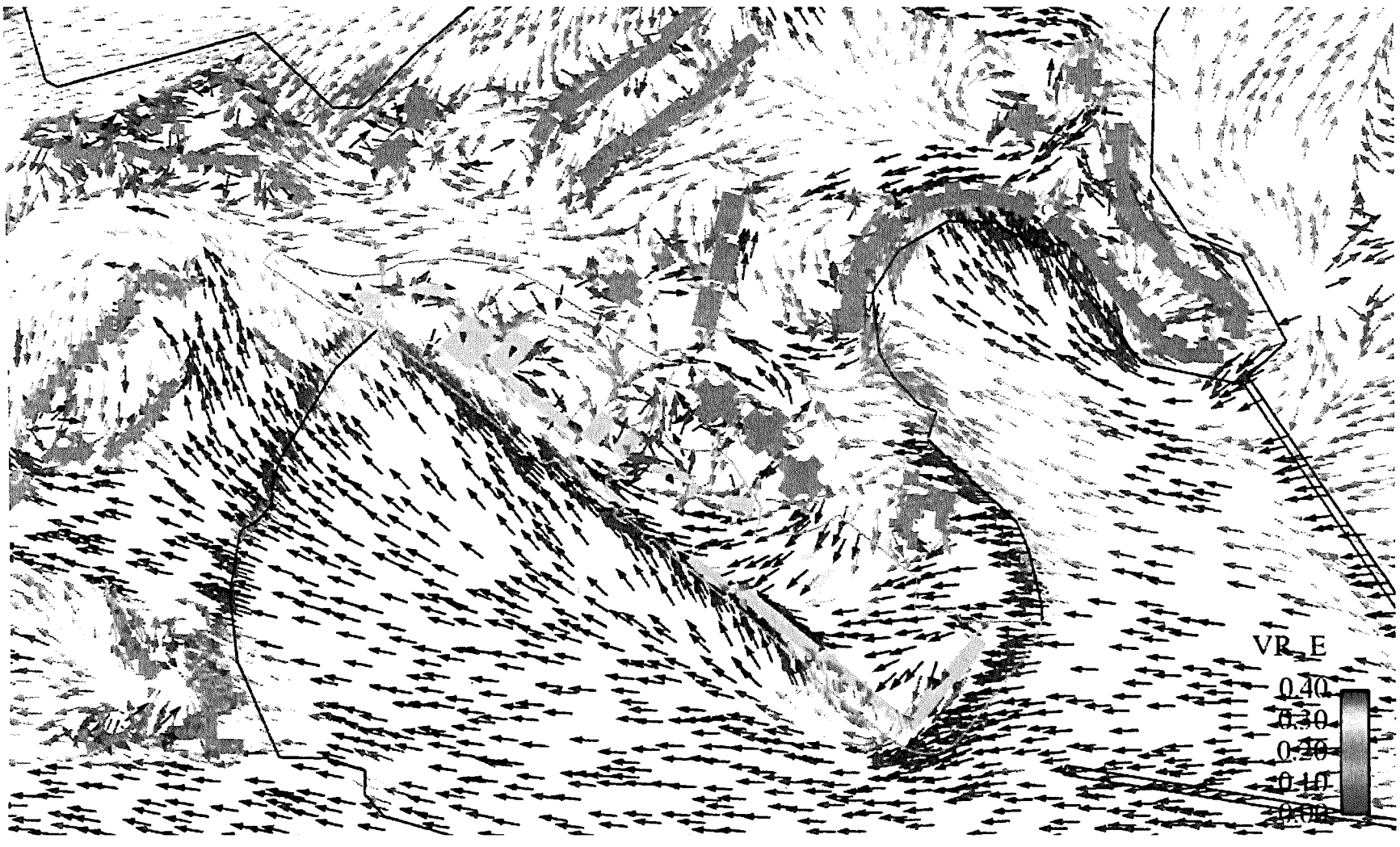


Figure C4 Vector Plot of VR under E Wind

Figure C5 Vector Plot of VR under ESE Wind

Figure C6 Vector Plot of VR under SE Wind

Figure C7 Vector Plot of VR under SSE Wind

Figure C8 Vector Plot of VR under S Wind

Figure C9 Vector Plot of VR under SSW Wind

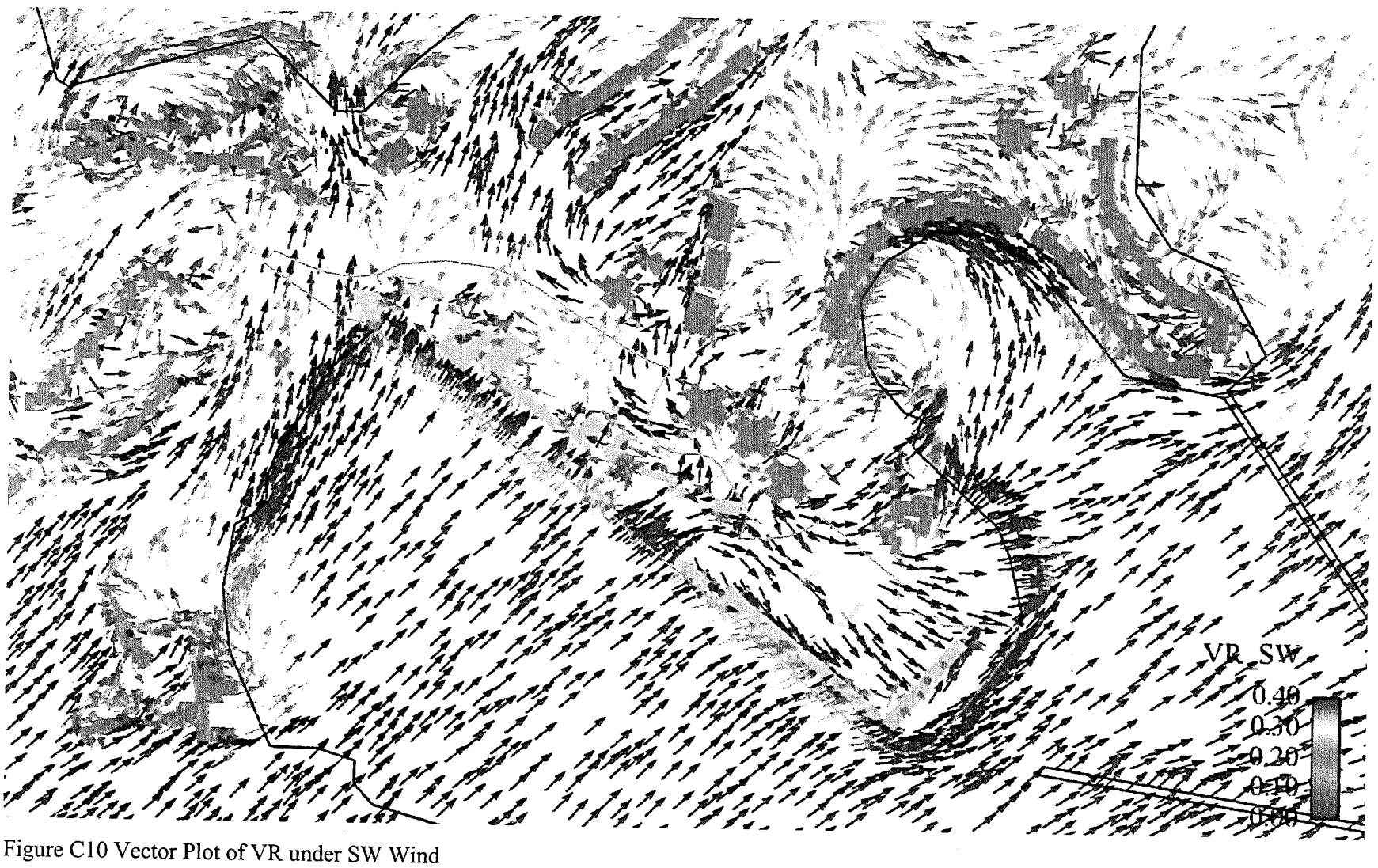


Figure C10 Vector Plot of VR under SW Wind

Figure C11 Vector Plot of VR under WSW Wind

C2 Baseline Scheme

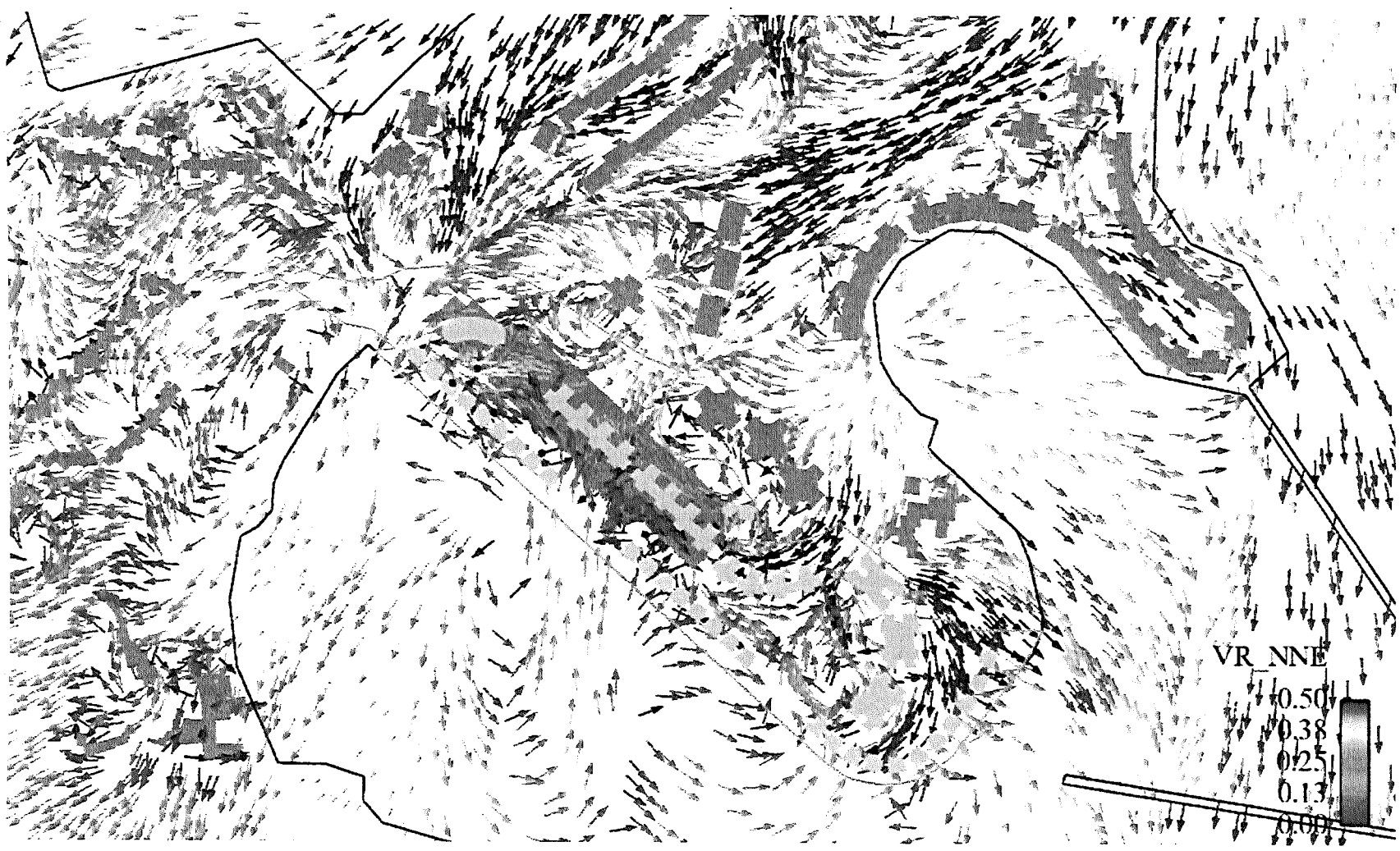


Figure C12 Vector Plot of VR under NNE Wind

Figure C13 Vector Plot of VR under NE Wind

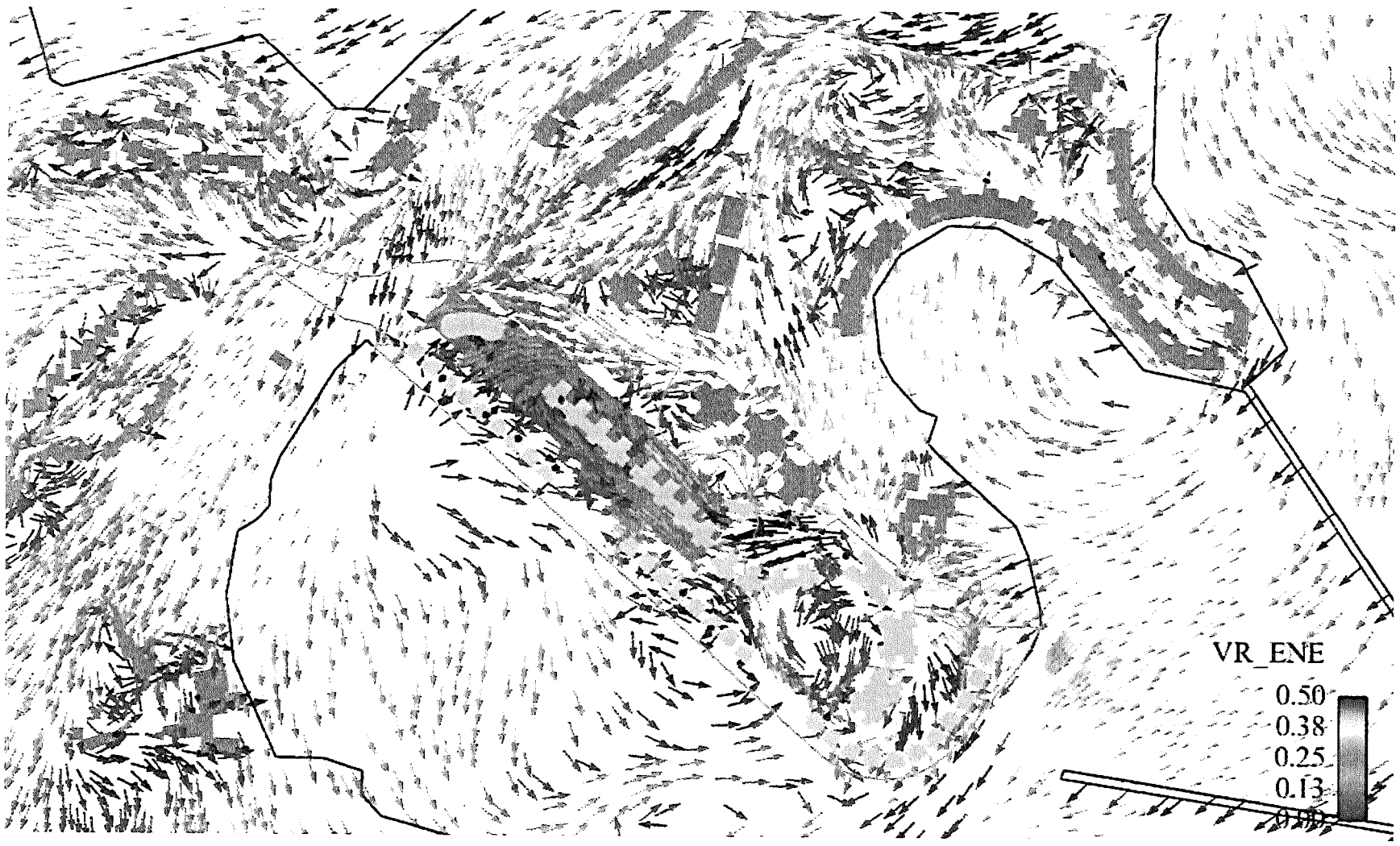


Figure C14 Vector Plot of VR under ENE Wind

Figure C15 Vector Plot of VR under E Wind

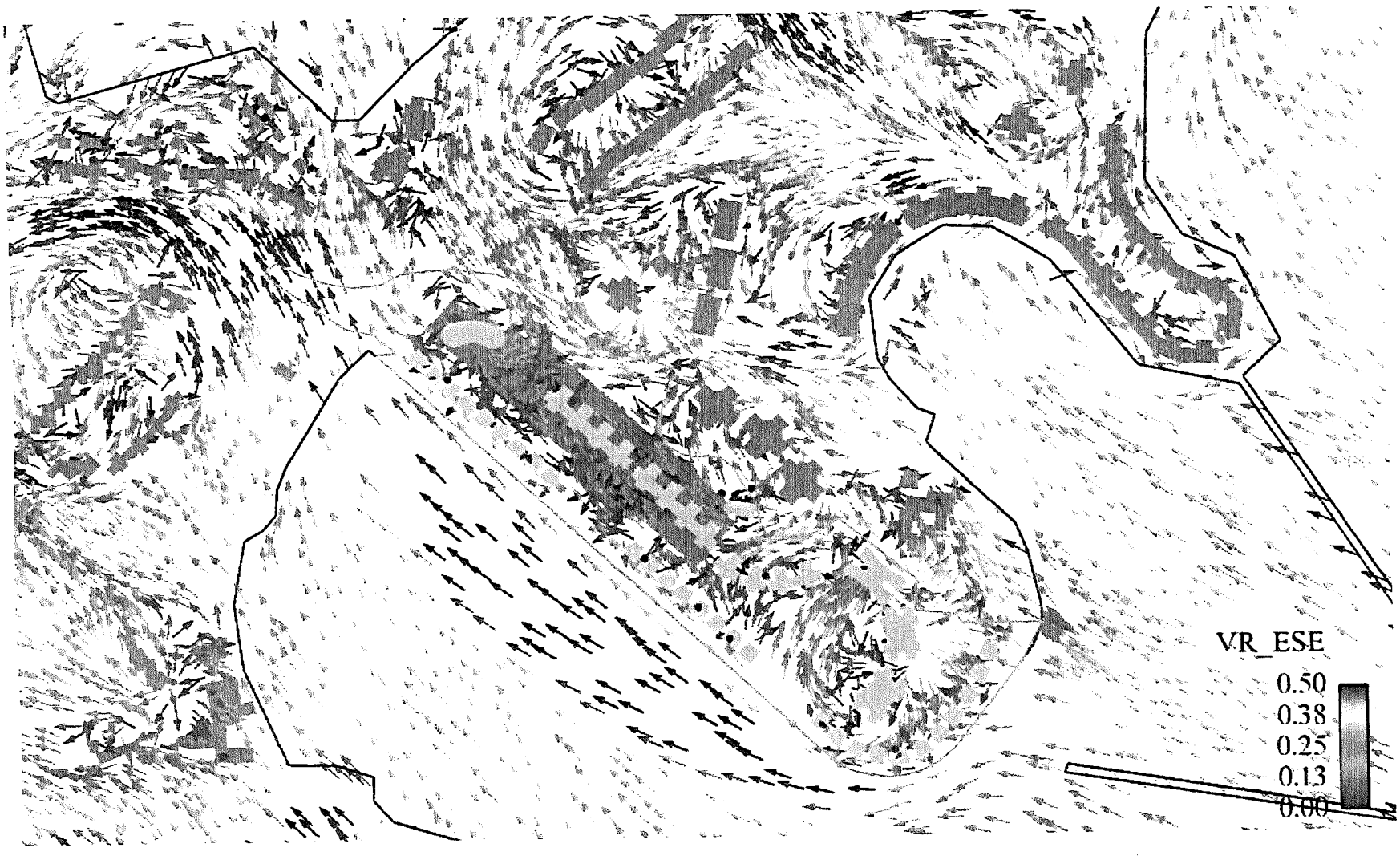


Figure C16 Vector Plot of VR under ESE Wind

Figure C17 Vector Plot of VR under SE Wind

Figure C18 Vector Plot of VR under SSE Wind

Figure C19 Vector Plot of VR under S Wind

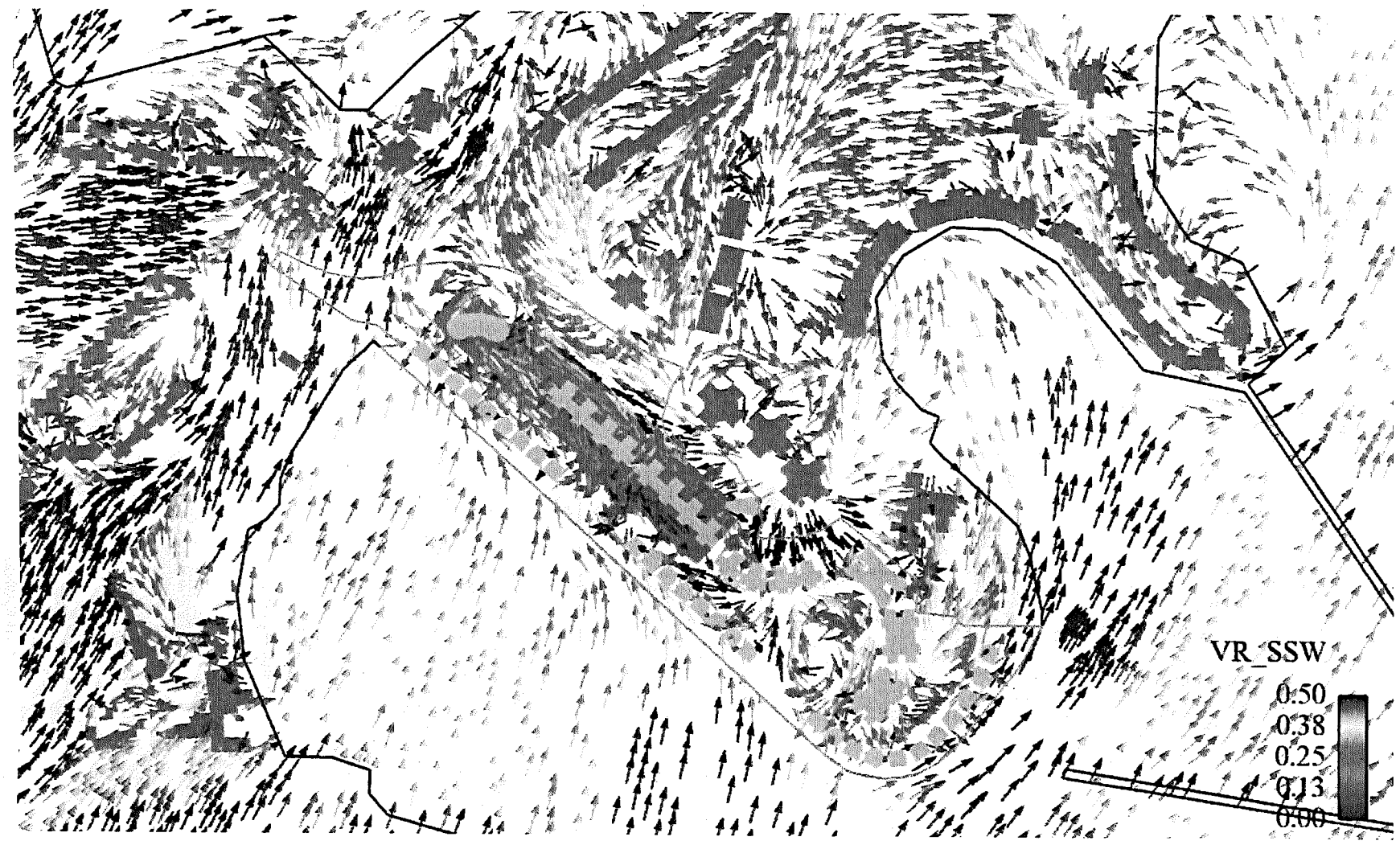


Figure C20 Vector Plot of VR under SSW Wind

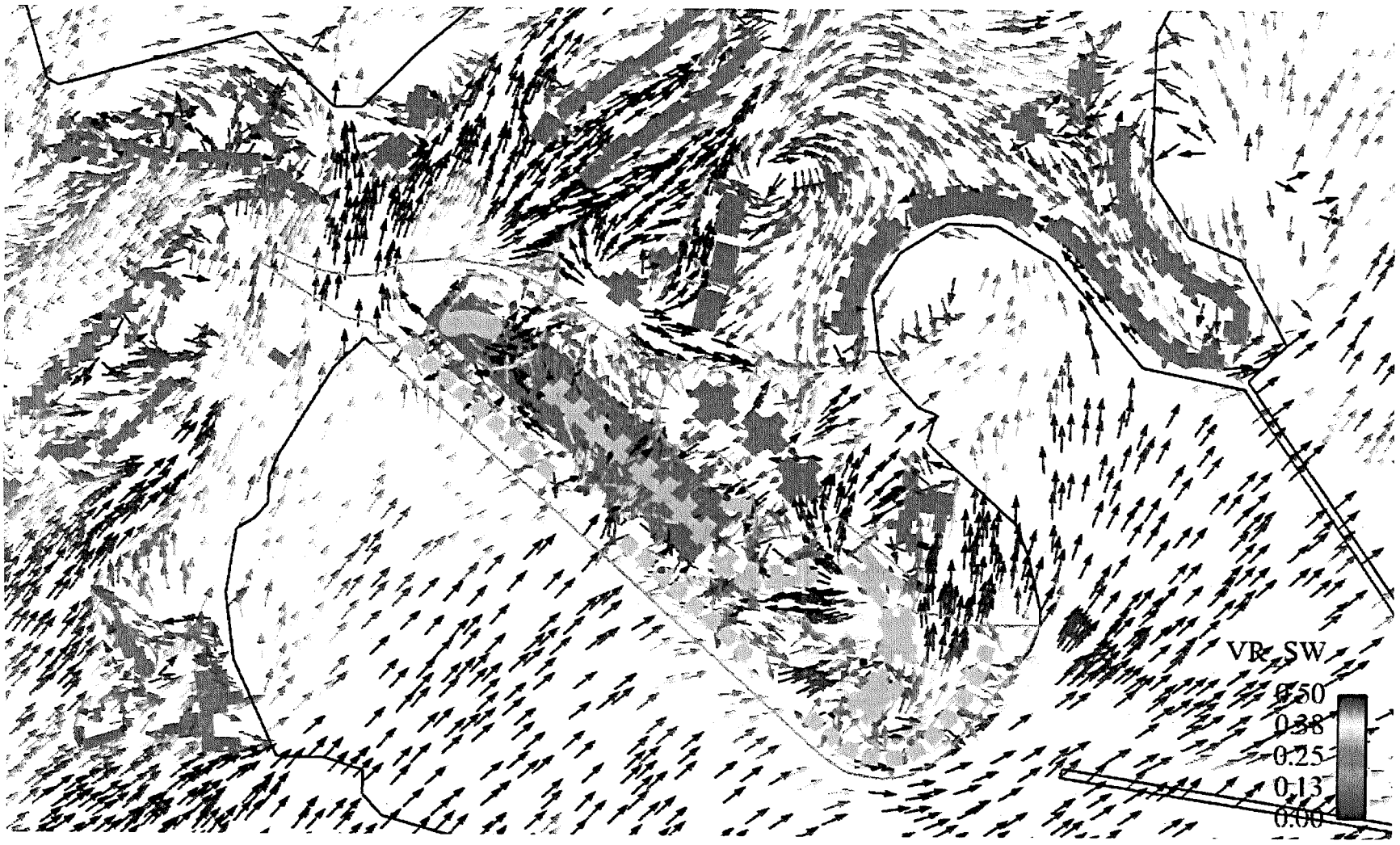


Figure C21 Vector Plot of VR under SW Wind

Figure C22 Vector Plot of VR under WSW Wind

C3 Proposed Scheme

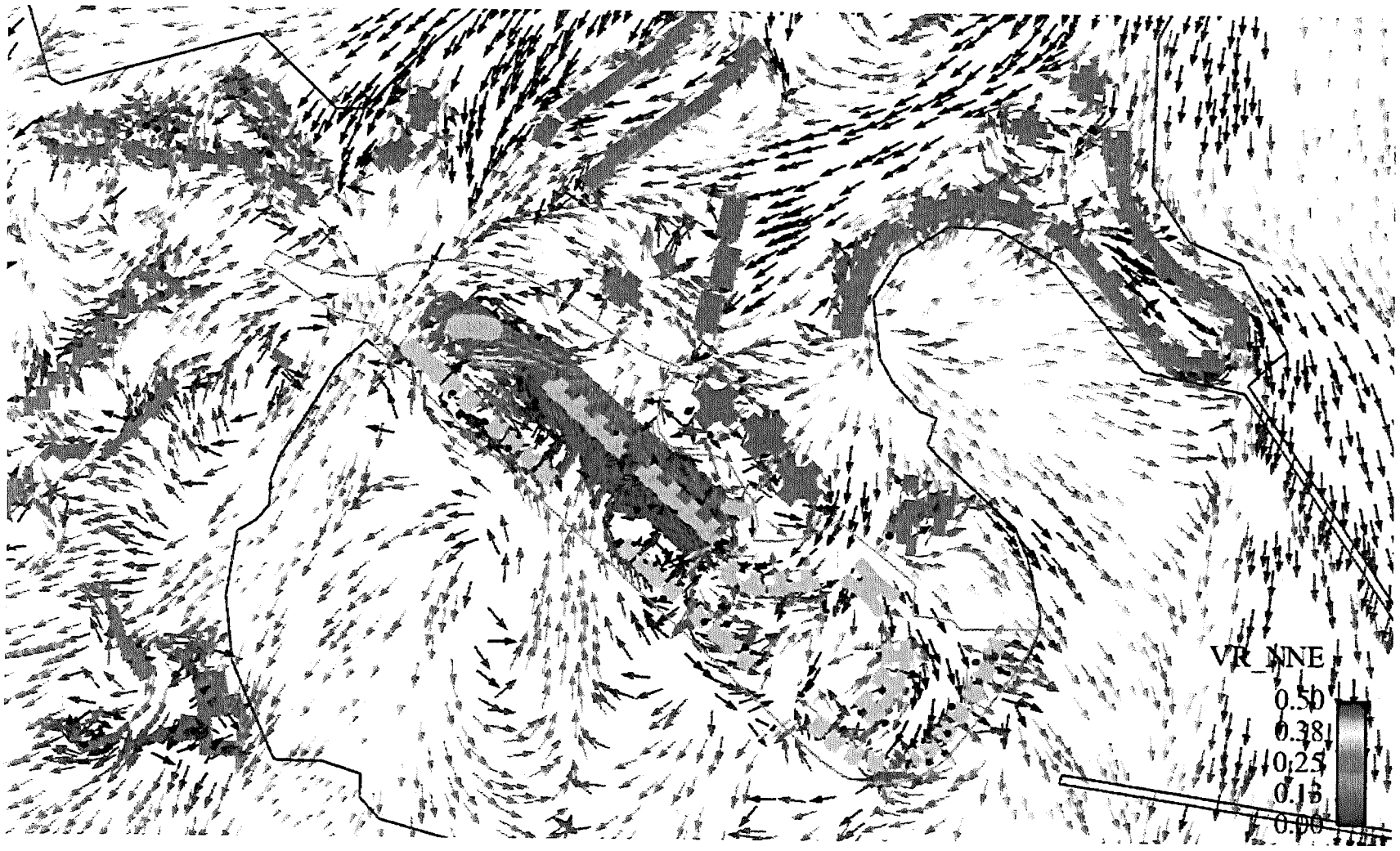


Figure C23 Vector Plot of VR under NNE Wind

Figure C24 Vector Plot of VR under NE Wind

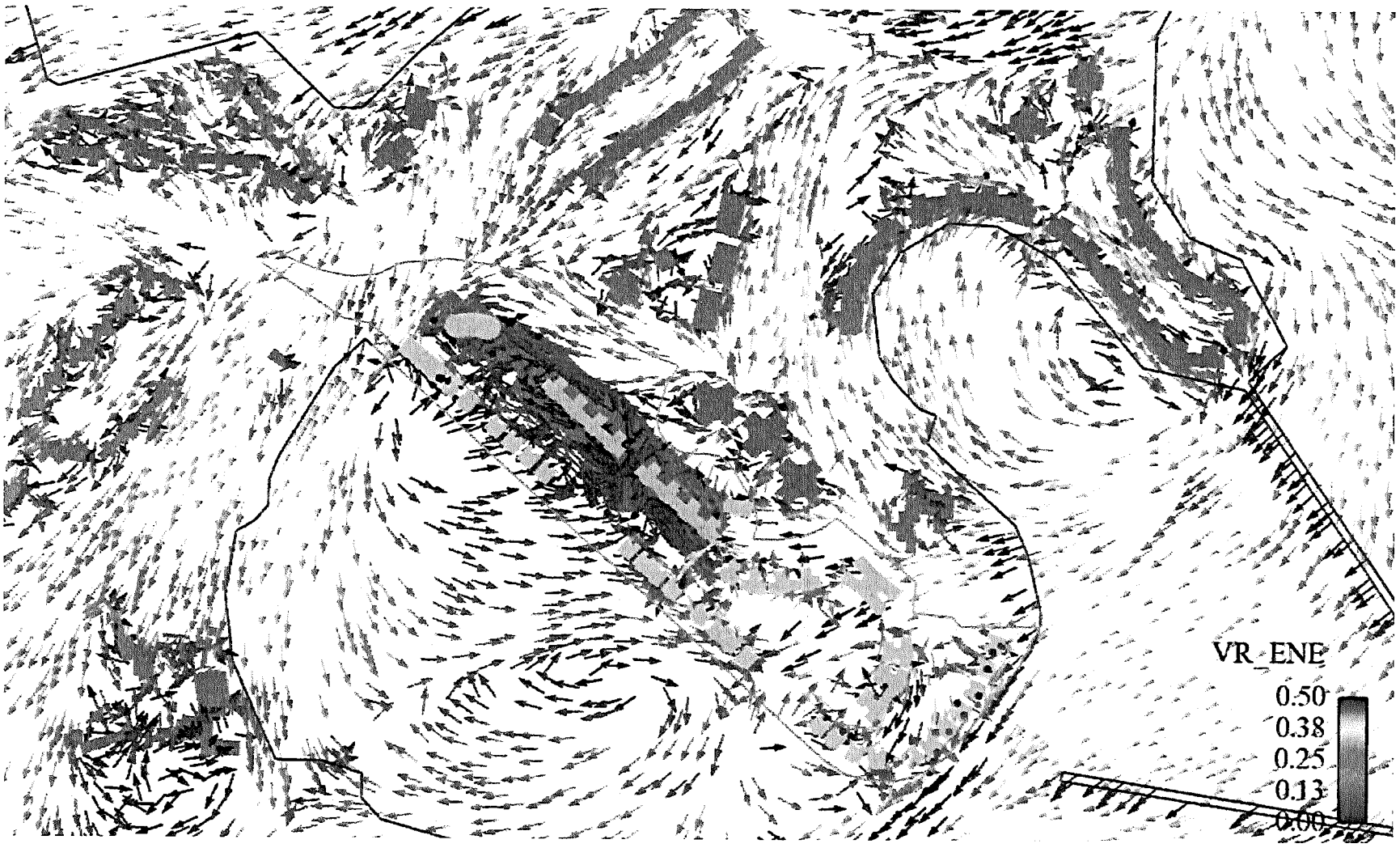


Figure C25 Vector Plot of VR under ENE Wind

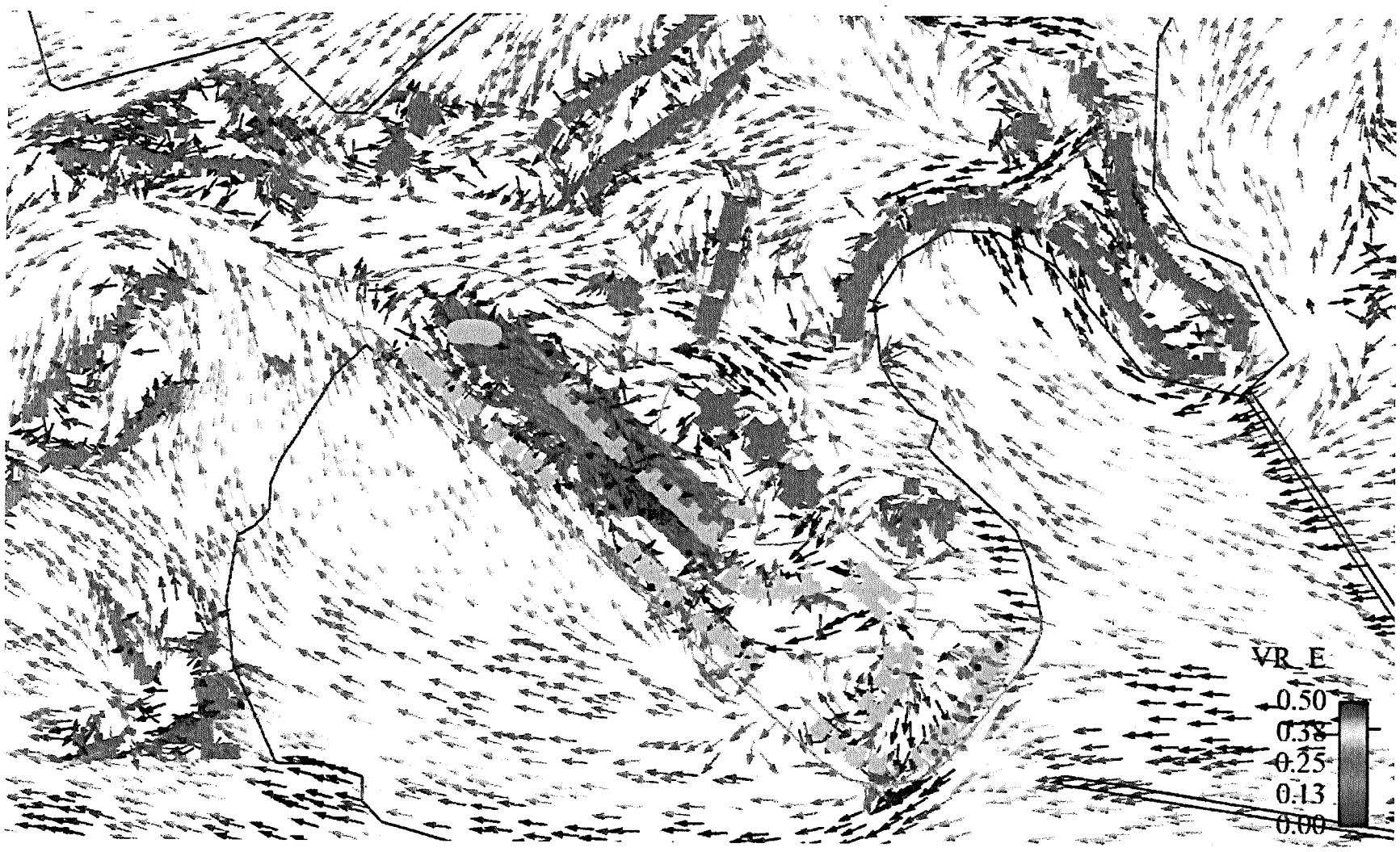


Figure C26 Vector Plot of VR under E Wind

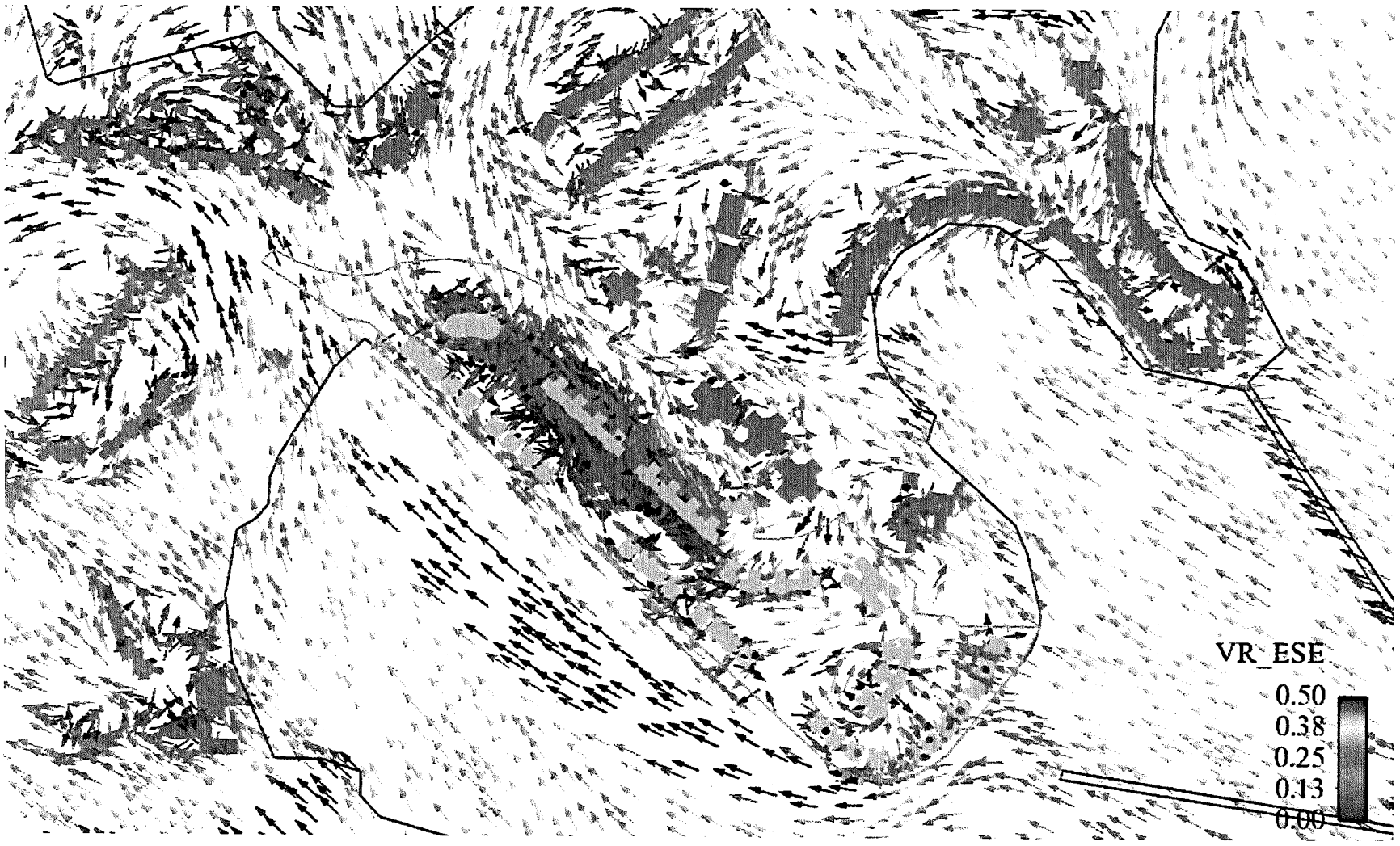


Figure C27 Vector Plot of VR under ESE Wind

Figure C28 Vector Plot of VR under SE Wind

Figure C29 Vector Plot of VR under SSE Wind

Figure C30 Vector Plot of VR under S Wind

Figure C31 Vector Plot of VR under SSW Wind

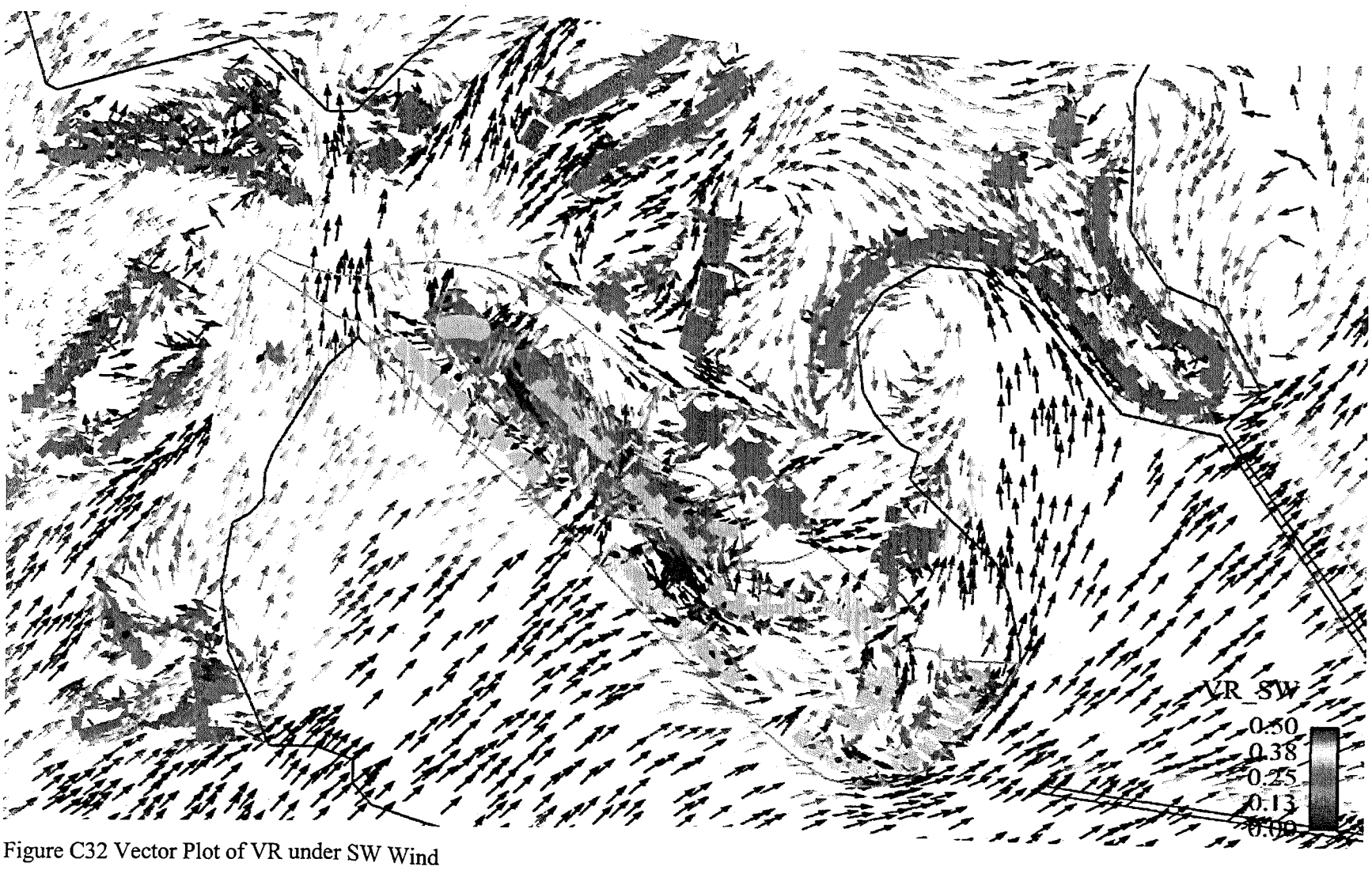


Figure C32 Vector Plot of VR under SW Wind

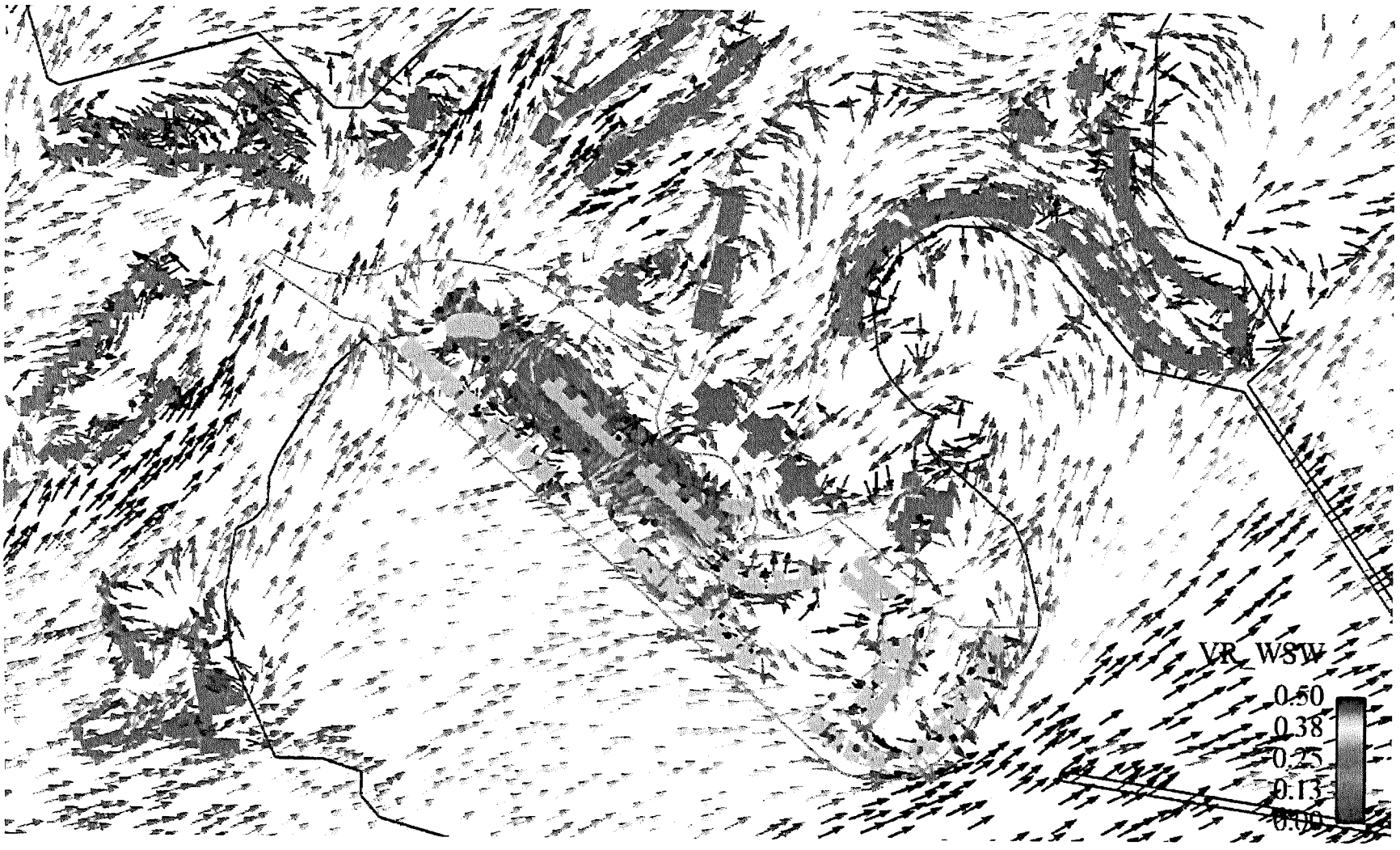


Figure C33 Vector Plot of VR under WSW Wind

Appendix D

Velocity Ratio of Test Points

Contents

D1 OZP-Compliant Scheme

Table D1 Velocity Ratio of Perimeter Test Points

Direction	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW
P1	0.37	0.54	0.39	0.29	0.34	0.28	0.33	0.39	0.47	0.49	0.36
P2	0.24	0.13	0.17	0.31	0.48	0.45	0.45	0.48	0.35	0.41	0.31
P3	0.05	0.39	0.42	0.31	0.45	0.48	0.49	0.66	0.61	0.42	0.36
P4	0.15	0.39	0.32	0.31	0.47	0.52	0.57	0.56	0.52	0.36	0.43
P5	0.14	0.23	0.12	0.30	0.50	0.50	0.54	0.56	0.26	0.39	0.41
P6	0.05	0.17	0.09	0.14	0.45	0.46	0.44	0.49	0.06	0.37	0.39
P7	0.11	0.37	0.23	0.04	0.39	0.40	0.40	0.60	0.53	0.40	0.37
P8	0.31	0.21	0.38	0.08	0.15	0.16	0.17	0.41	0.49	0.48	0.47
P9	0.22	0.47	0.38	0.19	0.39	0.25	0.24	0.37	0.25	0.39	0.25
P10	0.44	0.22	0.29	0.12	0.21	0.20	0.26	0.19	0.06	0.14	0.15
P11	0.14	0.19	0.19	0.19	0.29	0.17	0.30	0.27	0.28	0.34	0.07
P12	0.26	0.36	0.24	0.19	0.25	0.24	0.40	0.32	0.32	0.34	0.21
P13	0.16	0.23	0.09	0.03	0.25	0.36	0.51	0.39	0.36	0.24	0.16
P14	0.18	0.28	0.19	0.08	0.23	0.34	0.52	0.42	0.28	0.38	0.06
P15	0.27	0.05	0.24	0.09	0.29	0.25	0.47	0.12	0.19	0.20	0.16
P16	0.37	0.48	0.25	0.16	0.37	0.09	0.48	0.29	0.33	0.43	0.24
P17	0.36	0.30	0.24	0.58	0.47	0.05	0.11	0.43	0.48	0.65	0.44
P18	0.13	0.41	0.04	0.08	0.22	0.22	0.43	0.40	0.48	0.70	0.29
P19	0.08	0.07	0.05	0.07	0.19	0.22	0.43	0.40	0.58	0.72	0.10
P20	0.06	0.24	0.09	0.02	0.28	0.18	0.27	0.41	0.59	0.44	0.17
P21	0.06	0.18	0.28	0.20	0.47	0.29	0.10	0.28	0.51	0.28	0.29
P22	0.20	0.16	0.15	0.20	0.48	0.40	0.11	0.30	0.46	0.60	0.30
P23	0.16	0.06	0.15	0.58	0.44	0.40	0.39	0.25	0.40	0.57	0.13

Direction	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW
P24	0.14	0.06	0.31	0.61	0.40	0.35	0.39	0.24	0.56	0.69	0.51
P25	0.62	0.30	0.28	0.50	0.33	0.17	0.37	0.27	0.60	0.57	0.47
P26	0.64	0.53	0.16	0.38	0.10	0.26	0.40	0.12	0.44	0.47	0.41
P27	0.14	0.49	0.17	0.12	0.35	0.31	0.25	0.21	0.08	0.72	0.49
P28	0.18	0.48	0.49	0.49	0.39	0.16	0.23	0.27	0.29	0.71	0.50
P29	0.31	0.28	0.52	0.57	0.43	0.09	0.14	0.27	0.09	0.57	0.50
P30	0.44	0.22	0.44	0.54	0.47	0.41	0.37	0.28	0.28	0.32	0.42

Table D2 Velocity Ratio of Overall Test Points

Direction	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW
O1	0.30	0.26	0.18	0.45	0.15	0.26	0.44	0.23	0.24	0.30	0.26
O2	0.31	0.40	0.26	0.28	0.12	0.25	0.25	0.06	0.34	0.20	0.11
O3	0.07	0.09	0.03	0.03	0.03	0.03	0.22	0.39	0.49	0.59	0.34
O4	0.20	0.15	0.14	0.32	0.34	0.26	0.06	0.24	0.32	0.44	0.29
O5	0.20	0.20	0.23	0.52	0.45	0.16	0.44	0.39	0.53	0.69	0.42
O6	0.50	0.46	0.16	0.09	0.10	0.41	0.53	0.44	0.57	0.09	0.10
O7	0.46	0.32	0.23	0.29	0.43	0.34	0.55	0.49	0.33	0.21	0.19
O8	0.39	0.16	0.25	0.39	0.32	0.29	0.44	0.38	0.20	0.31	0.06
O9	0.25	0.24	0.30	0.34	0.43	0.47	0.58	0.09	0.11	0.52	0.33
O10	0.56	0.41	0.15	0.33	0.18	0.28	0.41	0.25	0.47	0.54	0.35
O11	0.15	0.21	0.51	0.43	0.39	0.28	0.23	0.35	0.30	0.82	0.55
O12	0.40	0.27	0.52	0.47	0.42	0.37	0.02	0.30	0.10	0.65	0.54
O13	0.22	0.09	0.39	0.36	0.22	0.22	0.23	0.44	0.33	0.53	0.28
O14	0.23	0.23	0.31	0.50	0.38	0.44	0.08	0.12	0.15	0.36	0.27
O15	0.08	0.24	0.31	0.55	0.55	0.41	0.54	0.15	0.33	0.44	0.35
O16	0.02	0.25	0.28	0.17	0.14	0.28	0.44	0.42	0.19	0.44	0.40

Direction	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW
O17	0.24	0.23	0.24	0.09	0.05	0.33	0.42	0.34	0.18	0.31	0.31
O18	0.35	0.45	0.30	0.42	0.30	0.40	0.19	0.42	0.45	0.66	0.48
O19	0.14	0.21	0.03	0.28	0.15	0.36	0.12	0.47	0.55	0.77	0.54
O20	0.16	0.18	0.07	0.12	0.19	0.02	0.05	0.40	0.46	0.36	0.10
O21	0.24	0.25	0.32	0.13	0.30	0.40	0.15	0.02	0.25	0.90	0.62
O22	0.35	0.29	0.22	0.26	0.38	0.44	0.19	0.42	0.46	0.47	0.40
O23	0.31	0.36	0.28	0.11	0.19	0.44	0.32	0.50	0.47	0.67	0.42
O24	0.49	0.38	0.36	0.17	0.15	0.27	0.19	0.41	0.42	0.84	0.56
O25	0.55	0.39	0.41	0.16	0.09	0.39	0.28	0.43	0.29	0.54	0.43
O26	0.32	0.29	0.24	0.07	0.24	0.18	0.11	0.11	0.55	0.67	0.40
O27	0.39	0.34	0.38	0.23	0.38	0.16	0.06	0.18	0.35	0.73	0.49
O28	0.53	0.37	0.25	0.11	0.04	0.08	0.11	0.11	0.12	0.23	0.20
O29	0.64	0.36	0.32	0.18	0.14	0.07	0.07	0.16	0.38	0.81	0.53
O30	0.11	0.09	0.07	0.06	0.26	0.32	0.57	0.48	0.47	0.56	0.35
O31	0.40	0.34	0.07	0.27	0.02	0.01	0.02	0.32	0.44	0.71	0.51
O32	0.22	0.19	0.04	0.27	0.25	0.47	0.18	0.17	0.05	0.06	0.12
O33	0.30	0.35	0.20	0.47	0.33	0.33	0.43	0.37	0.30	0.07	0.05
O34	0.45	0.44	0.29	0.37	0.36	0.30	0.29	0.17	0.12	0.16	0.16
O35	0.37	0.39	0.23	0.43	0.48	0.29	0.06	0.05	0.04	0.22	0.09
O36	0.55	0.33	0.22	0.15	0.13	0.31	0.27	0.26	0.57	0.45	0.44
O37	0.21	0.08	0.27	0.22	0.30	0.39	0.39	0.07	0.22	0.11	0.16
O38	0.22	0.50	0.39	0.08	0.26	0.18	0.17	0.20	0.62	0.41	0.34
O39	0.65	0.68	0.34	0.25	0.44	0.48	0.53	0.56	0.67	0.53	0.31
O40	0.19	0.34	0.18	0.22	0.31	0.45	0.46	0.27	0.47	0.21	0.37
O41	0.54	0.42	0.26	0.07	0.18	0.27	0.36	0.44	0.68	0.47	0.42
O42	0.40	0.32	0.16	0.07	0.39	0.50	0.54	0.32	0.16	0.21	0.09
O43	0.40	0.42	0.32	0.17	0.41	0.54	0.52	0.59	0.36	0.41	0.21

Direction	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW
O44	0.15	0.23	0.12	0.16	0.08	0.35	0.22	0.25	0.27	0.18	0.14
O45	0.18	0.23	0.26	0.09	0.14	0.10	0.09	0.04	0.16	0.12	0.07
O46	0.24	0.09	0.10	0.07	0.09	0.09	0.10	0.26	0.35	0.13	0.10
O47	0.13	0.27	0.24	0.04	0.27	0.35	0.35	0.31	0.22	0.34	0.17
O48	0.38	0.32	0.21	0.11	0.36	0.42	0.32	0.23	0.07	0.04	0.02
O49	0.17	0.11	0.34	0.31	0.46	0.06	0.12	0.64	0.71	0.26	0.20
O50	0.36	0.14	0.27	0.21	0.50	0.37	0.47	0.49	0.71	0.22	0.21
O51	0.18	0.13	0.24	0.20	0.49	0.47	0.55	0.22	0.69	0.28	0.16
O52	0.24	0.14	0.21	0.18	0.45	0.35	0.38	0.27	0.47	0.30	0.32
O53	0.05	0.19	0.17	0.18	0.45	0.41	0.40	0.38	0.33	0.06	0.08
O54	0.19	0.10	0.35	0.27	0.19	0.06	0.08	0.41	0.72	0.35	0.33
O55	0.23	0.20	0.39	0.16	0.06	0.03	0.08	0.47	0.69	0.41	0.39
O56	0.35	0.27	0.34	0.32	0.39	0.08	0.03	0.37	0.62	0.42	0.38
O57	0.21	0.25	0.09	0.50	0.63	0.56	0.54	0.33	0.19	0.10	0.06
O58	0.24	0.18	0.15	0.54	0.58	0.60	0.62	0.61	0.61	0.10	0.19
O59	0.24	0.21	0.18	0.39	0.37	0.30	0.28	0.25	0.23	0.09	0.15
O60	0.33	0.22	0.16	0.31	0.50	0.31	0.15	0.39	0.30	0.05	0.11
O61	0.17	0.31	0.28	0.35	0.47	0.07	0.13	0.38	0.24	0.10	0.11
O62	0.13	0.31	0.29	0.40	0.14	0.10	0.09	0.19	0.22	0.18	0.17
O63	0.08	0.42	0.29	0.24	0.13	0.19	0.32	0.58	0.75	0.39	0.56
O64	0.04	0.40	0.31	0.48	0.41	0.43	0.47	0.64	0.66	0.13	0.47

Table D3 Velocity Ratio of Special Test Points

Direction	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW
SP1	0.22	0.25	0.26	0.36	0.40	0.34	0.43	0.48	0.55	0.53	0.30
SP2	0.01	0.10	0.01	0.37	0.41	0.41	0.44	0.40	0.44	0.47	0.29
SP3	0.14	0.12	0.04	0.37	0.39	0.45	0.46	0.48	0.41	0.48	0.36
SP4	0.23	0.22	0.07	0.37	0.38	0.47	0.47	0.46	0.33	0.49	0.37
SP5	0.26	0.18	0.09	0.42	0.40	0.54	0.51	0.41	0.39	0.51	0.38
SP6	0.08	0.25	0.13	0.40	0.38	0.48	0.48	0.31	0.28	0.39	0.40
SP7	0.04	0.04	0.08	0.11	0.38	0.47	0.47	0.23	0.16	0.14	0.18
SP8	0.09	0.06	0.06	0.43	0.36	0.48	0.45	0.29	0.26	0.71	0.39
SP9	0.11	0.09	0.05	0.45	0.34	0.45	0.42	0.33	0.57	0.82	0.36
SP10	0.06	0.06	0.06	0.53	0.29	0.37	0.35	0.20	0.35	0.29	0.27
SP11	0.10	0.09	0.06	0.46	0.23	0.39	0.39	0.19	0.37	0.33	0.31
SP12	0.10	0.16	0.06	0.43	0.19	0.41	0.42	0.18	0.30	0.27	0.29
SP13	0.12	0.14	0.03	0.34	0.16	0.40	0.42	0.24	0.30	0.31	0.36
SP14	0.29	0.20	0.26	0.34	0.20	0.47	0.48	0.34	0.47	0.45	0.38
SP15	0.19	0.13	0.38	0.17	0.28	0.47	0.43	0.26	0.31	0.31	0.27
SP16	0.05	0.17	0.23	0.25	0.36	0.49	0.49	0.38	0.48	0.51	0.39
SP17	0.16	0.19	0.58	0.58	0.49	0.41	0.35	0.29	0.52	0.62	0.52
SP18	0.34	0.20	0.64	0.63	0.39	0.31	0.40	0.44	0.67	0.76	0.56
SP19	0.41	0.15	0.55	0.56	0.37	0.32	0.44	0.50	0.65	0.60	0.39
SP20	0.39	0.15	0.58	0.58	0.39	0.40	0.35	0.48	0.68	0.63	0.28
SP21	0.51	0.13	0.60	0.64	0.53	0.43	0.34	0.50	0.69	0.67	0.21
SP22	0.47	0.10	0.62	0.67	0.58	0.50	0.36	0.55	0.68	0.62	0.12
SP23	0.46	0.18	0.57	0.51	0.45	0.42	0.32	0.28	0.43	0.59	0.57
SP24	0.45	0.20	0.50	0.47	0.37	0.37	0.29	0.38	0.19	0.61	0.44
SP25	0.39	0.43	0.28	0.42	0.37	0.30	0.11	0.23	0.09	0.25	0.14

Direction	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW
SP26	0.36	0.48	0.28	0.34	0.44	0.32	0.08	0.11	0.12	0.50	0.02
SP27	0.33	0.44	0.20	0.17	0.29	0.16	0.06	0.13	0.42	0.06	0.10
SP28	0.23	0.24	0.26	0.20	0.14	0.12	0.23	0.15	0.49	0.13	0.09
SS1	0.28	0.51	0.42	0.24	0.38	0.35	0.30	0.35	0.35	0.44	0.19
SS2	0.12	0.15	0.08	0.11	0.30	0.30	0.30	0.39	0.38	0.44	0.28
SS3	0.37	0.29	0.27	0.10	0.25	0.42	0.13	0.33	0.42	0.44	0.32
SS4	0.13	0.02	0.01	0.23	0.22	0.30	0.35	0.18	0.25	0.27	0.21
SS5	0.09	0.23	0.05	0.32	0.32	0.38	0.45	0.25	0.14	0.25	0.23
SS6	0.09	0.10	0.06	0.31	0.34	0.32	0.37	0.30	0.19	0.16	0.22
SS7	0.06	0.07	0.11	0.26	0.35	0.34	0.35	0.28	0.28	0.40	0.38
SS8	0.06	0.07	0.04	0.46	0.34	0.35	0.51	0.23	0.19	0.38	0.16
SS9	0.15	0.05	0.19	0.63	0.38	0.38	0.51	0.12	0.27	0.66	0.28
SS10	0.20	0.11	0.28	0.60	0.39	0.33	0.45	0.18	0.62	0.67	0.43
SS11	0.07	0.14	0.24	0.13	0.16	0.22	0.27	0.15	0.28	0.38	0.29
SS12	0.18	0.36	0.05	0.10	0.10	0.27	0.43	0.27	0.42	0.35	0.17
SS13	0.29	0.43	0.03	0.11	0.12	0.13	0.18	0.27	0.16	0.20	0.19
SS14	0.19	0.25	0.01	0.03	0.21	0.16	0.25	0.19	0.23	0.25	0.09
SS15	0.18	0.18	0.02	0.03	0.20	0.11	0.19	0.22	0.19	0.13	0.09
SS16	0.22	0.07	0.03	0.10	0.18	0.20	0.20	0.24	0.24	0.29	0.13
SS17	0.19	0.05	0.28	0.50	0.44	0.28	0.36	0.10	0.52	0.97	0.51
SS18	0.02	0.05	0.28	0.53	0.44	0.17	0.40	0.14	0.64	0.89	0.50
SS19	0.30	0.18	0.11	0.23	0.39	0.21	0.36	0.11	0.47	1.02	0.52
SS20	0.65	0.44	0.24	0.44	0.17	0.23	0.42	0.10	0.50	0.60	0.50
SS21	0.59	0.50	0.05	0.20	0.38	0.22	0.44	0.04	0.26	0.75	0.47
SS22	0.59	0.45	0.30	0.33	0.40	0.04	0.48	0.10	0.44	0.86	0.48
SS23	0.47	0.35	0.37	0.41	0.39	0.15	0.42	0.11	0.30	0.76	0.54
SS24	0.42	0.46	0.26	0.48	0.27	0.02	0.45	0.17	0.51	0.60	0.46

Direction	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW
SS25	0.29	0.50	0.46	0.49	0.38	0.10	0.34	0.06	0.27	0.75	0.48
SS26	0.28	0.47	0.32	0.54	0.26	0.18	0.33	0.06	0.22	0.65	0.41
SS27	0.24	0.32	0.35	0.31	0.07	0.05	0.05	0.17	0.09	0.10	0.25
SS28	0.24	0.27	0.28	0.42	0.18	0.05	0.03	0.17	0.12	0.38	0.24
SS29	0.27	0.48	0.47	0.53	0.38	0.12	0.26	0.23	0.16	0.61	0.47

D2 Baseline Scheme

Table D4 Velocity Ratio of Perimeter Test Points

Direction	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW
P1	0.51	0.33	0.45	0.11	0.44	0.49	0.51	0.52	0.49	0.56	0.33
P2	0.43	0.47	0.49	0.08	0.46	0.45	0.49	0.49	0.46	0.52	0.40
P3	0.06	0.37	0.45	0.03	0.50	0.40	0.42	0.64	0.60	0.51	0.42
P4	0.16	0.31	0.33	0.05	0.54	0.48	0.51	0.62	0.50	0.36	0.46
P5	0.13	0.20	0.13	0.10	0.55	0.50	0.54	0.56	0.41	0.44	0.42
P6	0.08	0.17	0.10	0.17	0.53	0.44	0.44	0.55	0.21	0.41	0.42
P7	0.11	0.32	0.23	0.12	0.50	0.41	0.45	0.56	0.55	0.41	0.40
P8	0.37	0.34	0.46	0.07	0.45	0.43	0.44	0.45	0.54	0.54	0.48
P9	0.06	0.52	0.49	0.09	0.25	0.20	0.31	0.14	0.47	0.57	0.42
P10	0.50	0.20	0.43	0.16	0.03	0.03	0.13	0.11	0.10	0.35	0.25
P11	0.14	0.24	0.26	0.15	0.15	0.24	0.35	0.27	0.13	0.44	0.24
P12	0.23	0.32	0.23	0.12	0.25	0.42	0.50	0.34	0.27	0.45	0.37
P13	0.24	0.34	0.06	0.09	0.28	0.41	0.51	0.35	0.26	0.15	0.21
P14	0.18	0.16	0.24	0.14	0.24	0.32	0.49	0.36	0.33	0.28	0.18
P15	0.20	0.19	0.35	0.08	0.16	0.21	0.43	0.27	0.26	0.35	0.22
P16	0.36	0.48	0.30	0.58	0.40	0.10	0.40	0.34	0.25	0.37	0.33
P17	0.35	0.34	0.29	0.60	0.48	0.09	0.24	0.40	0.18	0.36	0.20
P18	0.32	0.36	0.04	0.07	0.04	0.11	0.41	0.38	0.39	0.15	0.29
P19	0.17	0.30	0.05	0.07	0.04	0.11	0.35	0.29	0.66	0.16	0.23
P20	0.09	0.05	0.09	0.18	0.05	0.06	0.26	0.23	0.51	0.37	0.16
P21	0.08	0.11	0.27	0.14	0.07	0.06	0.20	0.21	0.45	0.46	0.34
P22	0.05	0.19	0.24	0.07	0.17	0.08	0.22	0.12	0.50	0.58	0.25
P23	0.22	0.19	0.45	0.20	0.14	0.09	0.09	0.16	0.45	0.33	0.25

Direction	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW
P24	0.50	0.23	0.61	0.57	0.41	0.06	0.23	0.08	0.68	0.07	0.26
P25	0.59	0.32	0.56	0.58	0.42	0.18	0.18	0.42	0.66	0.71	0.32
P26	0.34	0.31	0.56	0.62	0.39	0.34	0.08	0.10	0.48	0.41	0.29
P27	0.38	0.43	0.27	0.15	0.21	0.24	0.22	0.12	0.10	0.02	0.02
P28	0.46	0.09	0.27	0.20	0.24	0.24	0.49	0.10	0.11	0.09	0.11
P29	0.57	0.40	0.28	0.11	0.25	0.26	0.32	0.27	0.46	0.75	0.33
P30	0.52	0.24	0.25	0.41	0.30	0.34	0.38	0.32	0.27	0.32	0.12

Table D5 Velocity Ratio of Overall Test Points

Direction	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW
O1	0.34	0.36	0.30	0.46	0.16	0.07	0.29	0.09	0.12	0.60	0.25
O2	0.34	0.37	0.22	0.13	0.09	0.05	0.26	0.26	0.24	0.28	0.27
O3	0.06	0.09	0.01	0.04	0.10	0.04	0.17	0.28	0.18	0.22	0.27
O4	0.20	0.18	0.21	0.44	0.13	0.17	0.04	0.23	0.33	0.53	0.26
O5	0.22	0.16	0.15	0.45	0.30	0.19	0.28	0.28	0.38	0.36	0.35
O6	0.45	0.44	0.35	0.26	0.19	0.20	0.22	0.36	0.39	0.40	0.03
O7	0.44	0.35	0.39	0.40	0.46	0.23	0.22	0.31	0.34	0.39	0.18
O8	0.37	0.21	0.39	0.37	0.32	0.35	0.23	0.22	0.19	0.05	0.14
O9	0.27	0.25	0.45	0.46	0.44	0.31	0.32	0.09	0.23	0.23	0.20
O10	0.32	0.30	0.30	0.10	0.04	0.04	0.15	0.20	0.29	0.57	0.33
O11	0.49	0.29	0.17	0.29	0.26	0.46	0.25	0.37	0.46	0.55	0.24
O12	0.48	0.22	0.15	0.14	0.28	0.14	0.26	0.14	0.41	0.74	0.34
O13	0.19	0.14	0.18	0.10	0.19	0.36	0.21	0.36	0.49	0.50	0.14
O14	0.26	0.24	0.25	0.53	0.35	0.31	0.24	0.17	0.20	0.51	0.28
O15	0.08	0.25	0.51	0.49	0.54	0.43	0.31	0.18	0.08	0.12	0.38
O16	0.03	0.24	0.17	0.04	0.14	0.19	0.22	0.25	0.08	0.19	0.20

Direction	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW
O17	0.23	0.19	0.08	0.11	0.06	0.04	0.35	0.23	0.10	0.22	0.12
O18	0.34	0.47	0.37	0.35	0.23	0.28	0.23	0.41	0.22	0.68	0.43
O19	0.09	0.22	0.03	0.20	0.20	0.21	0.15	0.41	0.35	0.78	0.53
O20	0.17	0.18	0.18	0.10	0.17	0.11	0.02	0.39	0.25	0.48	0.15
O21	0.21	0.22	0.33	0.15	0.26	0.22	0.17	0.27	0.17	0.72	0.54
O22	0.32	0.31	0.30	0.35	0.38	0.33	0.21	0.40	0.31	0.68	0.46
O23	0.26	0.34	0.34	0.08	0.05	0.35	0.32	0.48	0.31	0.74	0.50
O24	0.45	0.37	0.41	0.09	0.11	0.27	0.17	0.41	0.29	0.92	0.61
O25	0.53	0.38	0.44	0.09	0.11	0.30	0.24	0.45	0.24	0.73	0.51
O26	0.31	0.31	0.37	0.02	0.25	0.21	0.24	0.10	0.40	0.08	0.21
O27	0.38	0.37	0.49	0.23	0.40	0.08	0.21	0.28	0.28	0.29	0.32
O28	0.53	0.36	0.32	0.14	0.03	0.06	0.09	0.10	0.10	0.21	0.08
O29	0.63	0.31	0.39	0.14	0.13	0.08	0.06	0.08	0.32	0.89	0.57
O30	0.06	0.08	0.10	0.06	0.25	0.31	0.45	0.45	0.28	0.63	0.43
O31	0.34	0.30	0.12	0.20	0.04	0.16	0.27	0.33	0.29	0.69	0.46
O32	0.25	0.22	0.13	0.28	0.28	0.28	0.12	0.13	0.20	0.29	0.21
O33	0.25	0.32	0.07	0.45	0.36	0.27	0.31	0.39	0.29	0.19	0.11
O34	0.44	0.46	0.40	0.28	0.34	0.30	0.20	0.10	0.11	0.11	0.16
O35	0.36	0.39	0.39	0.45	0.47	0.20	0.15	0.04	0.10	0.05	0.04
O36	0.51	0.32	0.32	0.20	0.30	0.27	0.38	0.36	0.56	0.54	0.47
O37	0.20	0.15	0.30	0.30	0.20	0.18	0.23	0.21	0.40	0.50	0.45
O38	0.21	0.54	0.44	0.03	0.08	0.14	0.17	0.23	0.62	0.65	0.53
O39	0.52	0.68	0.36	0.35	0.21	0.49	0.43	0.42	0.59	0.67	0.29
O40	0.52	0.36	0.17	0.27	0.29	0.35	0.38	0.29	0.49	0.48	0.37
O41	0.55	0.44	0.27	0.06	0.24	0.26	0.36	0.41	0.64	0.64	0.41
O42	0.21	0.32	0.18	0.08	0.37	0.43	0.45	0.26	0.16	0.14	0.08
O43	0.38	0.40	0.31	0.17	0.32	0.43	0.42	0.37	0.14	0.14	0.08

Direction	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW
O44	0.14	0.18	0.09	0.20	0.11	0.06	0.14	0.33	0.23	0.15	0.11
O45	0.18	0.23	0.25	0.12	0.13	0.08	0.07	0.04	0.16	0.13	0.08
O46	0.25	0.10	0.10	0.05	0.10	0.08	0.09	0.26	0.36	0.15	0.12
O47	0.13	0.27	0.24	0.03	0.31	0.35	0.34	0.31	0.23	0.35	0.17
O48	0.39	0.33	0.21	0.12	0.40	0.44	0.32	0.23	0.07	0.05	0.04
O49	0.18	0.13	0.33	0.17	0.51	0.07	0.11	0.63	0.72	0.26	0.20
O50	0.36	0.17	0.25	0.14	0.46	0.35	0.42	0.49	0.72	0.22	0.21
O51	0.17	0.11	0.22	0.18	0.48	0.47	0.50	0.22	0.69	0.29	0.16
O52	0.25	0.18	0.19	0.11	0.44	0.37	0.37	0.27	0.47	0.31	0.31
O53	0.06	0.18	0.16	0.17	0.48	0.42	0.39	0.37	0.30	0.10	0.10
O54	0.18	0.07	0.36	0.22	0.18	0.05	0.06	0.41	0.73	0.35	0.34
O55	0.23	0.16	0.40	0.26	0.05	0.06	0.07	0.47	0.69	0.42	0.39
O56	0.36	0.22	0.34	0.27	0.39	0.08	0.03	0.37	0.62	0.43	0.39
O57	0.22	0.25	0.08	0.23	0.62	0.52	0.54	0.32	0.18	0.09	0.06
O58	0.24	0.17	0.17	0.38	0.56	0.59	0.62	0.61	0.62	0.11	0.20
O59	0.25	0.20	0.16	0.33	0.34	0.30	0.29	0.25	0.23	0.08	0.15
O60	0.34	0.21	0.13	0.22	0.49	0.30	0.16	0.38	0.31	0.04	0.11
O61	0.18	0.30	0.25	0.17	0.51	0.08	0.14	0.38	0.23	0.09	0.10
O62	0.12	0.30	0.29	0.09	0.32	0.09	0.08	0.19	0.22	0.15	0.17
O63	0.08	0.40	0.33	0.34	0.16	0.20	0.32	0.57	0.74	0.42	0.56
O64	0.01	0.38	0.35	0.47	0.44	0.43	0.47	0.64	0.67	0.21	0.47

Table D6 Velocity Ratio of Special Test Points

Direction	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW
SP1	0.07	0.05	0.04	0.12	0.44	0.50	0.49	0.44	0.39	0.38	0.21
SP2	0.10	0.09	0.03	0.17	0.42	0.48	0.45	0.40	0.30	0.28	0.23
SP3	0.03	0.11	0.05	0.26	0.42	0.46	0.44	0.32	0.14	0.26	0.24
SP4	0.14	0.20	0.07	0.28	0.41	0.48	0.45	0.33	0.27	0.30	0.24
SP5	0.10	0.16	0.07	0.28	0.41	0.50	0.48	0.29	0.25	0.34	0.30
SP6	0.19	0.02	0.03	0.31	0.38	0.47	0.47	0.34	0.29	0.57	0.44
SP7	0.10	0.05	0.16	0.29	0.37	0.46	0.49	0.34	0.32	0.66	0.34
SP8	0.05	0.06	0.15	0.29	0.37	0.46	0.47	0.29	0.27	0.54	0.31
SP9	0.01	0.09	0.25	0.28	0.35	0.46	0.47	0.27	0.36	0.51	0.31
SP10	0.08	0.05	0.02	0.26	0.34	0.46	0.48	0.29	0.41	0.39	0.27
SP11	0.12	0.06	0.02	0.23	0.30	0.43	0.48	0.25	0.36	0.31	0.25
SP12	0.05	0.14	0.02	0.22	0.27	0.43	0.49	0.29	0.60	0.57	0.41
SP13	0.10	0.16	0.08	0.24	0.31	0.46	0.53	0.36	0.66	0.70	0.42
SP14	0.10	0.01	0.07	0.11	0.27	0.48	0.49	0.27	0.29	0.31	0.27
SP15	0.09	0.03	0.17	0.13	0.57	0.54	0.48	0.25	0.40	0.45	0.37
SP16	0.14	0.06	0.09	0.39	0.58	0.44	0.29	0.31	0.44	0.68	0.51
SP17	0.11	0.07	0.28	0.66	0.45	0.28	0.27	0.30	0.64	0.80	0.56
SP18	0.12	0.12	0.49	0.51	0.21	0.25	0.32	0.38	0.71	0.73	0.10
SP19	0.27	0.18	0.46	0.42	0.25	0.20	0.36	0.45	0.71	0.37	0.24
SP20	0.09	0.13	0.43	0.36	0.28	0.19	0.45	0.52	0.72	0.37	0.17
SP21	0.64	0.24	0.47	0.44	0.40	0.36	0.43	0.56	0.74	0.45	0.30
SP22	0.54	0.08	0.47	0.60	0.45	0.39	0.39	0.55	0.74	0.49	0.27
SP23	0.43	0.12	0.41	0.33	0.39	0.35	0.47	0.50	0.56	0.52	0.12
SP24	0.29	0.12	0.32	0.31	0.36	0.33	0.28	0.15	0.44	0.66	0.20
SP25	0.37	0.37	0.32	0.45	0.37	0.30	0.13	0.20	0.33	0.08	0.08

Direction	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW
SP26	0.34	0.42	0.37	0.39	0.47	0.37	0.11	0.15	0.09	0.43	0.20
SP27	0.29	0.38	0.34	0.34	0.41	0.32	0.11	0.13	0.24	0.29	0.08
SP28	0.24	0.23	0.36	0.17	0.27	0.24	0.14	0.14	0.27	0.10	0.02
SS1	0.31	0.33	0.39	0.07	0.02	0.06	0.14	0.11	0.04	0.41	0.26
SS2	0.24	0.45	0.48	0.08	0.22	0.28	0.48	0.29	0.45	0.56	0.38
SS3	0.19	0.20	0.04	0.03	0.25	0.38	0.54	0.41	0.34	0.45	0.28
SS4	0.20	0.15	0.04	0.12	0.04	0.05	0.15	0.18	0.20	0.21	0.07
SS5	0.10	0.09	0.05	0.16	0.06	0.05	0.04	0.11	0.27	0.40	0.03
SS6	0.03	0.20	0.09	0.20	0.03	0.07	0.03	0.13	0.32	0.48	0.09
SS7	0.04	0.27	0.10	0.04	0.07	0.14	0.18	0.11	0.21	0.42	0.17
SS8	0.11	0.21	0.04	0.03	0.12	0.02	0.05	0.24	0.29	0.33	0.26
SS9	0.05	0.02	0.16	0.02	0.08	0.04	0.16	0.04	0.08	0.34	0.25
SS10	0.02	0.02	0.08	0.06	0.17	0.19	0.24	0.14	0.28	0.50	0.30
SS11	0.07	0.01	0.08	0.13	0.14	0.20	0.26	0.22	0.52	0.35	0.39
SS12	0.21	0.08	0.01	0.18	0.12	0.15	0.13	0.12	0.44	0.29	0.32
SS13	0.13	0.08	0.17	0.14	0.19	0.19	0.31	0.30	0.47	0.12	0.30
SS14	0.18	0.10	0.30	0.16	0.14	0.07	0.05	0.04	0.42	0.55	0.30
SS15	0.10	0.19	0.11	0.04	0.11	0.11	0.15	0.08	0.23	0.40	0.32
SS16	0.51	0.05	0.38	0.46	0.19	0.12	0.15	0.08	0.32	0.48	0.44
SS17	0.58	0.03	0.50	0.52	0.18	0.18	0.15	0.17	0.16	0.27	0.29
SS18	0.60	0.01	0.53	0.47	0.32	0.15	0.13	0.22	0.29	0.52	0.44
SS19	0.09	0.19	0.10	0.04	0.04	0.07	0.15	0.10	0.34	0.19	0.24
SS20	0.08	0.29	0.06	0.19	0.18	0.17	0.15	0.24	0.09	0.20	0.08
SS21	0.12	0.12	0.03	0.18	0.07	0.19	0.11	0.12	0.35	0.27	0.20
SS22	0.65	0.39	0.02	0.21	0.18	0.23	0.19	0.33	0.26	0.61	0.30
SS23	0.09	0.17	0.15	0.20	0.19	0.06	0.06	0.17	0.13	0.52	0.16
SS24	0.40	0.27	0.07	0.18	0.02	0.02	0.05	0.53	0.36	0.91	0.37

Direction	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW
SS25	0.26	0.10	0.56	0.51	0.13	0.13	0.20	0.22	0.27	0.42	0.22
SS_P1	0.16	0.06	0.16	0.06	0.21	0.14	0.01	0.05	0.08	0.10	0.07
SS_P2	0.05	0.03	0.18	0.11	0.06	0.18	0.28	0.17	0.05	0.60	0.24
SS_P3	0.20	0.16	0.26	0.10	0.27	0.14	0.09	0.15	0.12	0.14	0.08
SS_P4	0.05	0.08	0.07	0.02	0.04	0.05	0.07	0.09	0.16	0.25	0.21
SS_P5	0.28	0.32	0.26	0.10	0.14	0.14	0.21	0.15	0.14	0.29	0.23
SS_P6	0.10	0.06	0.08	0.13	0.12	0.21	0.31	0.23	0.24	0.27	0.25
SS_P7	0.19	0.26	0.09	0.06	0.11	0.11	0.10	0.22	0.34	0.12	0.13
SS_P8	0.12	0.18	0.08	0.10	0.17	0.20	0.26	0.20	0.29	0.50	0.24
SS_P9	0.20	0.33	0.03	0.05	0.04	0.22	0.23	0.23	0.29	0.14	0.19
SS_P10	0.23	0.27	0.07	0.08	0.04	0.10	0.16	0.25	0.35	0.52	0.19
SS_P11	0.27	0.08	0.14	0.36	0.11	0.19	0.11	0.32	0.14	0.50	0.43
SS_P12	0.34	0.33	0.19	0.29	0.08	0.22	0.14	0.34	0.36	0.60	0.42
SS_P13	0.23	0.41	0.16	0.04	0.06	0.14	0.17	0.39	0.46	0.56	0.48

D3 Proposed Scheme

Table D7 Velocity Ratio of Perimeter Test Points

Direction	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW
P1	0.49	0.32	0.42	0.08	0.28	0.39	0.41	0.50	0.52	0.57	0.34
P2	0.42	0.44	0.47	0.17	0.38	0.46	0.48	0.51	0.45	0.51	0.42
P3	0.05	0.38	0.45	0.17	0.44	0.41	0.41	0.65	0.63	0.49	0.43
P4	0.17	0.24	0.27	0.21	0.52	0.48	0.52	0.65	0.44	0.40	0.45
P5	0.13	0.21	0.13	0.20	0.52	0.51	0.56	0.54	0.41	0.44	0.42
P6	0.04	0.15	0.10	0.09	0.48	0.42	0.43	0.51	0.13	0.40	0.40
P7	0.12	0.30	0.24	0.03	0.43	0.41	0.41	0.60	0.55	0.40	0.38
P8	0.41	0.34	0.44	0.03	0.32	0.37	0.40	0.37	0.52	0.53	0.47
P9	0.02	0.50	0.46	0.11	0.23	0.35	0.46	0.44	0.37	0.32	0.40
P10	0.52	0.18	0.39	0.20	0.10	0.08	0.11	0.45	0.27	0.17	0.15
P11	0.18	0.25	0.18	0.21	0.23	0.21	0.10	0.15	0.08	0.43	0.25
P12	0.25	0.33	0.18	0.20	0.25	0.34	0.43	0.36	0.31	0.25	0.23
P13	0.23	0.32	0.15	0.09	0.22	0.36	0.45	0.35	0.31	0.08	0.10
P14	0.18	0.29	0.22	0.18	0.27	0.34	0.44	0.36	0.34	0.24	0.14
P15	0.26	0.26	0.24	0.13	0.32	0.27	0.39	0.30	0.19	0.24	0.14
P16	0.36	0.47	0.26	0.25	0.40	0.13	0.39	0.33	0.15	0.51	0.28
P17	0.35	0.29	0.28	0.62	0.46	0.04	0.26	0.34	0.19	0.54	0.39
P18	0.18	0.48	0.03	0.07	0.17	0.23	0.37	0.42	0.35	0.40	0.32
P19	0.09	0.19	0.08	0.03	0.24	0.24	0.30	0.45	0.62	0.22	0.12
P20	0.08	0.07	0.13	0.22	0.25	0.16	0.24	0.35	0.56	0.37	0.11
P21	0.13	0.06	0.28	0.12	0.38	0.24	0.18	0.32	0.52	0.44	0.30
P22	0.09	0.19	0.02	0.10	0.38	0.27	0.19	0.31	0.49	0.65	0.29
P23	0.04	0.12	0.43	0.43	0.36	0.26	0.16	0.25	0.44	0.30	0.30

Direction	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW
P24	0.07	0.10	0.55	0.66	0.43	0.24	0.26	0.39	0.56	0.27	0.30
P25	0.60	0.32	0.46	0.50	0.45	0.08	0.19	0.24	0.79	0.47	0.40
P26	0.41	0.41	0.45	0.43	0.20	0.11	0.07	0.20	0.63	0.55	0.42
P27	0.37	0.47	0.27	0.30	0.17	0.36	0.14	0.23	0.16	0.19	0.10
P28	0.58	0.48	0.34	0.29	0.16	0.39	0.19	0.24	0.49	0.63	0.52
P29	0.47	0.40	0.30	0.38	0.18	0.45	0.44	0.36	0.32	0.48	0.22
P30	0.38	0.21	0.25	0.46	0.28	0.09	0.12	0.09	0.09	0.20	0.04

Table D8 Velocity Ratio of Overall Test Points

Direction	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW
O1	0.19	0.29	0.14	0.26	0.17	0.24	0.18	0.22	0.31	0.59	0.31
O2	0.28	0.38	0.31	0.18	0.26	0.19	0.29	0.10	0.37	0.28	0.30
O3	0.05	0.10	0.02	0.06	0.06	0.02	0.25	0.32	0.23	0.18	0.27
O4	0.20	0.21	0.13	0.32	0.32	0.21	0.04	0.28	0.30	0.62	0.33
O5	0.21	0.17	0.33	0.45	0.39	0.24	0.24	0.34	0.45	0.29	0.35
O6	0.47	0.45	0.20	0.17	0.10	0.30	0.18	0.10	0.47	0.15	0.11
O7	0.45	0.35	0.29	0.35	0.45	0.18	0.16	0.07	0.35	0.46	0.12
O8	0.38	0.20	0.31	0.36	0.33	0.36	0.22	0.16	0.22	0.12	0.05
O9	0.26	0.25	0.34	0.40	0.41	0.23	0.23	0.16	0.17	0.37	0.31
O10	0.42	0.33	0.17	0.12	0.08	0.22	0.07	0.11	0.42	0.43	0.41
O11	0.38	0.26	0.33	0.26	0.18	0.31	0.30	0.29	0.38	0.49	0.24
O12	0.37	0.25	0.40	0.37	0.39	0.27	0.35	0.33	0.28	0.50	0.24
O13	0.02	0.12	0.30	0.20	0.25	0.18	0.30	0.26	0.36	0.40	0.11
O14	0.20	0.27	0.30	0.49	0.33	0.32	0.22	0.14	0.23	0.67	0.31
O15	0.10	0.26	0.38	0.48	0.55	0.41	0.26	0.26	0.10	0.11	0.36
O16	0.02	0.25	0.35	0.19	0.14	0.17	0.21	0.11	0.07	0.16	0.29

Direction	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW
O17	0.23	0.21	0.04	0.09	0.06	0.08	0.35	0.18	0.08	0.18	0.26
O18	0.35	0.44	0.31	0.39	0.26	0.26	0.31	0.36	0.31	0.75	0.48
O19	0.13	0.20	0.00	0.22	0.13	0.16	0.13	0.37	0.28	0.92	0.57
O20	0.17	0.18	0.07	0.11	0.17	0.10	0.07	0.33	0.23	0.64	0.15
O21	0.22	0.23	0.32	0.13	0.28	0.26	0.20	0.28	0.32	0.79	0.51
O22	0.31	0.30	0.22	0.30	0.38	0.31	0.22	0.38	0.40	0.65	0.46
O23	0.29	0.35	0.32	0.10	0.18	0.35	0.36	0.46	0.40	0.71	0.51
O24	0.43	0.37	0.39	0.10	0.14	0.22	0.18	0.41	0.27	0.87	0.60
O25	0.53	0.38	0.43	0.12	0.08	0.28	0.26	0.46	0.25	0.72	0.53
O26	0.31	0.30	0.29	0.05	0.25	0.14	0.19	0.12	0.49	0.35	0.26
O27	0.38	0.36	0.44	0.22	0.39	0.10	0.16	0.31	0.41	0.47	0.36
O28	0.52	0.36	0.29	0.05	0.06	0.07	0.12	0.11	0.12	0.25	0.19
O29	0.64	0.38	0.36	0.17	0.12	0.03	0.07	0.07	0.41	0.82	0.54
O30	0.10	0.09	0.09	0.08	0.27	0.31	0.50	0.43	0.33	0.56	0.42
O31	0.39	0.40	0.09	0.28	0.02	0.11	0.18	0.27	0.35	0.71	0.46
O32	0.23	0.20	0.05	0.24	0.22	0.32	0.23	0.28	0.25	0.14	0.26
O33	0.30	0.37	0.17	0.45	0.34	0.25	0.39	0.42	0.33	0.09	0.08
O34	0.45	0.45	0.28	0.34	0.37	0.30	0.16	0.13	0.05	0.12	0.13
O35	0.36	0.39	0.27	0.40	0.49	0.30	0.12	0.06	0.04	0.04	0.04
O36	0.55	0.35	0.29	0.17	0.25	0.38	0.46	0.28	0.57	0.52	0.46
O37	0.18	0.11	0.29	0.23	0.18	0.19	0.17	0.30	0.37	0.47	0.45
O38	0.22	0.50	0.41	0.11	0.13	0.06	0.17	0.45	0.62	0.65	0.54
O39	0.39	0.66	0.34	0.23	0.31	0.35	0.36	0.65	0.53	0.54	0.37
O40	0.42	0.31	0.18	0.20	0.25	0.33	0.33	0.39	0.50	0.46	0.37
O41	0.55	0.42	0.27	0.08	0.21	0.23	0.45	0.50	0.65	0.64	0.42
O42	0.41	0.29	0.17	0.11	0.34	0.50	0.44	0.43	0.16	0.17	0.08
O43	0.41	0.41	0.31	0.13	0.37	0.47	0.48	0.54	0.30	0.33	0.20

Direction	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW
O44	0.14	0.22	0.12	0.18	0.09	0.09	0.17	0.34	0.23	0.15	0.11
O45	0.18	0.23	0.25	0.10	0.10	0.12	0.07	0.04	0.16	0.12	0.08
O46	0.25	0.09	0.10	0.05	0.14	0.10	0.11	0.24	0.36	0.14	0.11
O47	0.13	0.28	0.23	0.05	0.29	0.36	0.34	0.31	0.23	0.35	0.16
O48	0.39	0.32	0.21	0.11	0.38	0.44	0.31	0.22	0.07	0.05	0.03
O49	0.18	0.12	0.33	0.22	0.52	0.09	0.15	0.63	0.71	0.26	0.20
O50	0.36	0.15	0.26	0.16	0.49	0.38	0.43	0.48	0.72	0.22	0.21
O51	0.17	0.12	0.23	0.17	0.48	0.48	0.51	0.21	0.69	0.28	0.15
O52	0.24	0.16	0.20	0.12	0.44	0.37	0.37	0.28	0.47	0.31	0.31
O53	0.05	0.20	0.16	0.13	0.46	0.42	0.42	0.36	0.30	0.10	0.10
O54	0.18	0.09	0.34	0.19	0.14	0.09	0.05	0.41	0.73	0.35	0.32
O55	0.24	0.18	0.39	0.11	0.16	0.06	0.06	0.46	0.69	0.41	0.38
O56	0.36	0.25	0.34	0.27	0.42	0.05	0.03	0.36	0.62	0.42	0.38
O57	0.22	0.25	0.08	0.38	0.65	0.53	0.51	0.34	0.18	0.09	0.06
O58	0.25	0.16	0.17	0.43	0.60	0.60	0.62	0.61	0.63	0.11	0.20
O59	0.25	0.20	0.20	0.25	0.31	0.30	0.28	0.24	0.23	0.09	0.15
O60	0.34	0.21	0.17	0.25	0.50	0.30	0.16	0.39	0.30	0.04	0.11
O61	0.17	0.31	0.30	0.09	0.52	0.06	0.13	0.39	0.24	0.09	0.10
O62	0.12	0.31	0.33	0.18	0.35	0.09	0.08	0.19	0.22	0.16	0.16
O63	0.08	0.42	0.34	0.26	0.17	0.20	0.32	0.58	0.74	0.42	0.55
O64	0.01	0.40	0.37	0.43	0.44	0.43	0.47	0.64	0.67	0.19	0.46

Table D9 Velocity Ratio of Special Test Points

Direction	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW
SP1	0.07	0.05	0.03	0.18	0.27	0.47	0.46	0.40	0.28	0.31	0.17
SP2	0.08	0.06	0.02	0.19	0.24	0.45	0.44	0.36	0.27	0.26	0.20
SP3	0.10	0.13	0.03	0.22	0.22	0.46	0.44	0.38	0.23	0.40	0.34
SP4	0.19	0.22	0.04	0.24	0.21	0.47	0.45	0.33	0.24	0.28	0.22
SP5	0.12	0.14	0.05	0.27	0.22	0.51	0.48	0.30	0.25	0.30	0.27
SP6	0.19	0.11	0.07	0.26	0.18	0.47	0.46	0.35	0.33	0.57	0.45
SP7	0.13	0.04	0.06	0.26	0.18	0.50	0.47	0.36	0.36	0.80	0.41
SP8	0.06	0.04	0.05	0.26	0.14	0.44	0.40	0.26	0.32	0.39	0.26
SP9	0.05	0.08	0.13	0.29	0.17	0.44	0.45	0.26	0.36	0.50	0.33
SP10	0.10	0.06	0.14	0.24	0.13	0.42	0.44	0.30	0.46	0.44	0.27
SP11	0.06	0.06	0.08	0.17	0.12	0.39	0.43	0.22	0.37	0.27	0.26
SP12	0.08	0.09	0.55	0.10	0.09	0.35	0.45	0.24	0.54	0.57	0.43
SP13	0.42	0.23	0.13	0.18	0.08	0.37	0.54	0.40	0.73	0.74	0.45
SP14	0.07	0.04	0.08	0.15	0.14	0.49	0.50	0.32	0.37	0.43	0.29
SP15	0.07	0.06	0.07	0.17	0.45	0.49	0.46	0.31	0.40	0.45	0.37
SP16	0.12	0.05	0.07	0.17	0.56	0.41	0.29	0.11	0.43	0.66	0.51
SP17	0.13	0.11	0.37	0.59	0.45	0.35	0.34	0.37	0.61	0.76	0.52
SP18	0.06	0.15	0.50	0.43	0.18	0.26	0.28	0.35	0.70	0.70	0.09
SP19	0.11	0.15	0.50	0.26	0.14	0.20	0.35	0.43	0.69	0.50	0.07
SP20	0.18	0.08	0.42	0.33	0.23	0.19	0.47	0.52	0.66	0.68	0.24
SP21	0.17	0.14	0.47	0.35	0.36	0.29	0.45	0.55	0.68	0.76	0.26
SP22	0.48	0.11	0.52	0.58	0.46	0.37	0.42	0.53	0.61	0.75	0.25
SP23	0.40	0.16	0.46	0.41	0.42	0.32	0.31	0.21	0.44	0.46	0.10
SP24	0.36	0.16	0.41	0.37	0.38	0.25	0.32	0.33	0.28	0.54	0.20
SP25	0.38	0.41	0.29	0.45	0.36	0.19	0.14	0.02	0.03	0.10	0.07

Direction	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW
SP26	0.35	0.45	0.32	0.37	0.45	0.32	0.10	0.03	0.10	0.33	0.05
SP27	0.31	0.40	0.28	0.32	0.42	0.32	0.10	0.08	0.25	0.16	0.12
SP28	0.26	0.24	0.31	0.20	0.27	0.24	0.11	0.09	0.31	0.11	0.07
SS1	0.31	0.31	0.36	0.08	0.10	0.07	0.19	0.43	0.12	0.26	0.14
SS2	0.24	0.46	0.45	0.07	0.20	0.35	0.47	0.43	0.40	0.41	0.38
SS3	0.19	0.20	0.05	0.11	0.24	0.38	0.46	0.54	0.51	0.57	0.32
SS4	0.23	0.11	0.08	0.13	0.08	0.18	0.20	0.17	0.21	0.18	0.08
SS5	0.15	0.04	0.09	0.16	0.13	0.25	0.23	0.16	0.16	0.22	0.13
SS6	0.08	0.22	0.09	0.17	0.03	0.08	0.07	0.04	0.24	0.35	0.09
SS7	0.04	0.29	0.06	0.05	0.02	0.05	0.08	0.08	0.05	0.17	0.04
SS8	0.13	0.20	0.01	0.01	0.05	0.14	0.11	0.23	0.21	0.34	0.21
SS9	0.07	0.03	0.03	0.21	0.10	0.03	0.10	0.05	0.10	0.42	0.28
SS10	0.03	0.03	0.02	0.24	0.17	0.16	0.13	0.16	0.23	0.71	0.31
SS11	0.23	0.02	0.15	0.27	0.12	0.16	0.22	0.24	0.49	0.58	0.38
SS12	0.26	0.07	0.27	0.48	0.24	0.02	0.15	0.29	0.54	0.62	0.41
SS13	0.16	0.04	0.18	0.44	0.24	0.03	0.27	0.13	0.14	0.39	0.33
SS14	0.23	0.12	0.31	0.17	0.05	0.10	0.02	0.22	0.45	0.53	0.29
SS15	0.08	0.35	0.14	0.41	0.17	0.14	0.22	0.15	0.21	0.33	0.24
SS16	0.49	0.10	0.52	0.66	0.44	0.36	0.38	0.44	0.10	0.34	0.48
SS17	0.57	0.08	0.44	0.60	0.42	0.57	0.22	0.04	0.10	0.28	0.42
SS18	0.58	0.40	0.18	0.47	0.36	0.55	0.43	0.29	0.15	0.40	0.45
SS19	0.02	0.38	0.15	0.22	0.21	0.17	0.26	0.08	0.34	0.16	0.23
SS20	0.56	0.21	0.65	0.58	0.38	0.32	0.03	0.15	0.12	0.27	0.04
SS21	0.49	0.04	0.64	0.65	0.46	0.09	0.20	0.33	0.48	0.55	0.29
SS22	0.67	0.50	0.17	0.24	0.22	0.13	0.26	0.20	0.24	0.19	0.12
SS23	0.20	0.16	0.15	0.07	0.27	0.14	0.18	0.04	0.29	0.38	0.03
SS24	0.44	0.30	0.53	0.73	0.37	0.07	0.13	0.10	0.48	0.22	0.18

Direction	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW
SS25	0.40	0.15	0.44	0.46	0.37	0.26	0.25	0.24	0.06	0.57	0.37
SS26	0.56	0.35	0.35	0.13	0.09	0.11	0.28	0.44	0.56	0.69	0.36
SS27	0.49	0.06	0.59	0.57	0.37	0.30	0.35	0.16	0.37	0.70	0.57
SS_P1	0.12	0.05	0.06	0.10	0.27	0.20	0.04	0.18	0.09	0.14	0.10
SS_P2	0.09	0.02	0.05	0.13	0.06	0.03	0.30	0.02	0.09	0.49	0.30
SS_P3	0.20	0.10	0.10	0.19	0.36	0.17	0.08	0.14	0.06	0.04	0.12
SS_P4	0.05	0.27	0.04	0.02	0.13	0.03	0.24	0.13	0.18	0.38	0.20
SS_P5	0.25	0.28	0.05	0.17	0.19	0.20	0.06	0.09	0.13	0.24	0.50
SS_P6	0.11	0.13	0.03	0.16	0.12	0.14	0.23	0.23	0.20	0.34	0.18
SS_P7	0.18	0.24	0.03	0.12	0.05	0.15	0.01	0.21	0.38	0.28	0.14
SS_P8	0.12	0.24	0.02	0.18	0.12	0.18	0.19	0.24	0.30	0.51	0.17
SS_P9	0.19	0.31	0.06	0.29	0.06	0.16	0.16	0.23	0.36	0.33	0.15
SS_P10	0.14	0.23	0.01	0.17	0.08	0.02	0.10	0.18	0.31	0.43	0.22
SS_P11	0.30	0.14	0.07	0.28	0.14	0.11	0.10	0.22	0.16	0.55	0.22
SS_P12	0.32	0.28	0.09	0.11	0.05	0.06	0.12	0.12	0.10	0.33	0.27
SS_P13	0.21	0.35	0.13	0.03	0.07	0.13	0.12	0.23	0.37	0.45	0.39
SS_P14	0.23	0.18	0.03	0.09	0.34	0.45	0.68	0.75	0.56	0.65	0.37
SS_P15	0.20	0.32	0.09	0.01	0.27	0.36	0.53	0.62	0.54	0.90	0.52

Annex C

Revised Technical Note on Marine Moorings

(Relevant Revised Pages Only)

Technical Note – Optimisation of Land Use in Discovery Bay (Maritime)

ARUP

Executive Summary

This Technical Note summarises the findings on the review of the comments by the Marine Department in relation to the Application, in particular on any potential impact on the existing private moorings. Information relating to the existing marine facilities and marine activities that are current or will continue after development was collected. These activities include the existing kaito / ferry services, berthing of bounty and berthing of vessels for delivery of materials and LPG trucks. It is noticed that the bounty berth will not be reprovisioned after the development.

The approach, manoeuvring and departure paths of the associated vessels were evaluated. It is found that there is sufficient space for manoeuvring of the existing kaito / ferry service, and it is considered that there is no impact on the existing private moorings. Relating to manoeuvring of other service vessels, tug assistance will be considered to avoid or minimise any impact on the private moorings.

During construction, a marine works area will be demarcated for the construction vessels and the private moorings are not anticipated to be affected by the marine works area. The construction of the submarine outfall will be proposed within this marine works area to avoid any impact on the moorings.

In conclusion, the potential marine impact on the private moorings is considered to be insignificant during construction and operation phases of the proposed development.

1 Introduction

1.1.1.1 This note is prepared for the project proponent - Hong Kong Resort International Limited (HKR) - to address the first two comments (a) and (b) made by Marine Department (MD) on the Planning Application No. Y/I-DB-3 for Area 10b, Lot 385 RP & Ext. (Part) in D.D. 352 in Discovery Bay received on 28 July.

1.1.1.2 Marine Department's comments are:

"(a) *The project proponent should provide assessment to justify the extension of seawall would not affect the private moorings (PM) during the construction stage and operation phase of the project. The mitigating measures would be taken to prevent the impact on the PM should be specified.*

(b) The PM and the vessels moored may need to relocate to give room for the construction works of the proposed pipeline / outfall. The project proponent needs to formulate plans for temporary relocation and consult the PM and vessel owners. The proposed pipeline / outfall should not affect the laying, maintenance and removal of the mooring components after completion of the proposed pipeline / outfall and during operation.

(c) The removal of some annotations clearly indicating the piers and petrol filling stations, etc. may cause confusion on "whether such facilities are certainly allowed" under the proposed amended OZP.

(d) The PM owners were omitted in the preliminary consultation."

1.1.1.3 The location of the Application Site is shown in **Figure 1**. The project proponent is proposing to build a new waterfront edge to provide a platform for the new land uses and to offer marine access points for maintaining the marine operations at the existing sea edge. The new waterfront edge will be closer to the existing private moorings in Nim Shue Wan.

1.1.1.4 This note presents our assessment of the impacts on the private moorings during construction of the platform and the associated infrastructure and during the operation of Area 10b development.

2 Information

2.1.1.1 The following information was used in preparing the assessment:

(a) "Charts for Local Vessels, 2016" by the Hydrographic Office of the Marine Department;

(b) Hong Kong Electronic Navigation Chart (ENC), 2015 Edition by the Hydrographic Office of the Marine Department;

(c) Aerial Photo of Nim Shu Wan area from Google Earth (Time Line in February 2016);

(d) Transport Department's internet "Transport in Hong Kong > Public Transport > Ferries" (http://www.td.gov.hk/en/transport_in_hong_kong/public_transport/ferries/index.html)

2.1.1.2 Site visits were made in August and September 2016 to collect vessel data and to enhance understanding of the marine operations at the existing sea edge.

2.1.1.3 There are 7 existing marine facilities along the existing sea edge, and they are shown in **Figure 2**. The marine operations associated with these marine facilities are described below.

Vertical Seawall

2.1.1.4 A 100m long vertical seawall is mainly used for loading and unloading materials from vessels to the land. These materials include sand, LPG bottles and sundries. LPG trucks on flat top barges are towed to the site for refilling the storage tanks of the land-side petrol refilling station. Photos of these marine operations are shown in **Figure 3**. The delivery of these materials is provided using various types of vessels, and the dimensions of these vessels are summarised in **Table 2.1**.

Table 2.1 Dimensions of Vessels for Marine Activities at Vertical Seawall

Marine Activity	Vessel	Length Overall	Beam	Draft
Delivery of sand	Pelican barge	49.8m	12.3m	2.8m
Transportation of LPG trucks	Flat top barge	36.6m	15.2m	3m
	Tug	22m	6m	2-3m
Delivery of LPG bottles	Crane barge	20.96m	7.85m	1.2m
	Tug	22m	6m	2-3m
Delivery of sundries	Crane barge	24.3m	9.7m	3m

2.1.1.5 For delivery of sand, a pelican barge is used to deliver sand to the site about 4 times a year. The barge berths perpendicular to the seawall and unloads sand using its conveyor

belt. When departing, the barge reverses backwards until it can turn clockwise by about 90 degree.

2.1.1.6 A flat top barge assisted by tug is currently used for transportation of LPG trucks to the site. When the flat top barge approaches the berth, a tug boat will push the flat top barge aside and assists to turn the bow of the barge towards the berth. When departing the berth, the tug boat moves to the stern of the barge and pulls it away from the seawall.

2.1.1.7 A 21m long crane barge assisted by tug is used for delivery of LPG bottles. The crane barge berths on its port or starboard side against the seawall and its crane on board is used to lift LPG bottles on or off the barge. When departing the seawall, a tug boat is used to pull the crane barge away from the seawall.

2.1.1.8 Sundries are delivered to the site by an approximately 25m long crane barge. The barge berths on its port or starboard side against the seawall and its crane on board is used to load or unload items on or off the barge.

Kaito Landing Steps

2.1.1.9 The landing steps as shown in **Figure 4** is used by the licensed ferry service between Discovery Bay and Mui Wo and the licensed kaito service between Discovery Bay and Peng Chau / Trappist Monastery. The dimensions of the ferry / kaito are 20.6m (LOA), 6.4m (beam) and 2.5m (draft). The vessels berth with their bows against the landings, and passengers board on / alight off the ferry / kaito from their bows. When departing the landing steps, the vessels reverse backwards then move forward clockwise.

Landing Steps

2.1.1.10 This flight of landing steps is south of kaito landing steps, and this is shown in **Figure 6**. There is no specific service or vessel route using these landing steps. It was noted that vessels for delivery of sundries used these landing steps.

Marine Refuelling Station

2.1.1.11 The marine fuelling station as shown in **Figure 7** is located at the southern end of the vertical seawall. This station is used to re-fuel the Discovery Bay passenger ferries and other leisure crafts.

Bounty Berth

2.1.1.12 The bounty serves the Auberg Discovery Bay Hotel and is available for rental for various functions. Visitors board or align off the bounty at a floating pontoon at the hotel, and the bounty stands by at this bounty berth at Area 10b. The bounty and the berth are shown in

Figure 8. The dimensions of the bounty are: 26m (LOA), 40.5m (LOA including the bowsprit), 8.6m (beam) and 4m (draft). However, the project proponent HKR confirmed that the bounty would not berth at the new waterfront edge after the development under this Application.

Boat Hoist and Dry Stack

2.1.1.13 The boat hoist as shown in **Figure 9** is located next to the marine fuelling station. There is a recessed area for vessels to move into for hoisting. The hoisted boats can be stored in Dry Stack as shown in **Figure 10**.

2.1.1.14 The preliminary arrangement of the marine facilities after the development under this Application is shown in **Figure 11**. The bounty berth will not be re-provisioned at the new seaward edge, and the landing steps for public use and boarding/alighting of kaito/ferry services together with the berth for materials handling will be relocated to the southern corner of the new seaward edge.

2.1.1.15 There are private moorings in Nim Shue Wan. The locations of these private moorings and the swing circles of the moored vehicles as depicted from a plan provided by MD are shown in **Figure 12**, together with the bathymetric chart and the extent of the new development under this Application.

3 Assessment of Impact in the Operational Phase

3.1.1.1 The marine facilities will be relocated after development, and the assessments of the impacts on the existing private moorings due to these relocated marine facilities are presented in the following paragraphs for kaito / ferry landing steps/pier, service seawall and bounty berthing area.

Kaito / Ferry Landing Steps/Pier

3.1.1.2 The distance between the new landing/pier and the swing circle of the closet private mooring is about 65m. When approaching the landing/pier, the vessel turns 90 degree clockwise and the radius of the turning circle of the vessel is estimated to be about 42m, i.e. two times the length overall (LOA) of vessel. The estimated path of an approaching vessel is shown in **Figure 13**. When leaving the landing/pier, the vessel is considered to reverse backwards followed by a 90 degree clockwise turn and the estimated path is also shown in **Figure 13**. Therefore, it can be considered that the tracks of the kaito / ferry service would not have any significant impact on the existing private mooring, and relocation of the private moorings is not considered necessary.

Service Seawall

3.1.1.3 The service seawall is proposed for delivery of sand, transportation of LPG trucks, delivery of LPG bottles and delivery of sundries.

3.1.1.4 After development, tug assistance will continue to facilitate turning and manoeuvring of the barges at the berth. The tug will enable the movement of the barge between the new seaward edge of the development and the existing private moorings.

3.1.1.5 Approach, manoeuvring and departing of these service barges will be scheduled to avoid concurrent movement of kaito / ferry service in the same area.

Bounty Berthing Area

3.1.1.6 As confirmed by HKR, the bounty berthing area will not be re-provisioned in the development due to commercial reason. Therefore, it is considered that there is no impact on the private moorings by manoeuvring and navigation of bounty by the proposal.

4 Assessment of Impact in the Construction Phase

4.1.1.1 A new platform will be constructed beyond the existing seawall. Whilst the details of construction are yet to be designed, the extent of works is estimated in this assessment to evaluate the impact of the marine works space on the private moorings.

4.1.1.2 Construction vessels are proposed to be stationed alongside the new edge of the development, and, in view of the metocean conditions, anchoring lines and the preliminary marine works area are proposed as shown in **Figure 14**. This shows that the marine works area for the new platform is about 40m or more away from the existing private moorings.

4.1.1.3 For the new submarine outfall for sewerage treatment works, the location, alignment, length and construction method will be determined in the design stage. Preliminarily, part of the alignment of the new submarine outfall will be positioned within the proposed marine works area for the new platform to reduce any impact on the private moorings. For part of the submarine outfall which located outside the proposed works area and Nim Shue Wan, mobile construction vessel will be deployed for the construction works in order not to affect the nearby marine traffic.

4.1.1.4 Dredging, if so required, for submarine outfall works will be carried out by one derrick lighter with grab to minimise occupancy of water space. In addition, dredging will be carried out within the proposed works area for the submarine outfall.

4.1.1.5 Therefore, it is anticipated that the impact on the private moorings during the marine construction works is insignificant.

5 Summary

5.1.1.1 This note presents the assessment of the impacts on the private moorings due to the Project in both the construction and operation phases.

5.1.1.2 After development, there is adequate water space between the new seaward edge of development and the private moorings for approach and departure of the licensed kaito / ferry service.

5.1.1.3 Barges for other service operations including delivery of sand, LPG bottles and sundries and transportation of LPG trucks can manoeuvre and turn at the new service seawall with the assistance of tugs.

5.1.1.4 During construction, the marine works will be carried out within the works area and this will be outside the extent of swing circles of private moorings. Thus, the private moorings will not be affected.

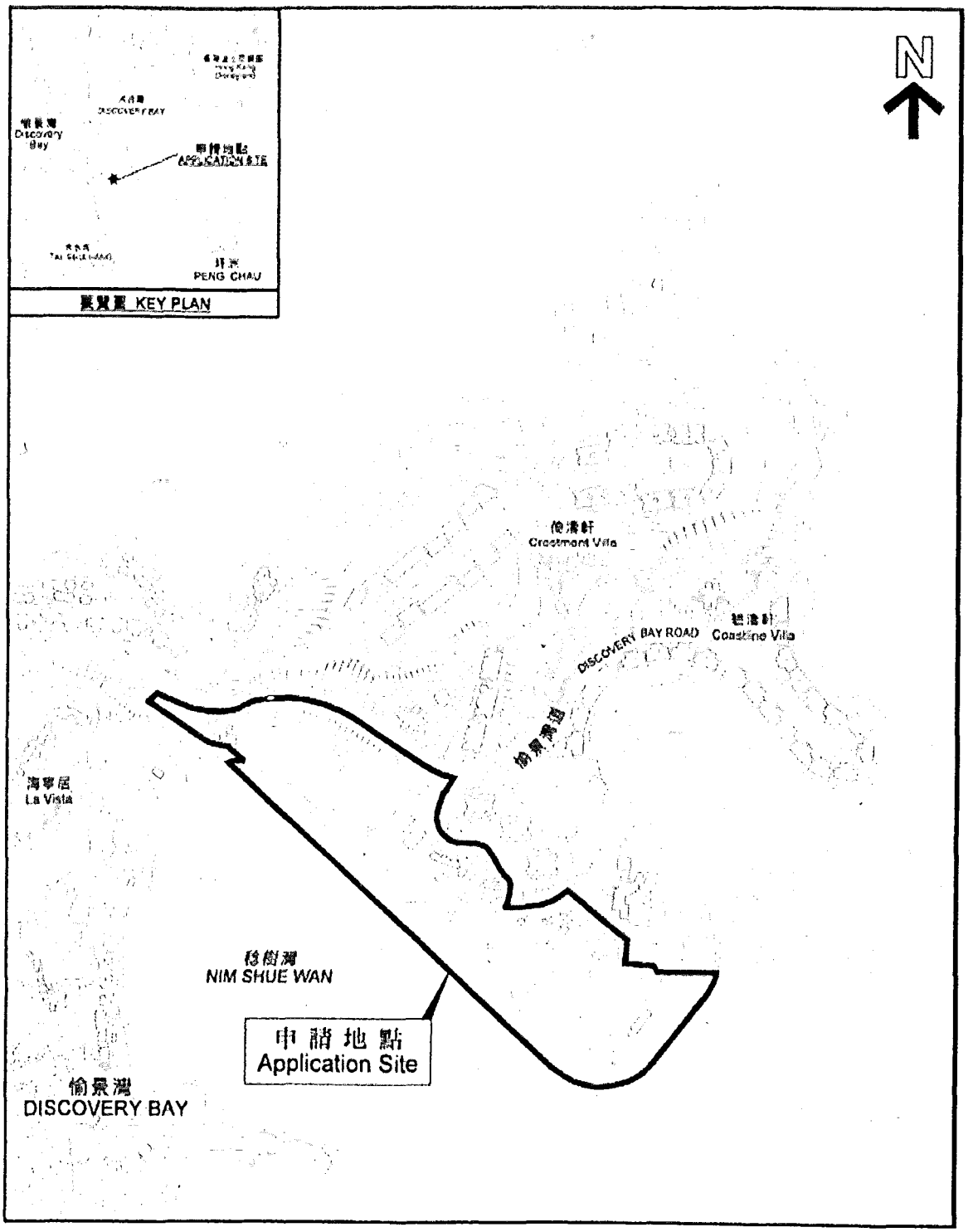


Figure 1 Location Plan of the Application Site

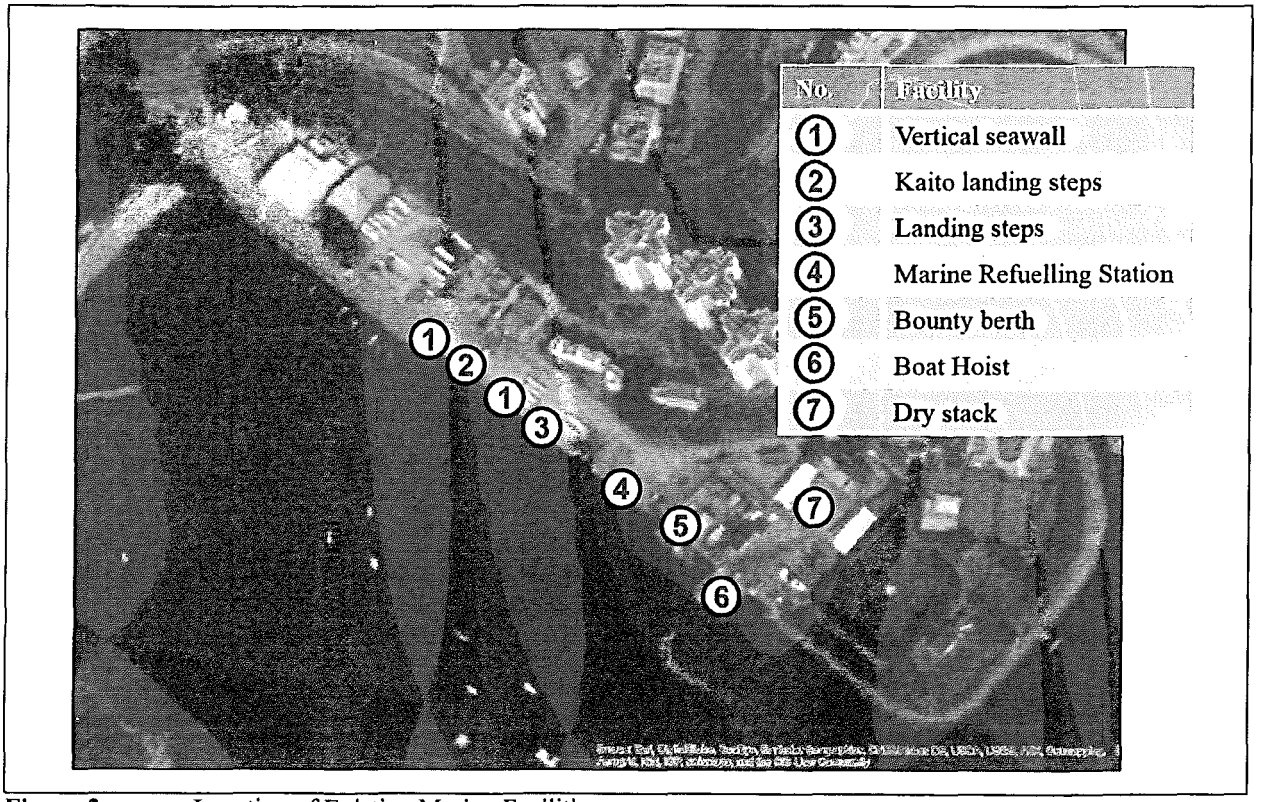


Figure 2 Location of Existing Marine Facilities

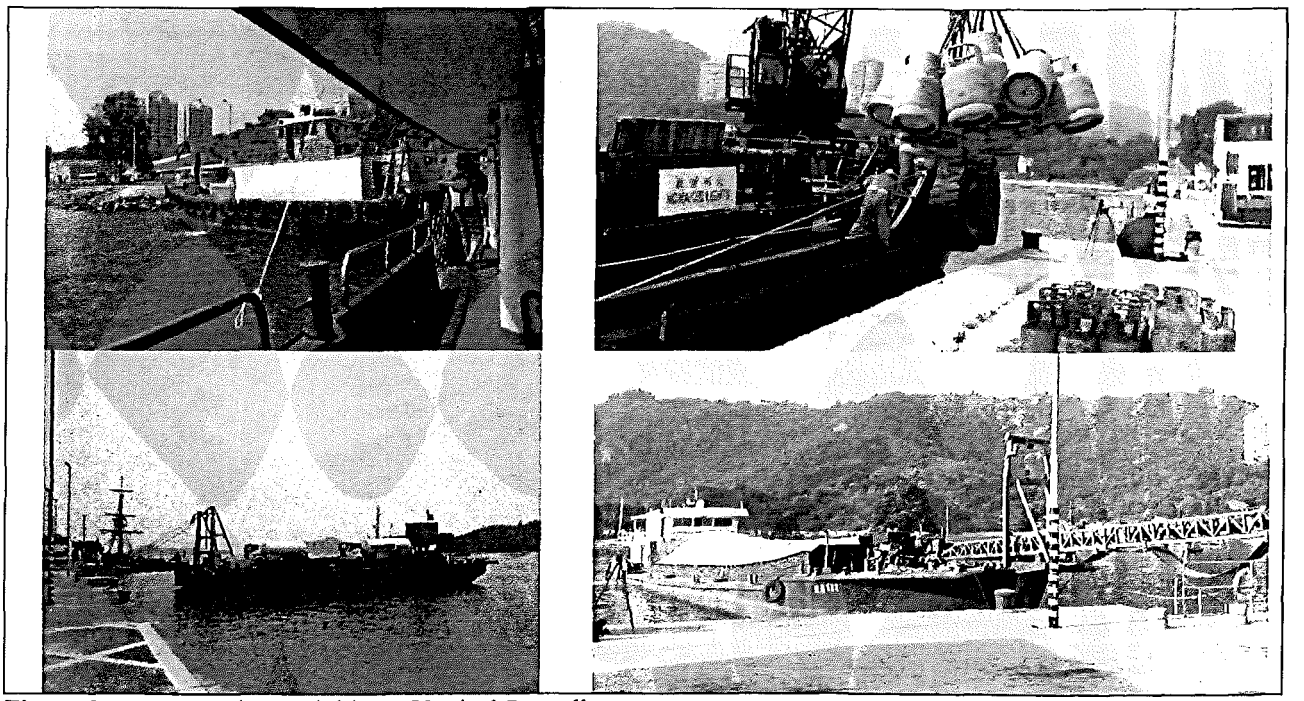


Figure 3 Marine Activities at Vertical Seawall

Top left: Delivery of sundries by crane barge
Top Right: Delivery of LPG bottles
Bottom left: Flat top barge for transportation of LPG trucks
Top Right: Delivery of sand by pelican barge

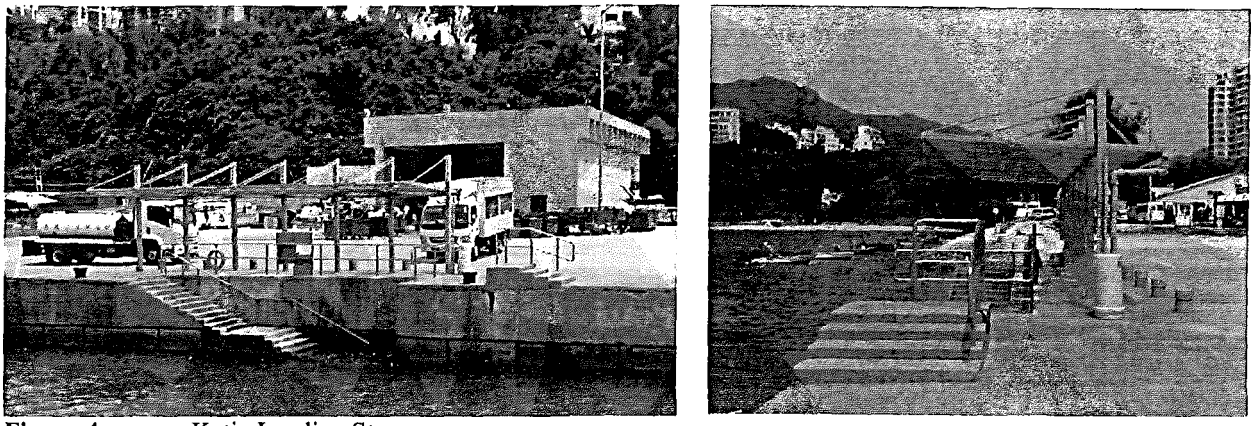


Figure 4 Katio Landing Steps

Figure 5 Licensed Ferry/Katio Services at Kaito Landing Steps

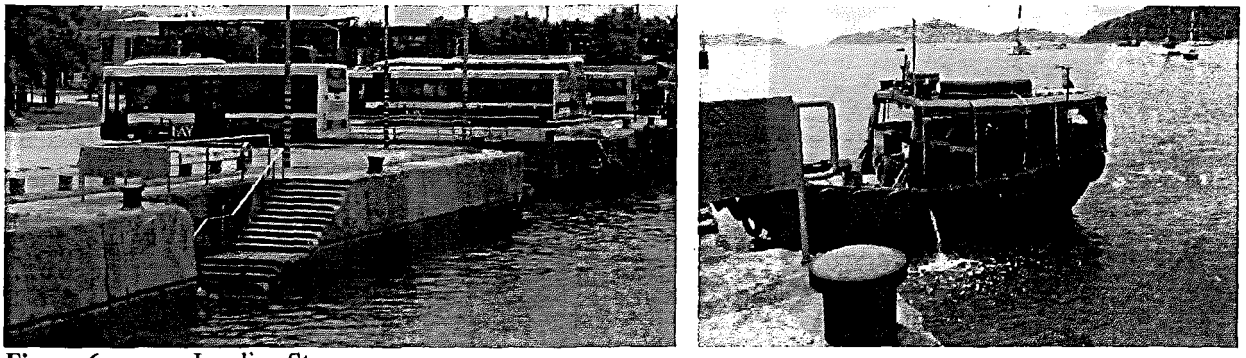


Figure 6 Landing Steps

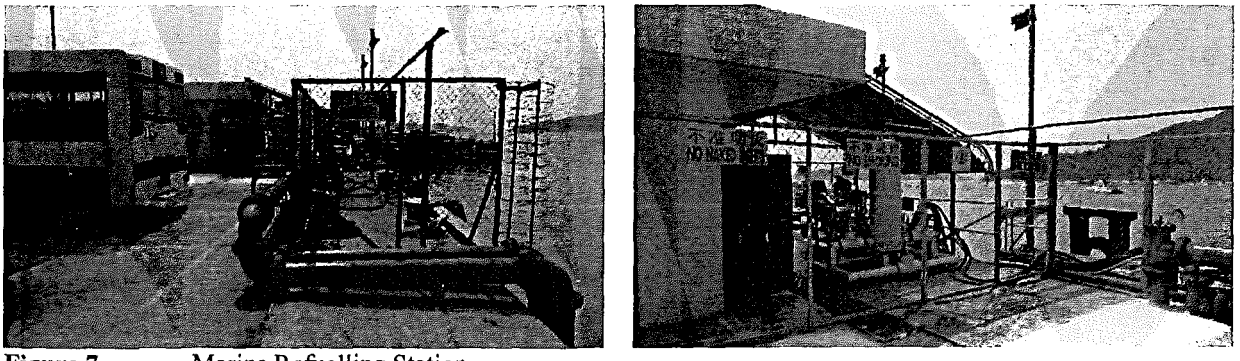


Figure 7 Marine Refuelling Station

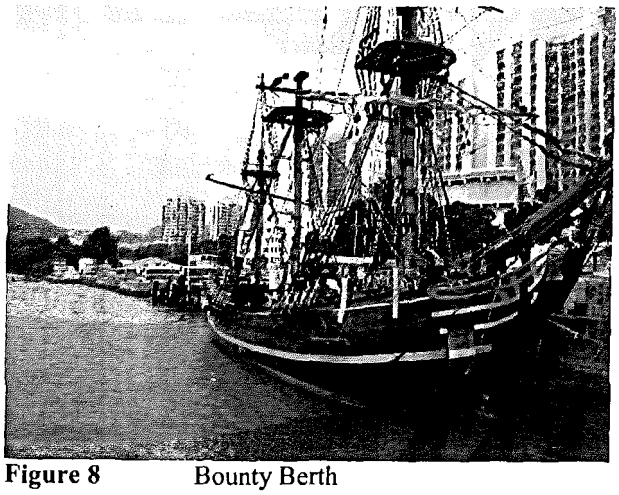
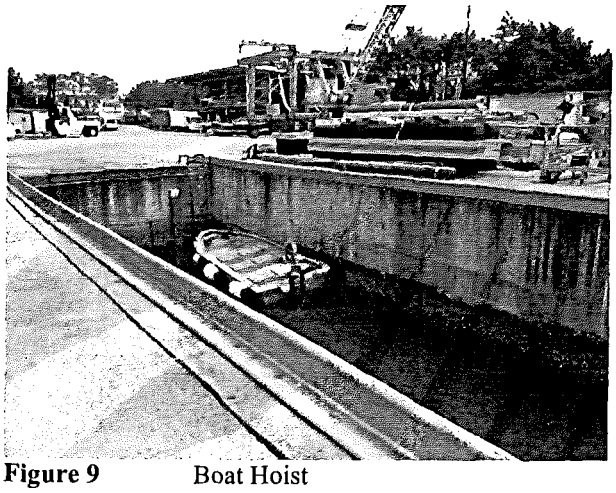


Figure 8 Bounty Berth



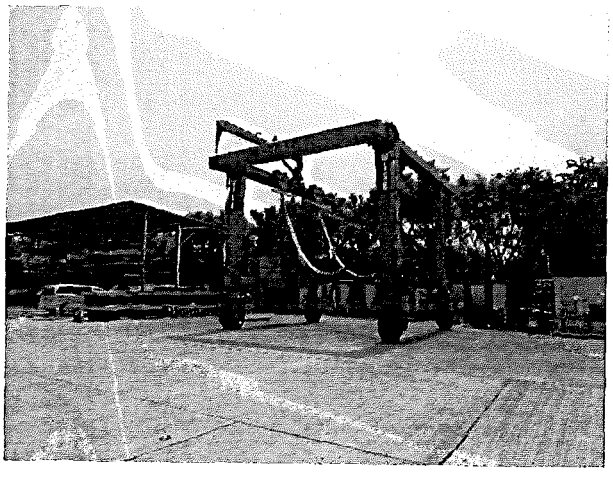


Figure 9 Boat Hoist

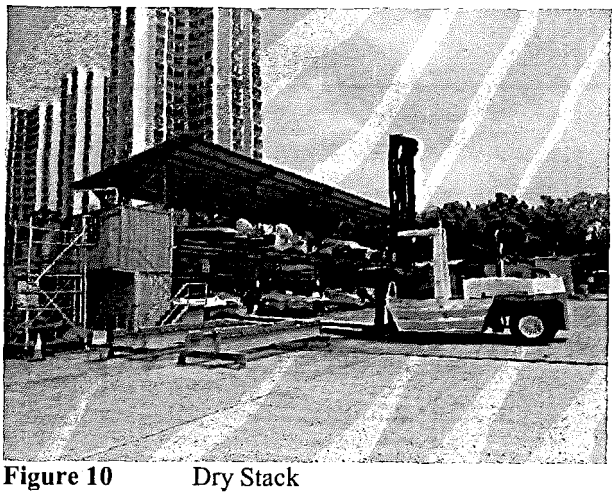
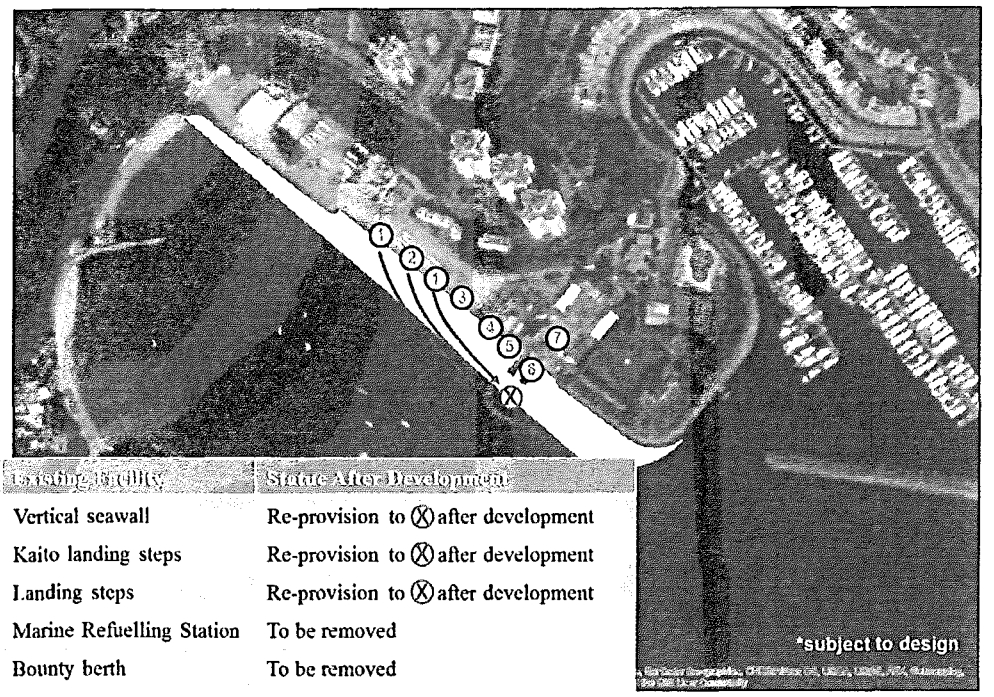


Figure 10 Dry Stack



No.	Existing Facility	Status After Development
1	Vertical seawall	Re-provision to ⊗ after development
2	Kaito landing steps	Re-provision to ⊗ after development
3	Landing steps	Re-provision to ⊗ after development
4	Marine Refuelling Station	To be removed
5	Bounty berth	To be removed
6	Boat Hoist	To be removed
7	Dry stack	To be removed

Figure 11 Relocation of Existing Marine Facilities after Development

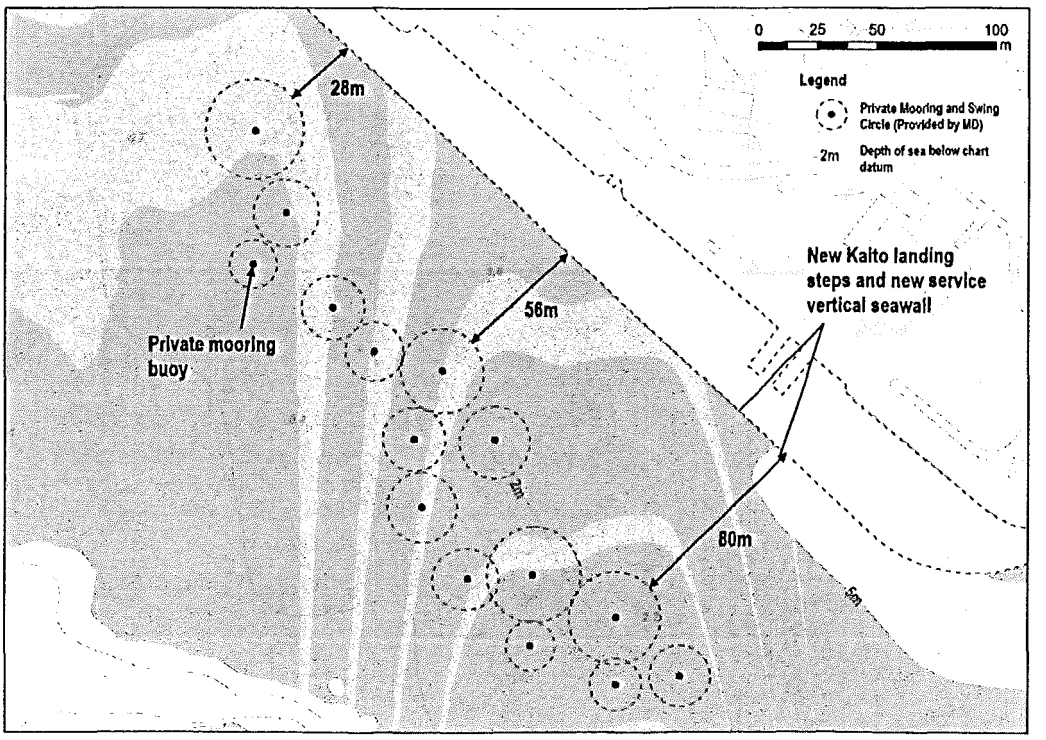


Figure 12 Private Moorings in Nim Shue Wan (prepared based on mooring plan provided by MD)

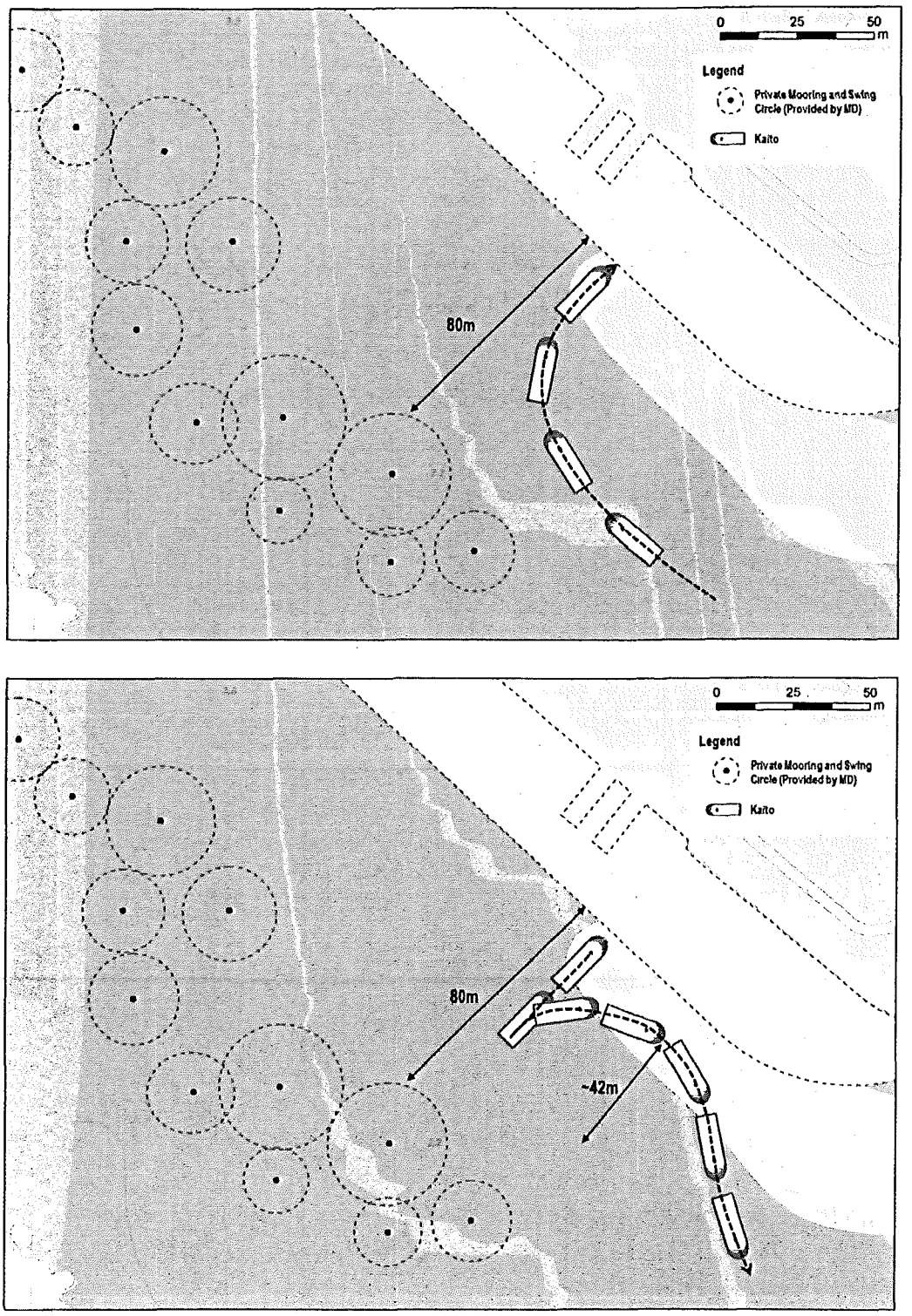


Figure 13 Paths of Kaito / Ferry Approaching and Departing the Landing Steps after Development

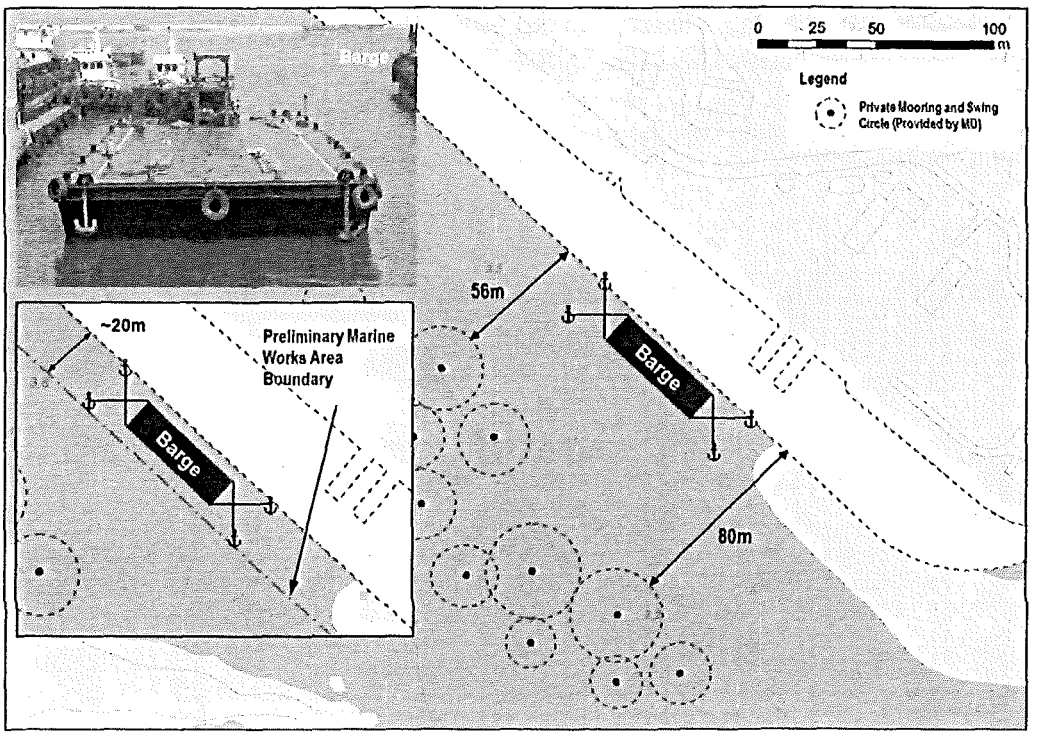


Figure 14 Preliminary Marine Works Area for the new Platform

Annex D

Revised Study on Water Supplies System

(Relevant Revised Pages Only)

6.6.2.5 A new water treatment works will be needed to treat the abstracted water from the Discovery Bay Reservoir before distribution to the end users.

6.6.2.6 As requested by WSD, if this option is finally adopted, the fresh water distribution system for the treated water from the proposed new water treatment works needs to be segregated from the existing fresh water distribution network at Discovery Bay to avoid potential cross contamination problem. Therefore, new distribution mains and a separate service reservoir storage (refer to Service Reservoir No. 3 in the **Figure 4**) exclusively to cater the fresh water demand arising from the proposed development are required

6.7 Flushing Water Supply Impacts and Provisions

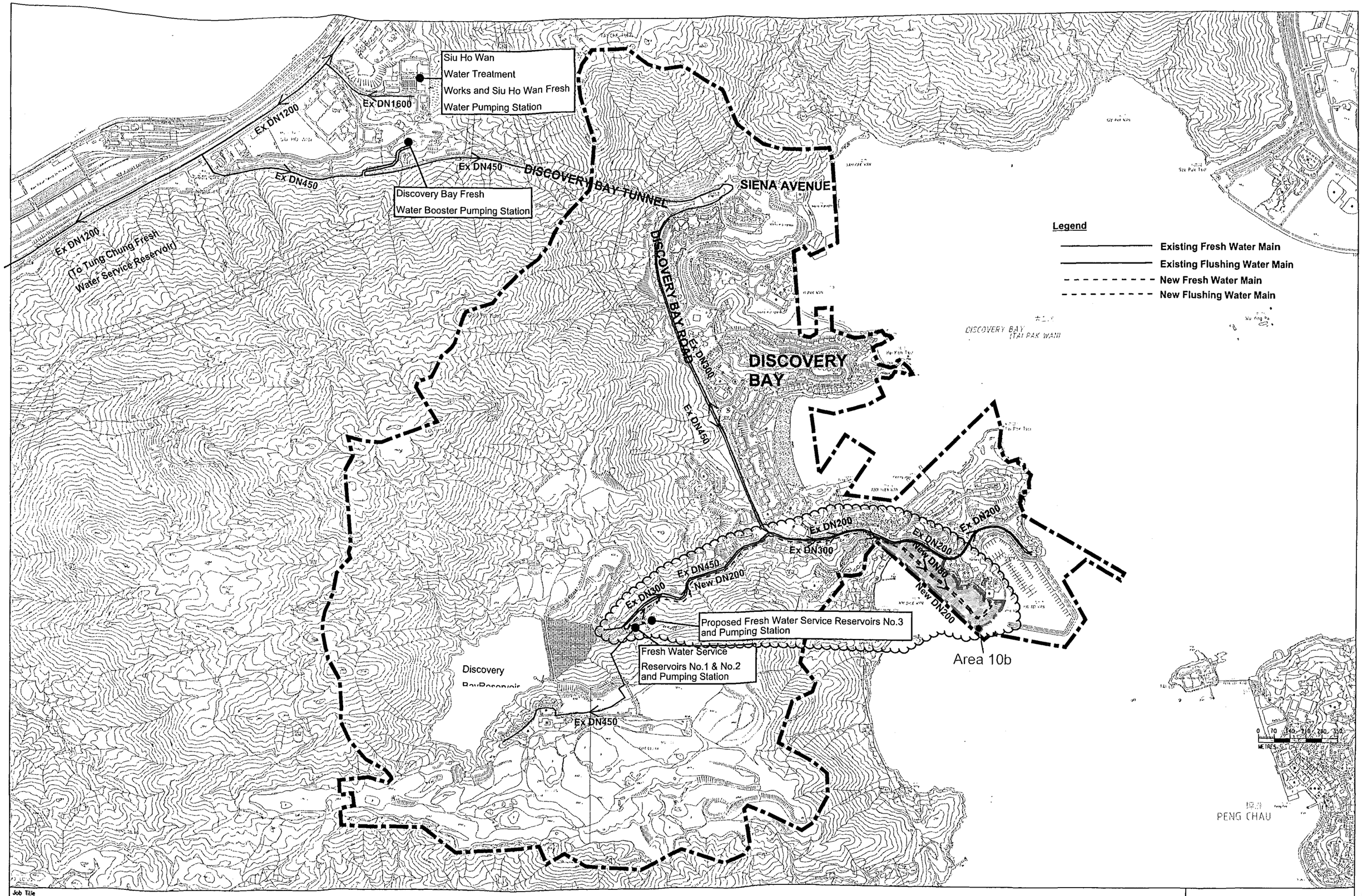
6.7.1 Discovery Bay Reservoir

6.7.1.1 Discovery Bay Reservoir provides flushing water to existing Discovery Bay and both fresh and flushing water to Nim Shue Wan Village. Following the current flushing water supply arrangement, flushing water for the potential development Areas 6f and 10b is proposed to be supplied by the Discovery Bay Reservoir. Detailed calculations are provided in **APPENDIX B3** and a summary of total water supply from Discovery Bay Reservoir is provided in **Table 6.8**.

Table 6.8: Total Water Demand from Discovery Bay Reservoir

Supply Zone	Population	Population Type	Unit Flow Factor (m^3/person/d)	Flushing Water Demand (m^3/d)
Flushing Demand from Existing Discovery Bay Development	25,000	Residential	0.07	1,750
	4,100	School	0.025	102.5
Fresh and Flushing Water Demand from Existing Nim Shue Wan Village	150	Residential + Service Trades	0.23+0.04+0.07	51.0
Flushing Demand from Discovery Bay potential development Areas 6f and 10b	4,003	Residential	0.07	280.2
			Total =	2,183.7

6.7.1.2 A similar analysis has been carried out to check the adequacy of water supply for the Discovery Bay Reservoir during a drought year. The assessment considered all inflows and outflows into and out of the reservoir during the drought year (12 months between October 2010 and September 2011). It estimated that after the drought year, the Discovery Bay Reservoir will still have around 0.99 million m^3 storage volume, which is still more than total water demand for a whole year (2,184 m^3/d x 365 = 0.80 million m^3). It shows that it is feasible to



Job Title

DISCOVERY BAY - OPTIMIZATION OF LAND USE

FIGURE 4

Date	Scale	Drawing Title
FEB 2017	1:15000	EXISTING AND PROPOSED WATER SUPPLY LAYOUT PLAN
Drawn	Job No.	
SY	236078	

ARUP

Annex E

Revised Environmental Assessment

Hong Kong Resort Company Limited

Optimization of Land Use in Discovery Bay

235928

Final | February 2017

Job number 235928

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Standard Practice for Site Drainage

Appendix 6.3

Preliminary Water Quality Assessment

Appendix 7.1

Legislation and Standards for Land Contamination Assessment

Appendix 7.2

Historical Aerial Photos for Discovery Bay

Executive Summary

The Hong Kong Resort Company Limited (HKRCL) has been considering the feasibility of implementing additional development areas within the existing boundary of Discovery Bay to provide additional housing supply. A planning statement, titled "Optimisation of Land Use in Discovery Bay" was submitted to Planning Department (PlanD) in July 2013. A round of comments from various government departments was received on December 2013 (ref PlanD.'s letter ()L1/L/DBNC/352-17 dated 17 December 2013). Another round of submission was made on August 2014 and the corresponding set of comments was received from various government departments on December 2014 (ref PlanD.'s letter ()L1/L/DBNS/352-17(CR) dated 23 December 2014). Subsequently, another round of submission was made in March 2015 and comments were received from various government departments. The latest round of submission was made in November 2016 and comments were received from various government departments in December 2016. In order to address those comments, the development proposal has been refined accordingly.

This Environmental Study refers to Area 10b. The potential development area is included in the latest approved Discovery Bay Outline Zoning Plan for a range of "Other Specified Uses" and "Government, Institution and Community", despite the fact that some of their development parameters and locations are proposed to be amended.

An Environmental Study for Area 10b has been conducted on the latest development proposal is to demonstrate land use compatibility and acceptability of the proposed development by providing necessary information, findings and conclusions. Some of those comments relating to the need for formal Environmental Impact Assessment Report for any Schedule 2 and Schedule 3 Designated Projects (DPs) would be separately handled when the Environmental Impact Assessment Ordinance (EIAO) process is formally initiated subsequent to a rezoning approval and prior to implementation. The issues considered in this Environmental Study include noise, air quality, water quality, land contamination and ecology. Those relating to sewerage and drainage, and water supply are separately presented in another report. The following potential Designated Projects (DPs) have been identified and these would be further investigated during the detailed design stage.

- Transport depot for buses and golf cars;
- Associated submarine outfall for the possible sewage treatment works, if required;

- Possible dredging for a future submarine outfall outside the approved reclamation area, if required.

Air Quality

All the relevant air emission sources in the vicinity that would have air quality impacts on the proposed developments have been identified and assessed. Key air emission sources include the marine vessels (such as the ferries between Discovery Bay and Central, kaitos, Oil Tankers and sand barges), the fireworks at Disney Theme Park, sewerage treatment works and sewage pumping station. A literature review on best available information including Environmental Protection Department (EPD)'s publications, approved Environmental Impact Assessment (EIA) Reports and operators' data has been conducted to establish the emission strengths of these air emission sources. These emission strengths are then included in EPD's approved air quality dispersion models to simulate air quality impacts on both existing and planned air sensitive receivers. The planned air sensitive receivers would unlikely be subject to adverse air quality impact.

The odour impact of the existing sewage pumping station is not noticeable while the proposed sewage treatment works could be mitigated to acceptable level by providing deodorizing unit and sufficient buffer distance between the exhaust of the deodourizing unit and ASRs. The exhaust location should be also located at the downwind location of the ASRs. As such, odour impacts to the planned and neighbouring ASRs would be minimised.

Noise

All the relevant noise sources in the vicinity that would have noise impacts on the proposed developments have been identified and assessed. These noise sources include the marine vessels (such as the ferries between Discovery Bay and Central, kaitos, Oil Tankers and barges), sewage treatment works, existing sewage pumping stations, traffic along nearby road network and the firework at Disney Theme Park. Where practicable, noise measurements have been conducted to establish the noise caused by these noise sources. These measurement data is then used to assess the noise impacts on both existing and planned noise sensitive receivers. Results indicate that the predicted noise impacts would not exceed the relevant noise limits and hence the proposed land uses would not be subject to insurmountable noise impacts.

Water Quality

Although most of the development would not involve marine works, some minor reclamation work would still be required. The minor reclamation would be conducted by decking over piles and hence any water quality impacts caused would unlikely be significant. Any release of sediment would be readily controlled after the implementation of good practices. It may also be necessary to conduct some dredging to facilitate the implementation of future submarine outfall. Preliminary estimation suggests that the total amount of dredging would be less than 100,000m^3. Some marine works may also be required for the potential sewage treatment works and the associated outfall. They will be considered in the subsequent statutory EIA which will include cumulative impacts caused by various sources, including the proposed sewerage treatment works, the design of the deck-over-piles, the dredging process and the outfall etc. Refinement and appropriate mitigation measures would be required to minimise any adverse impacts on hydrodynamic and water quality during both construction and operational phases.

Other aspects

Site inspection and review of historical photos have revealed that most of the areas within the potential development area have low potential of land contamination. However, the existing bus depot and services areas have some potential for land contamination. It is recommended to prepare a Contamination Assessment Plan (CAP) after the rezoning approval and during the subsequent statutory EIA. The CAP shall cover all the potential development area and would recommend the need for Site Investigation to collect soil and ground water samples for analysis, and subsequent actions as required.

Depending on the future discussion with DSD, there may be a need for a new sewage treatment plant. The effluent discharge and the dredging work of the future submarine outfall, if required, would have certain impact on marine ecology. Series of mitigation measures have been recommended to minimise the marine ecological impacts during construction phase. Furthermore, given the proposed STW would only have a daily flow rate of 1,100m^3 and the effluent concentration would be monitored and controlled. The operational phase water quality impact to the nearby marine waters should be minimal, hence impacts on marine ecology would be minimised.

For terrestrial ecology, the proposed site comprises of developed area where vegetation only occupies a small portion of the site. The existing site area is mostly urbanised and subject to moderate to high anthropogenic disturbance, hence the

ecological value of the area should be relatively low. Terrestrial ecological impacts are considered insignificant.

For fisheries, the nearest fish culture zones are located more than 6km away and the nearest nursery and spawning ground for fisheries resources in the southern waters are located at more than 6.5km away from the proposed discharge location. Given the treated effluent discharged from the proposed STW would meet the statutory standard together with the large separation distance, direct or indirect adverse impacts on the fish culture zones, nursery and spawning ground for fisheries resources are not anticipated. Direct impact on fishing grounds is not anticipated as there would be no reclamation works at the final location of the submarine outfall. For indirect impacts, water quality change due to effluent discharge from the submarine outfall could potentially affect capture fisheries production. However, the water quality impact to the nearby marine waters should be minimal with proper control and monitoring of effluent discharge from the proposed STW.

1 Introduction

1.1 Background

1.1.1.1 The Hong Kong Resort Company Limited (HKRCL) has been considering the feasibility of implementing additional development areas within the existing boundary of Discovery Bay to provide additional housing supply. A planning statement, titled "Optimization of Land Use in Discovery Bay" was submitted to Planning Department (PlanD) in July 2013. A round of comments from various government departments was received on December 2013 (ref PlanD.'s letter ()L1/L/DBNC/352-17 dated 17 December 2013).

1.1.1.2 Another round of submission was made on August 2014 and the corresponding set of comments was received from various government departments on December 2014 (ref PlanD.'s letter ()L1/L/DBNS/352-17(CR) dated 23 December 2014). A subsequent round of submission was made on March 2015 and comments were received from various government departments. The latest round of submission was made in November 2016 and comments were received from various government departments in December 2016.

1.1.1.3 Ove Arup & Partners HK Ltd (Arup) has been appointed by HKRCL to conduct assessments to address those comments relating to environmental aspects including noise, air quality, water quality, land contamination, ecology, sewerage and drainage, and water supply. However, given the purpose of this Environmental Study is to demonstrate land use compatibility and acceptability of the proposed development by providing necessary information, findings and conclusions, some of those comments relating to the need for statutory Environmental Impact Assessment Report would be separately handled when the Environmental Impact Assessment Ordinance (EIAO) process is formally initiated prior to implementation.

1.1.1.4 This report addresses those comments relating to noise, air quality, water quality, land contamination and ecology for Area 10b. Those relating to sewerage and drainage, and water supply are separately presented in another report.

1.2 Key Objectives of this Environmental Study

1.2.1.1 This Environmental Study is not intended to fulfil the statutory requirements under the EIAO for the DPs and the aim of this Environmental Study is to support the rezoning application for Area 10b. This key objectives for this Environmental Report are given below:

- Summarise the relevant regulations and regulations that are applicable;
- Establish the baseline environmental conditions ;
- Identify the representative environmental sensitive receivers that may be affected by the proposed development;
- Present the assessment methodologies applicable to various environmental aspects;
- summarise the key findings for those relevant environmental aspects;
- Propose mitigation measures where needed; and
- Identify further studies that may be required during the subsequent statutory EIA.

2 Project Description

2.1 Land uses

2.1.1.1 The current land uses for the area include "Government, Institution and Community" and "Other Specified Use" for a range of supporting service. Once the proposed development in the area is implemented, they would be changed from the current land uses to the proposed land uses of residential and various supporting service uses. The following table summarises both the current and proposed land uses for Area 10b and **Figure 2-1** illustrates its location. The total site area for potential development area is about 6.3 ha and would accommodate a total of 2,813 additional population.

Table 2.1: Current and proposed land uses

	Land uses	
Area	**Existing [1]**	**Proposed**
Area 10b	"OU" and "Government, Institution and Community" for various supporting service uses.	"OU" (Residential and various supporting service uses) R(C)13

[1] – As shown in OZP S/I-DB/4 - Discovery Bay

2.1.1.2 Area 10b is located along the existing seafront along Marina Avenue leading to the existing Marina. Site observation reveals that the site is mainly occupied by a number of services facilities including the depot for vehicles, petrol / LPG filling station, ferry pier etc. It is also noted that the entire depot area is paved with concrete.

2.1.1.3 Within Area 10b, it is proposed to have residential premises together with the necessary infrastructure and landscaping elements. Besides, some of the existing service would also be separated from the future housing by housing them in podium structure with access largely separated from residential developments, but still within Area 10b.

2.1.1.4 For sewerage system, a new sewerage treatment work (STW) (~ 1,100m^3 per day) will be established to receive and treat the sewage generated from the additional population from Area 10b, as discussed in the Study on Sewerage Systems accompanying this planning application. Within the STW, a sewage booster pump will be installed to pump and discharge treated effluent via marine outfall to the marine waters. This new STW will be designed, operated and maintained by the project proponent to achieve any treatment level if required. A

discharge licence will be obtained under the WPCO prior to discharge of the treated effluent.

2.1.1.5 For fresh water, it would either be supplied from Siu Ho Wan Water Treatment Works, or from Discovery Bay Reservoir, in which case a local Discovery Bay Water Treatment Works (DBWTW) would be provided near the existing Discovery Bay Service Reservoir No. 1. For the water disinfection process, it is preliminarily recommended that Sodium Hypochlorite solution would be used, subject to subsequent detailed design. Therefore, no on-site storage of chlorine gas is required.

2.1.1.6 The existing petrol filling station would also be relocated to a new location at the junction between Discovery Bay Road and Marina Avenue. A separation distance of 50m has been allowed between this new petrol filling station and the existing / planned residential premises. The existing LPG station will be relocated outside of Area 10b.

2.1.1.7 The existing seawall along Marina Avenue has adopted the configuration as a sloping seawall. In order to cater for the additional housing development, it is proposed to include an additional narrow strip of reclamation, in the form as a decking with a width of 9-34m. The total area for this additional decking would be approximately 0.86ha. It should be noted that the extent of deck would be within the gazetted zone approved under the Foreshore and Seabed Ordinance in 1977.

2.1.1.8 As confirmed with the facility operator, the Bounty services which is currently available at Area 10b will not be re-provisioned in the future construction and operational phase of the Project. Hence, berthing area for Bounty would no longer be necessary.

2.1.1.9 Similar to the existing developments within Discovery Bay, the municipal wastes from Area 10b will be transported away by vehicles.

2.2 Possible Construction Methodologies

2.2.1.1 The construction methodologies are yet to be developed in the subsequent stages. Nevertheless, the reclamation work at Area 10b would adopt an environmental friendly approach by decking over piles instead of using the conventional dredging approach. This would significantly reduce the release of sediment during the construction phase. Minor modification works would be required for the existing

vertical seawall along the Area 10b, including relocation of existing piers, will need to be conducted below water level, and the details will be established in the detailed design stage. In order to avoid/minimise water quality impacts due to the piling works, steel casings will firstly be installed at the proposed pile locations. The steel casings extend above the sea and will prevent soil or rock arisings from being disposed of into the sea. The arisings will be removed from within the piles to a barge anchored close to the piles. Once the materials inside the casings were removed, steel reinforcements/structural sections will be lowered inside the casing and then followed by concreting work. Silt curtain will be installed as secondary measures to prevent any accidental release of arisings into the sea.

2.2.1.2 In case a sewage treatment works is required for the development, some marine works, such as dredging, may also be required for the future submarine outfall subject to its ultimate location which would be determined in detailed design. Mitigation measures such as silt curtains and closed grab dredger would be employed.

2.3 Tentative Implementation Programme

2.3.1.1 According to the latest design, the tentative time for the occupation of the potential development area would be beyond 2020 and this actual date would be reviewed throughout the design process.

2.4 Designated Project

2.4.1.1 The elements within the potential development area have been reviewed to determine whether they are qualified as either Schedule 2 or Schedule 3 Designated Projects (DPs) under the EIAO. An overview of these potential DPs is given table below for further evaluation. However, it should be noted that this list of potential DPs would need to be continuously reviewed and updated as the design progresses. The following table lists out those potential DPs which are further discussed and evaluated in the following sections.

Table 2.2: Potential designated projects to be reviewed

DP Item	Description
Item A1 of Sch 2	A road which is an expressway, trunk road, primary distributor road or district distributor including new roads and major extensions or improvements to existing road.
Item A6 of Sch 2	A transport depot

DP Item	Description
Item C1, C2 & C12 of Sch 2	Reclamation works and dredging works
Item F2 of Sch 2	Sewage treatment works
Item F3 of Sch 2	Sewage pumping station
Item F6 of Sch 2	Submarine sewage outfall
Item 1 of Sch 3	Engineering feasibility study of urban development projects with a study area covering more than 20ha or involving a total population of more than 100,000.

2.4.1.2 It should be noted the potential development area are included in the latest approved OZP and has been partly implemented, despite the fact that some of their development parameters and locations are proposed to be amended.

2.4.2 Summary of Designated Projects

2.4.2.1 After the review, the following potential DPs have been identified and these would be further investigated during the detailed design stage.

- Item A6 of Schedule 2: Transport depot for buses and golf cars;
- Item C of Schedule 2: Dredging works if required.
- Item F6 of Schedule 2: The associated submarine outfall for the possible sewage treatment works for Area 10b;

2.4.3 Item A6 of Schedule 2

2.4.3.1 Item A6 of Schedule 2 refers to "*A transport depot located less than 200m from the nearest boundary of an existing or planned (a) residential area; (b) place of worship; (c) education institutions; or (d) health care institution.*" There is an existing depot for the buses and golf cars within Area 10b. Most of the maintenance area of this depot is enclosed. The nearest residential premises is the Twilight Court, which is located at around 50m away. Given that this depot has been operated before the enactment of the EIAO, it is an exempted DP under the EIAO. According to the latest design, the existing depot for buses and golf cars within Area 10b would be retained but modified and separated from the future residential units. The new depot will be housed in a podium with residential blocks on top. Vehicular and pedestrian access to the depot and residential blocks are totally separated at different level. Depot is accessed at ground level, whereas that of residential blocks is on top of podium roof. However, the future depot would be within 200m from the planned residential area in Area

10b. Obviously, housing the depot in a podium will eliminate lot of environmental issues, such as noise, air, visual etc. Moreover, this exempted DP would not have material change under EIAO. Nevertheless, this depot would still be a potential DP under Item A6 of Schedule 2.

2.4.4 Item C of Schedule 2

2.4.4.1 It should be noted the proposed development would involve certain reclamation and dredging to extend the land area by approximate 0.86ha. However, the extent of reclamation and dredging will be within the boundary of the approved under the Foreshore and Seabed Ordinance in 1977 (see **Figure 2-2**). Hence, by virtue of Clause 9(2)(c) of the EIAO, the reclamation and dredging works are exempted from the EIAO. However, dredging works outside the approved reclamation area may be required for the future submarine outfall that may be qualified as DP under Item C of Schedule 2. Besides, a decking over piles approach will be adopted instead of extrusive conventional dredging and filling as the construction methodology.

2.4.5 Item F6 of Schedule 2

2.4.5.1 A sewage treatment plant within Area 10b would need to be implemented to receive the sewage generated by the future population in Area 10b. The effluent standards will meet WPCO and TM-EIAO as necessary. The capacity of the sewage treatment works would be approximately 1,100m^3 per day and hence is not a DP by itself. However, depending on further studies, a new marine outfall may be required. Hence, it may be qualified as a DP under Item F6 of Schedule 2 respectively.

2.4.6 Others

2.4.6.1 Other than the above DPs, other Schedule 2 and Schedule 3 DPs have been reviewed and summarised below:

2.4.6.2 Item A1 of Schedule 2 refers to "*A road which is an expressway, trunk road, primary distributor road or district distributor including new roads and major extensions or improvements to existing road.*" According to the latest design, only local roads would be required for the potential development area. None of the roads proposed will be categorised as expressways, trunk roads, primary distributor roads or district distributors. Hence, all the local roads proposed would not be qualified as DP under Item A1 of Schedule 2.

2.4.6.3 Item F3 of Schedule 2 refers to "*A sewage pumping station larger than 300,000m^3 / day or more than 2,000m^3 / day and a boundary of which is less than 150m from uses including residential uses, place of worship, educational institution, health care institution, site of special scientific interest, site of cultural heritage, bathing beach, marine park or marine reserve, fish culture zone or seawater intake point.*" According to the previous design, an additional sewage pumping station of less than 1,000m^3/day would be required within Area 10b. However, through design and option evaluation process, only a booster pump system within the proposed STW might be necessary to pump treated sewage via the submarine outfall. Hence, it is not qualified as a DP under Item F3 of Schedule 2. Since the capacity of the sewage treatment works, if required, is approximately 1,100 m^3 per day and is less than 5,000 m^3/day. Hence, it is not classified as a DP under F2 of schedule 2.

2.4.6.4 Item 1 of Schedule 3 refers to "*Engineering feasibility study of urban development projects with a study area covering more than 20ha or involving a total population of more than 100,000.*" According to the latest design, the total size area of Area 10b is approximately 6.3 ha and will accommodate 2,813 population. Hence, the proposed development will not be qualified as a DP under Item 1 of Schedule 3.

2.4.6.5 In accordance with the requirements of Section 5(1) of the EIAO, a project profile for the Project would need to be submitted to the Director of Environmental Protection (DEP) for application for an EIA Study Brief (EIA SB). Once the development proposal is more developed, a Project Profile (PP) will be submitted to DEP to issue an EIA SB. The project proponent would need to submit an EIA Report to fulfil all the requirements in the EIA SB and the TM-EIAO. An Environmental Permit (EP) would be required prior to the commencement of any construction works.

2.5 Concurrent Projects

2.5.1.1 A review has been conducted to collate the information on potential concurrent projects that are available from the public domain. These potential concurrent projects are discussed in the following sections to evaluate if there are potential for cumulative impacts during the construction and operation phase of the proposed development in Discovery Bay.

2.5.1.2 This is a strategic study initiated by the Government to study the feasibility of implementing artificial islands in the water to the east of Discovery Bay to support the longer term development of Hong Kong. At the time of preparing this report, there are neither development options nor confirmed development programme. Hence, this is not considered as a concurrent project for the purpose of this Environmental Study.

2.5.1.3 Residential development is also being considered in Area 6f. Given that Area 6f is located more than 700m away, adverse cumulative impacts, in particular, the aspect of water quality are unlikely and would be further discussed in **Section 6.4**.

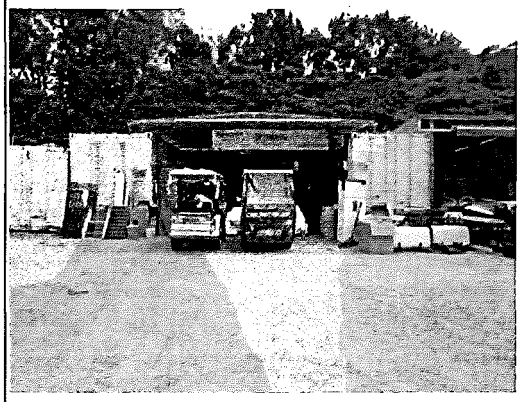
2.6 EIAO Implications

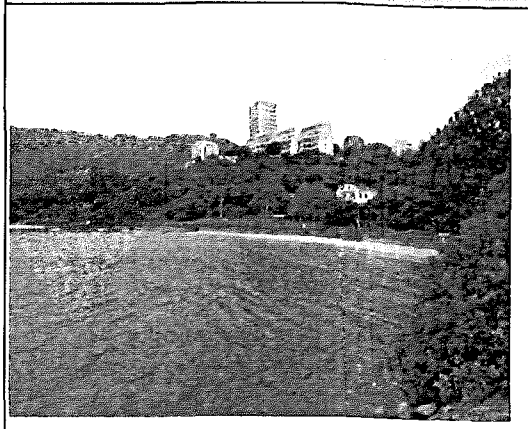
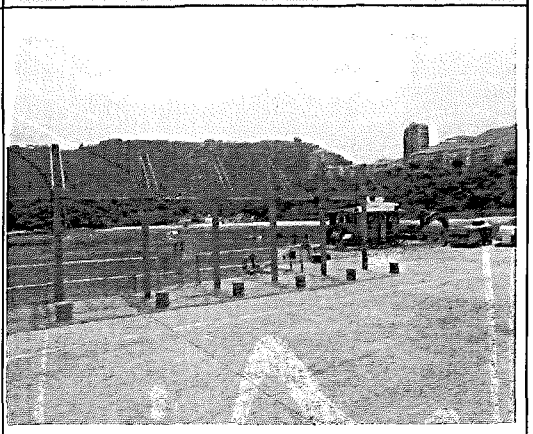
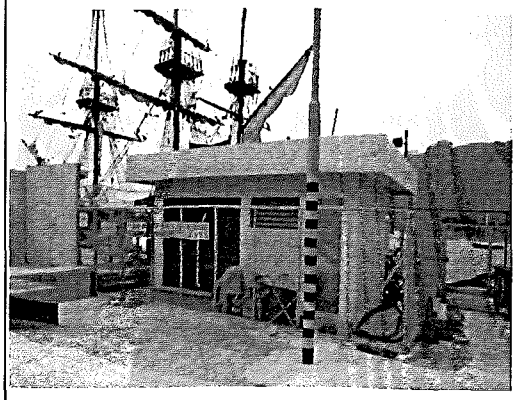
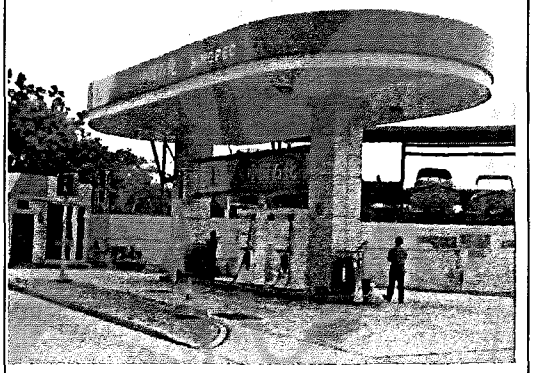
2.6.1.1 As discussed above, various construction items in the proposed development may constitute a DP under the EIAO. It is well noted the potential environmental impacts evaluated in this ES report shall be revisited in the later statutory EIA and the scope of assessments will be subject to the listed requirements in EIA SB which shall be issued by DEP after the submission of PP. Furthermore, detailed assessments/surveys shall be conducted and any proposed mitigation measures in this ES report will be further explored and agreed with relevant authorities in the future EIA.

3 Site Inspection

3.1.1.1 Several site visits were carried out in April – June 2014 and August 2016 to identify potential sources of environmental impact and sensitive receivers in the vicinity of Area 10b. The following table presents the images for Area 10b.

Table 3.1: Existing environment conditions

Viewpoint 1:Golf cart repair workshop	Viewpoint 2: Bus depot
	
Viewpoint 3: Overnight bus parking	**Viewpoint 4: A public refuse collection point**
	

Viewpoint 5: Nim Shue Wan	Viewpoint 6: Public ferry to Peng Chau / Mui Wo
	
Viewpoint 7: Existing boatyard	**Viewpoint 8: Petrol filling station**
	

4 Air Quality Assessment

4.1 Air Sensitive Receivers

4.1.1.1 Representative Air Sensitive Receivers (ASRs) [1] within the potential development area have been identified in **Table 4.1** and illustrated in **Figure 4-1.**

Table 4.1: Representative ASRs for air quality assessment

ASR ID	Description	Land use	Number of Storey	Building Hgt Above Local Ground (approx.) (m)
A10b-1	Planned building	Residential	4	15
A10b-2	Planned building	Residential	4	15
A10b-3	Planned building	Residential	4	15
A10b-4	Planned building	Residential	4	15
A10b-5	Planned building	Residential	4	15
A10b-6	Planned building	Residential	4	15
A10b-7	Planned building	Residential	4	15
A10b-8	Planned building	Residential	3	15
A10b-9	Planned building	Residential	3	15
A10b-10	Planned building	Residential	4	15
A10b-11	Planned building	Residential	4	15
A10b-12	Planned building	Residential	4	15
A10b-13	Planned building	Residential	4	15
A10b-14	Planned building	Residential	12	51
A10b-15	Planned building	Residential	18	71

[1] In accordance to Annex 12 of the TM-EIAO, Air Sensitive Receivers (ASRs) include any domestic premises, hotel, hostel, hospital, clinic, nursery, temporary housing accommodation, school, educational institution, office, factory, shop, shopping centre, place of public worship, library, court of law, sports stadium or performing arts centre. Any other premises or places with which, in terms of duration or number of people affected, have a similar sensitivity to the air pollutant as the aforelisted premises and places would also be considered as a sensitive receiver.

ASR ID	Description	Land use	Number of Storey	Building Hgt Above Local Ground (approx.) (m)
A10b-16	Planned building	Residential	6	25
A10b-17	Planned building	Residential	6	25
A10b-18	Planned building	Residential	4-5	29[1]
A10b-19	Planned building	Residential	4-5	27[1]
A10b-20	Planned building	Residential	4-5	27[1]
A10b-21	Planned building	Residential	18	80[1]

Note:

[1] These ASRs will be located on the top of a 9m podium. The building height shown in the table refer to the total height of the building and the podium. In the air quality model, "terrain mode" that the local ground level which considered in the model was selected. The "local ground level" of these ASRs in the model was referred to the top of the podium. Therefore, the building height of A10b-18, A10b-19, A10b-20 and A10b-21 were 20m, 18m, 18m and 71m, respectively.

4.1.1.2 Other than the above planned ASRs, a number of existing ASRs are also identified. The representative existing ASRs are summarized in **Table 4.2** and illustrated in **Figure 4-1.** As shown in **Figure 4-1**, the planned ASRs are located at locations more affected by pollution sources such as marine vessel emissions. Therefore, the existing ASRs are not selected for quantitative air quality assessment.

Table 4.2: Representative Existing ASRs

ASR ID	Description	Land use	Approximate Distance from the Site Boundary
A10b-22	Discovery Bay Marina Club	Recreational	15m
A10b-23	Verdant Court	Residential	15m
A10b-24	Haven Court	Residential	15m
A10b-25	Jovial Court	Residential	20m
A10b-26	Twilight Court	Residential	15m
A10b-27	La Costa Block 22	Residential	30m
A10b-28	La Vista Block 7B	Residential	50m

4.1.1.3 The relevant legislations and standards applicable to these ASRs are summarized in **Appendix 4.1**.

4.2 Air Pollution Sources

4.2.1 Construction Activities

Construction Dust

4.2.1.1 During construction phase, the reclamation works will be conducted by decking over the piles at the seashore. No backfilling of soil and major earth moving activities are required in compared with the convectional reclamation. Any possible dredging work for the future submarine outfall would not generate adverse dust emission as well. Hence, no adverse dust impact is anticipated from the reclamation works. For the superstructure works, the construction works of the development will not be conducted at the same time, but in multiple work front on the completed decking or existing flatland and no extensive excavation and site clearance works will be required. Hence, significant dust emission is therefore not anticipated provided that the relevant mitigation measures recommended in the Air Pollution Control (Construction Dust) Regulation are implemented.

4.2.1.2 The following dust suppression measures given in the Air Pollution Control (Construction Dust) Regulation should be incorporated by the Contractor to control the dust nuisance throughout the construction phase:

- Any stockpile of dusty material should be covered entirely by impervious sheeting or sprayed with water to maintain the entire surface wet and then removed or reinstated where practicable within 24 hours of the excavation or unloading;
- Any dusty material remaining after a stockpile is removed should be wetted with water and cleared from the surface of roads;
- A stockpile of dusty material should not extend beyond the pedestrian barriers, fencing or traffic cones;
- The load of dusty materials on a vehicle leaving a construction site should be covered entirely by impervious sheeting to ensure that the dusty materials do not leak form the vehicle;
- Where practicable, vehicles washing facilities including a high pressure water jet should be provided at every discernible or designated vehicle exit point. The area where vehicle washing takes place and the road section between the washing facilities and the exit point should be paved with concrete, bituminous materials or hardcores;

- When there are open excavation and reinstatement works, hoarding of not less than 2.4m high should be provided as far as practicable along the site boundary with provision for public crossing. Good site practice shall also be adopted by the Contractor to ensure the conditions of the hoardings are properly maintained throughout the construction period;
- The portion of any road leading only to construction site that is within 30m of a vehicle entrance or exit should be kept clear of dusty materials;
- Surfaces where any pneumatic or power-driven drilling, cutting, polishing or other mechanical breaking operation takes place should be sprayed with water or a dust suppression chemical continuously;
- Every stock of more than 20 bags of cement or dry pulverised fuel ash (PFA) should be covered entirely by impervious sheeting or placed in an area sheltered on the top and the three sides;
- Immediately before leaving a construction site, every vehicle shall be washed to remove any dusty materials from its body and wheels;
- Cement or dry PFA delivered in bulk should be stored in a closed silo fitted with an audible high level alarm which is interlocked with the material filling line and no overfilling is allowed; and
- Exposed earth should be properly treated by compaction, turfing, hydroseeding, vegetation planting or sealing with latex, vinyl, bitumen, shortcrete or other suitable surface stabiliser within six months after the last construction activity on the construction site or part of the construction site where the exposed earth lies.

Emission from Fuel Combustion Equipment to be used during Construction Works

4.2.1.3 Fuel combustion from the use of Powered Mechanical Equipment (PME) during construction works could be a source of NO2, SO2 and CO. To improve air quality and protect public health, EPD has introduced the Air Pollution Control (Non-road Mobile Machinery) (Emission) Regulation, which came in operation on 1 June 2015, to regulate emissions from machines and non-road vehicles. Starting from 1 December 2015, only approved or exempted non-road mobile machinery are allowed to be used in construction sites. Hence, with the effect of the Regulation, the emissions from PMEs are considered relatively small and will not cause adverse air quality impact.

4.2.2 Vehicular Emission

4.2.2.1 The Hong Kong Panning Standards and Guidelines (HKPSG) has specified the minimum setback distances between ASRs and different categories of roads, including trunk road and primary distributor, district distributor and local distributor. Since all the roads within Discovery Bay are private road and have no specific road type assigned. There is no specific road buffer requirement in HKPSG for private road. In order to assess the potential air quality impact form vehicular emission, the road buffer requirements in HKPSG of road type in similar nature is referenced.

4.2.2.2 As the Marine Drive provides direct access to the buildings within the district, the nature of these roads would be the same as "Local Distributor". Therefore, the buffer requirement of "Local Distributor" (i.e. 5m) is referenced for the purpose of evaluating the potential air quality impact induced by the road traffic activities.

4.2.2.3 As per the submitted Traffic Impact Assessment, the peak traffic flows of two major local roads, Discovery Bay Road and Marina Drive, would be only approximately 120 vehicles/hour and 90 vehicles/hour with all the developments (i.e. Area 6f and Area 10b) in place, respectively.

4.2.2.4 For Discovery Bay Road, the separate distance will be at least 30m and hence more than the HKPSG requirement of 5m. Besides the traffic forecast is only 120 veh/hr during peak hour. Hence, adverse air quality impacts due to Discovery Bay Road are not anticipated.

4.2.2.5 For the future realigned Marina Drive, most of the planned ASRs within Area 10b would have a separation distance of more than 5m. However, for some of the receivers along the seashore in the southern side of Marina Drive is less than 5m away from the Marina Avenue, which is considered as a local road, and cannot fulfill the 5m buffer requirements. However, it is noted that the traffic forecast of Marina Drive is only 90 vehicles per hour during the peak hour that adverse air quality impact is not anticipated. The bus depot will be located at the podium of the buildings along the northern side of the Marina Drive. However, the exact location is yet to be devised in the detailed design stage.

4.2.2.6 There are 54 no. of buses running in DB. Most bus services stop around mid-night. About 8 buses stay in Tai Pak bus terminus for overnight service. Currently these buses park in Area 10b open space. They are

eyesores to nearby residents and noise source at 5:30 am to 7am when they start leaving 10b to commence their routine daily services. Apart from the early morning and mid-night when buses are leaving for service and coming back for overnight parking, buses are coming back for refueling and cleaning at an average rate of 5-6 buses per hour in between the morning and evening peak daily.

4.2.2.7 The future depot provides a covered internal space to address such overnight bus parking need. The covered depot reduces the noise impact in the morning when many buses start their engine at more or less the same time. There are 6 no. of maintenance bays in existing bus depot, 2 of them equipped with maintenance pits. They allow regular and routine repair and maintenance to ensure all buses can run normally. As no. of buses increases, currently some repairs have to be done in external area not designed for bus maintenance. Hence 6 maintenance bays all equipped with maintenance pits are proposed in the rezoning application. In addition, night time maintenance activities are not anticipated. Apart from the maintenance bays no., the proposed depot is purely replacement of existing one. There is no DG store in existing bus depot. It is not required by the proposed depot. Buses fuel refilling is and will be done in the existing and future petro-filling station.

4.2.2.8 In addition, according to EPD, Euro I, II and III buses will not be licensed by end 2019. Hence by end 2019, out of the 54 buses in the fleet, 4 buses will be at Euro IV, 48 will be at Euro V or VI. The remaining 2 buses are electric buses. Hence, impacts of bus depot are not anticipated.

4.2.3 Industrial Emission

4.2.3.1 Site surveys conducted in May and June 2014 revealed that there is no existing chimney within 500m assessment area. The chimney information was further reviewed in November 2016 and January 2017. All the chimney information is still valid. Hence, no cumulative air quality impact from industrial emission is anticipated.

4.2.3.2 The proposed depot for buses and golf cars will be housed in a podium with residential blocks on top. Good design such as providing air purifying units and locating the exhaust air outlets away from the nearby residents would be implemented to avoid any air quality nuisance.

4.2.4 Marine Vessels Emission

4.2.4.1 Site inspections have revealed marine vessels activities within the 500m assessment area. These activities include:

- Passenger ferry service between Discovery Bay and Central;
- Kaito ferry service between Discovery Bay and Peng Chau;
- Kaito ferry service between Discovery Bay and Mui Wo;
- Marine light diesel refilling activities for passenger ferries (Discovery Bay / Central Route);
- Oil tanker for diesel delivery to the marine light diesel refilling facility;
- Tug boat and barge for LPG tanker vehicles delivery;
- Vessel for LPG bottle delivery;
- Sand barge;
- The Bounty and
- Yacht, speedboat and sailboat at marina and nearby area.

Passenger ferry service and Kaito ferry services

4.2.4.2 Based on the current passenger ferry and kaito schedule available from the Transport Department, the maximum marine traffic movements of the ferry services between Discovery Bay and Central, between Discovery Bay and Mui Wo, and between Discovery Bay and Peng Chau can be up to around 90, 16 and 40 trips per day respectively. As certain amounts of pollutants are generated during combustion of diesel from the ferries, emission from these ferry services are included in the near-field modelling. In addition, according to the proposed development layout shown in **Figure 2-1**, the existing pier of kaito ferry will need to be reprovided. Therefore, for the purpose of this assessment, the routes of the kaito services have been adjusted accordingly to allow for the same separation distance from the shoreline. The current and future navigation routes for various ferries are shown in **Figure 4-2** and **Figure 4-3** respectively.

4.2.4.3 There are two types of vessels, Catamaran ferries and Monohull ferries, providing ferry service between Discovery Bay and Central. The capacities of Catamaran ferries and Monohull ferries are about 500 and 300 passengers respectively. On the other hand, there is no information

from the operators of kaito ferry services between Discovery Bay and Mui Wo, and between Discovery Bay and Peng Chau.

4.2.4.4 With reference to the Traffic Impact Assessment accompanying this planning statement, the existing ferry service between Discovery Bay and Central would still operate with sufficient capacity with the additional residential developments in place. Therefore, no additional trip and projection of the emission from ferry service between Discovery Bay and Central is required.

4.2.4.5 Besides, there is no need to increase the kaito ferry between Discovery Bay and Mui Wo, and Discovery Bay and Peng Chau. However, in order to consider the cumulative impacts, the emission from existing kaito ferry services is also included in the assessment.

Marine light diesel refilling activities for passenger ferries (Discovery Bay / Central Route)

4.2.4.6 The current marine light diesel (MLD) refilling facility is located at Marina Avenue next to the Discovery Bay Marina Club. In order to cater for the future residential development, ferry diesel refilling will be conducted on marine based filling station outside Discovery Bay as advised by the operator. The oil tanker travelling route, and the ferry travelling route to and from MLD refilling facility will be located outside the 500m assessment area. Therefore, there will be no emission from the ferries during MLD refilling, and no traveling between the ferry pier at Tsoi Yuen Wan and the refilling facility within the assessment area in the future. Hence, marine emission due to the refilling activity would not be included in this assessment.

Oil tanker (Delivery of marine light diesel to Refilling Facility)

4.2.4.7 The refilling facility will be relocated and will not be present within the assessment area in order to cater for the future development. Therefore, no emission from the oil tanker is anticipated in the future. Hence, marine emission due to the MLD delivery would not be included in the near-field model in the quantitative assessment.

Tug boat and barge (Delivery of LPG Tanker Vehicles)

4.2.4.8 A barge towed by a tug boat will carry LPG tanker vehicles to the Discovery Bay every 5 to 6 days (i.e. about 5 to 6 times per month).

The engines on both tug boat and barge will be switched off during berthing, but the auxiliary engine will be intermittently used when lowering and hoisting the vehicle ramp and will last for about 10 minutes. Hence, emission from the tug boat and barge are included in the near-field model in the quantitative assessment. Based on the latest development layout plan, the uploading/unloading point will be slightly relocated from its current location and the navigation route will be changed accordingly. The current and future navigation routes are shown in **Figure 4-2** and **Figure 4-3** respectively.

Vessel for LPG Bottle Delivery and Sand Barge

4.2.4.9 A vessel for LPG bottle delivery and a sand barge for sand delivery will operate once every few months. The operating time of both vessels are limited to daytime (i.e. 7:00 am to 7:00 pm) during weekdays only and the navigation route as well as engine powers are similar to those of tug boat/barge. Due to site constraints, only one vessel can berth at the loading/unloading point at any one time. Hence, concurrent operations of these 3 types of vessel (i.e. tug boat/barge for LPG tanker vehicles delivery, vessel for LPG bottle delivery and sand barge) are not anticipated.

4.2.4.10 Based on the information from the operators, the operation of the LPG bottle delivery and sand barge would be carried out once per three months and once per week during daytime respectively. Hence, for the purpose of this study, a continuous operation of the tug boat/barge for LPG tanker vehicles delivery from 7:00 am to 7:00 pm during weekdays is assumed in the quantitative assessment. This conservative approach would cover the operations of the vessel for LPG bottle delivery and the sand barge as well.

The Bounty

4.2.4.11 The Bounty is currently for entertainment purpose and will operate very infrequently as advised by the operator. However, according to the latest information, Bounty services and its berthing area would not be re-provisioned as confirmed with the operator. Hence the Bounty would not be included in the quantitative assessment.

Yachts, Speedboats and Sailboats at Marina

4.2.4.12 Several site surveys have been conducted from April to June 2014 and revealed that there are also yachts, speedboats or sailboats travelling in

and out of the marina. Based on the site observations, the number of yachts, speedboats and sailboats movement is only about 1-2 vessels per hour. Once these yachts, speedboats and sailboats parked at the berths, their engines will be stopped and switched to power supplied by the marina. Together with the fact that these yachts, speedboats and sailboats have much smaller engines as compared to ferries, it is considered that their emission is unlikely significant. Hence, adverse cumulative air quality impact is not anticipated and therefore would not be included in the quantitative assessment.

4.2.5 Fireworks Displays Emission

4.2.5.1 Disneyland Theme Park is located at approximately 2.5 km north-east of Discovery Bay. There are fireworks displays every night, including weekdays and weekends. Fireworks launching location is illustrated in **Figure 4-4.** According to the schedule in Disneyland's website, fireworks displays will be conducted from 8:00 pm for a duration of about 15 minutes. According to the Theme Park EIA, firework displays in the Disneyland Park would emit RSP and heavy metals. However, emission of gaseous pollutants due to combustion of small amount of black powder is not anticipated according to Section 3.5.14 of the approved EIA study.

4.2.5.2 Hence, for the purpose of this report, assessments on the RSP and heavy metals emissions from fireworks displays are included in the near-field model. The latest Environmental Permits (EPs) (EP-01/059/2000/A, EP-01/059/2000/B and EP-01/059/2000/C) of the Disneyland Park has also been reviewed and site survey has been conducted to verify the assumptions, including types of heavy metals prohibited to be used in fireworks displays and bursting heights of fireworks.

4.2.5.3 Potential odour impact has also been considered in the approved EIA study, and it is predicted that the odour level contributed by the firework displays on Discovery Bay is only 0.05 OU, which is well below the criteria of 5 OU as stipulated in the Annex 4 of the EIAO-TM. Since there is no major odour source within the assessment area, adverse odour impact is not anticipated and quantitative assessment is not required.

4.2.6 Others

Odour from Existing Sewage Pumping Station

4.2.6.1 According to the current design, an addition sewage pumping station would no longer be necessary in Area 10b. The existing sewage pumping station would be potential odour source the planned receivers within Area 10b. According to site visit conducted earlier, there is no noticeable odour at the nearby the sewage pumping station. Hence, odour impact from the existing sewage pumping station is not anticipated.

Odour from Proposed Sewage Treatment Works

4.2.6.2 Depends on further discussion with the relevant authority, a new sewage treatment works (STW) may be required. The tentative location of the proposed sewage treatment works is shown in **Figure 4-1**. Subject to detailed design, secondary or better treatment, Membrane Bioreactor (MBR), will be implemented in proposed sewage treatment works. The sewage treatment facilities will be fully enclosed or covered with the provision of deodourizing unit. The design capacity of the (STW) would be around 1,100m^3 per day. It is recommended to achieve a 99% removal efficiency is recommended for the deodourizing unit subject to further assessment during detailed design stage. Other odour control devices, such as covering of the tanks, negative pressure, activated carbon filter etc, are required to contain the odour dispersion to the surrounding ASRs. Where necessary, water scrubbers could be considered as well.

4.2.6.3 In accordance with the approved EIA Outlying Islands Sewerage Stage 2 – Upgrading of Cheung Chau Sewage Collection, Treatment and Disposal Facilities (AEIAR-181/2013), the odour levels at the 3 closest ASRs to the Cheung Chau Sewage Works (CCSTW) with the installation of deodourizing unit of 99% removal efficiency would be:

- 3.5 OU at Cheung Chau Slaughter House (3m from the CCSTW)
- 2.7 OU at GIC-1 – C/IC Area near Pak Kok Tsui Road (23m from the CCSTW)
- 3.6 OU at North of Cheung Chau Sewage Treatment Plant (18m from the CCSW)

4.2.6.4 As the capacity of the proposed sewage treatment work is around 11% of that of CCSTW (i.e. MBR treatment with design capacity of

9,800m^3/day), the odour emission from the proposed sewage treatment work would be much lower than that of CCSTW. The closest ASR to the proposed STW in Area 10b is about 15m from the STW. Therefore, the odour impact of the proposed sewage treatment works could be mitigated to acceptable level by providing deodorizing unit and sufficient buffer distance between the exhaust of the deodourizing unit and ASRs. The exhaust location should be also located at the downwind location of the ASRs. The detail requirements of the deodourizing unit and buffer distance will be further determined during the EIA / detail design stage. As such, adverse odour impact is therefore not anticipated.

4.2.6.5 In addition, suitable buffer and landscaping features would be provided to minimise environmental and visual impacts on adjacent sensitive uses according to HKPSG.

Bus Depot

4.2.6.6 A new semi-confined bus depot will be provided in Area 10b. The design of the bus depot should follow the requirement of Practice Note for Professional Persons – Control of Air Pollution in Semi-confined Public Transport Interchanges (ProPECC PN1/98).

4.3 Operational Phase Air Quality Assessment on Marine Vessels Emission and Fireworks Displays

4.4 Methodology

4.4.1.1 For the marine vessels emission, operation information are collected from the operators as well as reviews on the EPD's "*Study on Marine Vessels Emission Inventory*" and other EIA studies has been conducted. Sire surveys were also conducted to supplement information.

4.4.1.2 For the fireworks displays, a review on the Theme Park EIA and the fireworks displays schedule from the operator has been conducted. Site surveys were also conducted to supplement information.

4.4.1.3 Detailed methodology of the air quality assessment is summarized in **Appendix 4.2**.

4.5 Assessment Results

4.5.1.1 The cumulative NO_2, RSP, FSP and SO_2 concentrations at each representative ASRs have been assessed. All the predicted pollutant concentrations of representative ASRs would comply with the relevant AQOs. Summary of the maximum predicted concentrations at planned ASRs among all assessment heights are presented in **Table 4.3** and assessment results at all assessment heights are detailed in **Appendix 4.3**.

Table 4.3: Cumulative NO_2, RSP, FSP and SO_2 concentrations at ASRs

ASR ID	Concentration (µg/m³)							
	NO_2		RSP		FSP		SO_2	
	19th highest 1-hour	Annual	10th highest 24-hour	Annual	10th highest 24-hour	Annual	Max 10-minute	4th highest 24-hour
A10b-1	130	30	75	40	56	28	138	30
A10b-2	130	30	75	40	56	28	138	30
A10b-3	131	30	75	40	56	28	138	30
A10b-4	132	30	75	40	56	28	139	30
A10b-5	131	30	75	40	56	28	139	30
A10b-6	130	31	75	40	56	28	139	30
A10b-7	130	32	75	40	56	28	139	30
A10b-8	147	39	76	40	57	29	139	30
A10b-9	134	31	75	40	57	28	139	30
A10b-10	136	31	76	40	57	28	139	30
A10b-11	130	31	76	40	57	28	138	30
A10b-12	129	30	75	40	56	28	138	30
A10b-13	129	30	75	40	56	28	138	30
A10b-14	130	30	75	40	56	28	138	30
A10b-15	129	30	75	40	56	28	138	30
A10b-16	130	32	75	40	56	28	138	30
A10b-17	129	32	75	40	56	28	138	30
A10b-18	130	31	75	40	56	28	139	30

ASR ID	Concentration ($\mu g/m^3$)							
	NO_2		RSP		FSP		SO_2	
	19th highest 1-hour	Annual	10th highest 24-hour	Annual	10th highest 24-hour	Annual	Max 10-minute	4th highest 24-hour
A10b-19	131	30	75	40	56	28	139	30
A10b-20	133	30	75	40	56	28	139	30
A10b-21	134	30	75	40	56	28	139	30
AQOs	**200**	**40**	**100**	**50**	**75**	**35**	**500**	**125**

4.5.1.2 As shown in **Appendix 4.3**, the worst hit level is found at 5m above ground for NO_2, annual RSP, and 10th highest 24-hour and annual FSP, 10m above ground for 10th highest 24-hour RSP, 20m above ground for 4th highest 24-hour SO_2 as well as 40m above ground for 10-minute SO_2, respectively. Contours of the 19th highest 1-hour NO_2, annual NO_2, 10th highest 24-hour RSP, annual RSP, 10th highest 24-hour FSP, annual FSP, maximum 10-minute SO_2 and 4th highest 24-hour SO_2 concentrations at the corresponding worst hit levels in the most concerned and critical area (i.e. Area 10b) are plotted in the following figures:

(1) **Figure 4-5** – Contours of Cumulative 19th highest 1-hour NO_2 Concentration at 5m above ground

(2) **Figure 4-6** – Contours of Cumulative Annual-average NO_2 Concentration at 5m above ground

(3) **Figure 4-7** – Contours of Cumulative 10th highest 24-hour RSP Concentration at 10m above ground

(4) **Figure 4-8** – Contours of Cumulative Annual-average RSP Concentration at 5m above ground

(5) **Figure 4-9** – Contours of Cumulative 10th highest 24-hour FSP Concentration at 5m above ground

(6) **Figure 4-10** – Contours of Cumulative Annual-average FSP Concentration at 5m above ground

(5) **Figure 4-11** – Contours of Cumulative maximum 10-minute SO_2 Concentration at 40m above ground

(6) **Figure 4-12** – Contours of Cumulative 4th highest 24-hour SO_2 Concentration at 20m above ground

4.5.1.3 According to the contours, it is observed that all the planned ASRs would comply with the respective criteria. Hence, no adverse air quality impact is anticipated.

4.5.1.4 In addition, the heavy metals concentrations at all planned ASRs also comply with the respective assessment criteria. The maximum predicted concentrations at ASRs among all assessment heights are presented in **Table 4.4** to **Table 4.6** below and assessment results at all assessment heights are detailed in **Appendix 4.3**. All the assessment results would comply with the relevant criteria.

Table 4.4: Maximum 1-hour heavy metals concentrations at planned ASRs

ASR ID	Max. 1-hour Concentration (μg/m³)					
	Aluminium	Antimony	Barium	Strontium	Copper	Titanium
A10b-1	0.734	0.238	0.583	0.305	0.284	0.074
A10b-2	0.689	0.218	0.536	0.280	0.270	0.068
A10b-3	0.626	0.191	0.470	0.244	0.250	0.060
A10b-4	0.528	0.148	0.368	0.190	0.219	0.046
A10b-5	0.479	0.127	0.316	0.162	0.204	0.040
A10b-6	0.484	0.129	0.322	0.165	0.206	0.040
A10b-7	0.470	0.123	0.307	0.157	0.201	0.038
A10b-8	0.426	0.103	0.261	0.133	0.187	0.032
A10b-9	0.363	0.076	0.196	0.098	0.168	0.024
A10b-10	0.417	0.100	0.252	0.128	0.185	0.031
A10b-11	0.427	0.104	0.263	0.133	0.188	0.033
A10b-12	0.425	0.103	0.261	0.132	0.187	0.032
A10b-13	0.428	0.105	0.264	0.134	0.188	0.033
A10b-14	0.387	0.087	0.221	0.111	0.175	0.027
A10b-15	0.366	0.077	0.199	0.099	0.169	0.024
A10b-16	0.447	0.113	0.283	0.144	0.194	0.035
A10b-17	0.481	0.128	0.319	0.164	0.205	0.040
A10b-18	0.566	0.165	0.408	0.211	0.231	0.051
A10b-19	0.553	0.159	0.394	0.204	0.227	0.050

ASR ID	Max. 1-hour Concentration (μg/m³)					
	Aluminium	Antimony	Barium	Strontium	Copper	Titanium
A10b-20	0.742	0.242	0.592	0.310	0.287	0.076
A10b-21	0.875	0.300	0.731	0.384	0.329	0.094
Criteria	--	--	--	--	**100**	--

Table 4.5: Maximum 8-hour heavy metals concentrations at ASRs

ASR ID	Max. 8-hour Concentration (μg/m³)					
	Aluminium	Antimony	Barium	Strontium	Copper	Titanium
A10b-1	0.257	0.030	0.085	0.038	0.134	0.009
A10b-2	0.251	0.027	0.079	0.035	0.133	0.009
A10b-3	0.244	0.024	0.071	0.031	0.130	0.007
A10b-4	0.231	0.019	0.058	0.024	0.126	0.006
A10b-5	0.225	0.016	0.052	0.020	0.124	0.005
A10b-6	0.226	0.016	0.053	0.021	0.125	0.005
A10b-7	0.224	0.015	0.051	0.020	0.124	0.005
A10b-8	0.219	0.013	0.045	0.017	0.122	0.004
A10b-9	0.211	0.010	0.037	0.012	0.120	0.003
A10b-10	0.218	0.012	0.044	0.016	0.122	0.004
A10b-11	0.219	0.013	0.045	0.017	0.122	0.004
A10b-12	0.219	0.013	0.045	0.017	0.122	0.004
A10b-13	0.219	0.013	0.045	0.017	0.122	0.004
A10b-14	0.214	0.011	0.040	0.014	0.121	0.003
A10b-15	0.211	0.010	0.037	0.012	0.120	0.003
A10b-16	0.221	0.014	0.048	0.018	0.123	0.004
A10b-17	0.226	0.016	0.052	0.020	0.124	0.005
A10b-18	0.236	0.021	0.063	0.026	0.128	0.006
A10b-19	0.234	0.020	0.061	0.025	0.127	0.006
A10b-20	0.258	0.030	0.086	0.039	0.135	0.009
A10b-21	0.275	0.037	0.104	0.048	0.140	0.012
Criteria	--	--	**500**	--	--	--

Table 4.6: Annual-average heavy metals concentrations at ASRs

ASR ID	Annual Concentration (µg/m³)					
	Aluminium	**Antimony**	**Barium**	**Strontium**	**Copper**	**Titanium**
A10b-1	0.189	<0.001	0.014	<0.001	0.113	<0.001
A10b-2	0.189	<0.001	0.014	<0.001	0.113	<0.001
A10b-3	0.189	<0.001	0.014	<0.001	0.113	<0.001
A10b-4	0.189	<0.001	0.014	<0.001	0.113	<0.001
A10b-5	0.189	<0.001	0.014	<0.001	0.113	<0.001
A10b-6	0.189	<0.001	0.014	<0.001	0.113	<0.001
A10b-7	0.189	<0.001	0.014	<0.001	0.113	<0.001
A10b-8	0.189	<0.001	0.014	<0.001	0.113	<0.001
A10b-9	0.189	<0.001	0.014	<0.001	0.113	<0.001
A10b-10	0.189	<0.001	0.014	<0.001	0.113	<0.001
A10b-11	0.189	<0.001	0.014	<0.001	0.113	<0.001
A10b-12	0.189	<0.001	0.014	<0.001	0.113	<0.001
A10b-13	0.189	<0.001	0.014	<0.001	0.113	<0.001
A10b-14	0.189	<0.001	0.014	<0.001	0.113	<0.001
A10b-15	0.189	<0.001	0.014	<0.001	0.113	<0.001
A10b-16	0.189	<0.001	0.014	<0.001	0.113	<0.001
A10b-17	0.189	<0.001	0.014	<0.001	0.113	<0.001
A10b-18	0.189	<0.001	0.014	<0.001	0.113	<0.001
A10b-19	0.189	<0.001	0.014	<0.001	0.113	<0.001
A10b-20	0.189	<0.001	0.014	<0.001	0.113	<0.001
A10b-21	0.189	<0.001	0.014	<0.001	0.113	<0.001
Criteria	**100**	**5**	**5**	**--**	**2.4**	**100**

4.6 Recommended Mitigation Measures

4.6.1.1 The key air pollutants (i.e. NO_2, RSP, FSP, SO_2 and heavy metals) at all planned ASRs would comply with AQOs and relevant assessment criteria, no adverse air quality impact is therefore anticipated and no mitigation measures are required.

4.6.1.2 For the proposed STW together with the booster pump system, deodourizing units of 99% odour removal efficiency is recommended to be installed to mitigate the odour impact to acceptable level subject to further assessment during the detailed design stage respectively. Other odour control measures, such as covering the sewage tank, activated carbon filter and negative pressure, should be also considered for the sewage treatment works. It is also recommended that exhausts should also located at the downwind location of the ASRs.

4.7 Conclusion

4.7.1.1 All the relevant air emission sources, including vehicular emission and marine vessels emission in the vicinity of Discovery Bay, and firework emission at the Disneyland Theme Park, that would have air quality impacts on the proposed developments have been identified and assessed.

4.7.1.2 Considering the comparatively low local traffic volume, significant air quality impact from vehicular emission on the proposed development is not anticipated.

4.7.1.3 Quantitative air quality assessment, taking into account the marine vessels emission in the vicinity of Discovery Bay and fireworks displays at Disneyland Theme Park, has been conducted. It is concluded that the predicted cumulative air quality impacts on all air sensitive uses would comply with the AQOs and relevant assessment criteria. Hence, adverse air quality impact on the proposed development is not anticipated.

4.7.1.4 Odour from potential sewage treatment works can be controlled by implementing suitable odour control measures, such as deodourizing unit, covering the sewage tank, activated carbon and negative pressure, subject to further assessment during detailed design stage.

5 Noise Assessment

5.1 Description of the Environment

5.1.1.1 The entire Discovery Bay has a relatively tranquil environment without any major noise sources that would impose adverse noise impacts on the neighbouring community. All the existing roads within Discovery Bay are local roads on which only licenced vehicles such as golf cars, shuttle buses and services vehicles are allowed to use. As observed on site, all the shuttle buses are Euro IV buses.

5.1.1.2 Other than road traffic, the commuting ferries between Discovery Bay and Central are another noise source within the Discovery Bay area. However, the majority of the residential developments in Discovery Bay have ample separation from the main navigation route. Besides, there are some services areas along the seafront north of Nim Shue Wan at which bus depot, petrol filling stations, sewage pumping station etc. are located. The kaitos commuting to Peng Chau and Mui Wo also land at this seafront.

5.2 Noise Sensitive Receivers

5.2.1.1 Several site visits were carried out in April 2014 to identify potential sources of environmental impact and sensitive receivers in the vicinity of the site. Photographs taken on site and the neighbouring areas are shown in **Section 3** to illustrate the existing context. Some general descriptions in terms of the noise environment have been described in **Section 5.1**. The following sections presents the NSRs identified for the potential development area for subsequent noise assessment.

5.2.1.2 Area 10b (see **Figure 5-1**) will accommodate residential premises within the existing services areas along Marina Avenue. The existing facilities including bus depot, petrol filling stations (for both vessels and vehicles) and landing point for kaito would be relocated to suit the development layout. As confirmed with the facility operator, the Bounty services currently available at Area 10b will not be re-provisioned in the future construction and operational phase of the Project. Hence, berthing area for the Bounty would no longer be necessary. Subject to further discussion with the relevant authorities, a sewage treatment works may be required. Relevant legislation that are applicable to noise impact is given in **Appendix 5.1**.

5.2.1.3 Since the future residential premises facing Nim Shue Wan would also be overlooking on the vessel movements, including the kaito movements, sand barge operations, therefore, a number of

considerations have been incorporated in the layout design of Area 10b (see **Figure 2-1**) to reduce the fixed noise impact due to these activities. Those design include an 8m tall solid wall next to kaito pier, an 8.8m tall solid wall next to goods delivery pier and 7.8m tall solid wall at 3-storey low rise development which was near to goods delivery pier. A number of representative NSRs have been selected for the purpose of this assessment. These representative NSRs include the following:

Table 5.1: Selected representative planned NSRs

NSR ID	Description	Uses
N10b-B1	3 storey development	Residential
N10b-B2	3 storey development	Residential
N10b-B4	3 storey development	Residential
N10b-B5	4 storey development	Residential
N10b-B8	4 storey development	Residential
N10b-D1	6-storey development	Residential
N10b-D5	18-storey development	Residential
N10b-D6	6-storey development	Residential
N10b-D8	6-storey development	Residential
N10b-A1	3 storey development	Residential
N10b-A2	3 storey development	Residential
N10b-A4	3 storey development	Residential
N10b-A5	3 storey development	Residential
N10b-A6	4 storey development	Residential
N10b-A8	4 storey development	Residential
N10b-A10	4 storey development	Residential
N10b-A15	4 storey development	Residential
N10b-C18	4 storey development	Residential

Table 5.2: Selected representative existing NSRs

NSR ID	Description	Uses	Approximate Distance from Site Boundary
EN10b-1	Twilight Court	Residential	20m

5.3 Road Traffic Noise Assessment

5.3.1.1 As discussed in **Section 5.1**, unlike the situations in other urban areas, all the shuttle buses operating within Discovery Bay are Euro IV type vehicles. Only licensed vehicles are allowed using the Discovery Bay Tunnel to access various parts of Discovery Bay. Besides, vans are prohibited after 6pm even if they have been issued with the license to use the Discovery Bay Tunnel.

5.3.1.2 With all the proposed developments in place, the traffic flow would only the approximately 120 veh / hr and 90 veh / hr for Discovery Bay Road and Marina Avenue respectively, which are categorized as local roads. Hence, given that relatively low traffic flows, adverse road traffic noise impacts are not anticipated and mitigation measures are not required.

5.4 Marine Traffic Noise Assessment

5.4.1 Assessment Results

5.4.1.1 Potential marine traffic noise impacts on Area 10b are anticipated from existing public ferry, kaito, tugboat with barge, the marina at Discovery Bay, sand barge and LPG container vessel. The marine traffic noise assessment methodology and source term measurement are given in **Appendix 5.2** and the predicted cumulative marine noise levels at the representative NSRs are presented in **Appendix 5.3** and summarized in the tables below.

Table 5.3: Predicted marine traffic noise impacts for Area 10b (Daytime & Evening time)

NSR ID	Period	PNL, $L_{eq\ 1hr}$	Max Predicted Noise Levels [1], dB(A)
N10b-B1	Daytime & Evening time	61	51
N10b-A1			50
N10b-A10			48
N10b-A15			47

Note:
[1] Bold value denotes non-compliance with criteria.

Table 5.4: Predicted marine traffic noise impacts for Area 10b (Nighttime)

NSR ID	Period	PNL, $L_{eq\ 1hr}$	Max Predicted Noise Levels [1], dB(A)
N10b-B1	Nighttime	56	44

NSR ID	Period	PNL, $L_{eq\ 1hr}$	Max Predicted Noise Levels [1], dB(A)
N10b-A1			42
N10b-A10			47
N10b-A15			46

Note:
[1] Bold value denotes non-compliance with criteria.

5.4.1.2 It can be seen from the above table that the predicted marine traffic noise levels at all the representative NSRs in this area will be below the PNL and hence further noise mitigation measures are not required.

5.5 Fixed Noise Assessment

Land-based Fixed Noise Sources

5.5.1.1 Existing noise sources include an existing sewage pumping station, a golf cart repair workshop, bus depot and overnight bus parking area, a public refuse collection point, all of which are located along Marina Avenue.

5.5.1.2 According to site survey, noise generated from the existing sewage pumping station was not noticeable. Hence, it would not contribute to any potential fixed noise impact.

5.5.1.3 According to the latest information, these existing noise sources such as the golf car repair workshop, bus depot, refuse collection point, will be located at a podium structure which is fully enclosed. The design of the podium will ensure that any direct line of sight between the noise sources and the surrounding residential developments will be avoided. In addition, these noise sources should be a major consideration in their determining their locations and site layouts. With reference to HKPSG, where opportunity arises and having due regard to the operational requirements, the siting of such facilities should take into account the potential locations of ingress/egress and the consequent noise disturbances due to traffic routings, particularly during sensitive hours. Consideration should also be given to adopting administrative controls so that the degree of noise disturbances can be further reduced.

5.5.1.4 In addition, the podium is a fully enclosed structure apart from entrance / exit of these noise sources and ventilation opening. It should also be

noted that there would not be any maintenance activity within the depot during night-time period unless during emergency. Since the exact location of ventilation opening is yet available, a backward calculation of fixed noise source is conducted for the maximum allowable Sound Power Level (SWL). As the minimum distance from the proposed building to podium edge is 5m and an ASR A has been adopted (i.e. Daytime noise criterion of 55 dB(A)) for the development, the maximum SWL will be 74 dB(A) according to standard acoustic principle of point source correction with 3dB(A) facade correction. Therefore, although mechanical ventilation is required, with the use of silencer / acoustic louvre, adverse noise impacts caused by these fixed noise sources are not anticipated.

5.5.1.5 A sewage treatment work (STW) together with the booster pump system may be required at Area 10b. Since the design detail is yet available, a backward calculation of fixed noise source is conducted for maximum SWL. As the minimum distance from the proposed STW to the nearest existing NSR Twilight Court (EN10b-1) and planned NSR (N10b-C18) are 32m and 22m separately. The maximum allowable SWL of ASR A for night time criterion of 45dB(A) will be 80 dB(A) and 77 dB(A) respectively. Therefore, although mechanical ventilation is required, with the use of silencer / acoustic louvre, adverse noise impacts caused by these fixed noise sources are not anticipated.

5.5.1.6 In case the previous water treatment facilities needs to be re-commissioned, they would generate some noise during its operation. However, it is located at more than 1000m away and screened by the hilly terrains between Area 10b and the water treatment work. Hence, adverse fixed noise impact is not anticipated.

Marine-based Fixed Noise Sources

5.5.1.7 As discussed in **Section 5.5.1**, the noise generated by the idling marine vessels would be assessed as fixed noise sources. According to the latest design, the following marine-based fixed noise sources shall be considered:

- Vessels idling (e.g. kaito, tugboat, sand barge, vessel for the gas bottle supplier);
- Lift on and off landing board of barge;
- Lorries engine on barge;
- Loading and unloading of gas bottle; and
- Loading and unloading of sand barge (operation of conveyor belt on sand barge and trucks).

5.5.1.8 As discussed in **Section 5.5.1**, most of the industrial noise sources along Marina Avenue would be located to a podium structure with suitably sited opening to avoid direct line of sight between the noise sources and the surrounding residential developments. Therefore, the potential fixed noise impacts would be only due to marine activities from ferry idling at public ferry and kaito pier, idling, sand loading due to operation of conveyor at sand barge and LPG glass bottle and unloading. According to the information from operator, there would be acoustic treatment, such as acoustic mat for the conveyor belt of sand barge and temporary noise barrier for crane of LPG glass bottle loading and unloading in future operation. Typically, a noise reduction of 10dB(A) for acoustic mat and temporary noise barrier for stationary source was adopted as in other in approved EIA Reports such as that for North East New Territories New Development Areas (AEIAR-175/2013). A noise reduction of 10 dB(A) for conveyor bell during sand loading and LPG glass bottle loading by crane has therefore been adopted in this assessment. The predicted noise levels at the representative NSRs are presented in the table below. Moreover, according to the information from the operators and/or the operation pattern observed, there would be no night-time operation of sand barge, LPG container vessels, tug boat and Mui Wo kaito. As such, these activities were not included in the night-time fixed noise assessment. The fixed noise assessment methodology and source term measurement are given in **Appendix 5.4** and the detailed calculation of predicted fixed noise levels is shown in **Appendix 5.5**.

5.5.1.9 It can be seen from the table that the predicted fixed noise levels at all the representative NSRs in this area will comply with the noise criteria and hence further noise mitigation measures are not required.

Table 5.5: Fixed noise assessment results – unmitigated case (daytime and evening time)

NSRs ID	Period	Criteria (ANL-5), dB(A)	Daytime max predicted noise level, dB(A)	Exceedance over ANL-5 dB(A)
N10b-B1	Daytime &	55	54	-

NSRs ID	Period	Criteria (ANL-5), dB(A)	Daytime max predicted noise level, dB(A)	Exceedance over ANL-5 dB(A)
N10b-B2	Evening		53	-
N10b-B4			54	-
N10b-B5			55	-
N10b-B8			53	-
N10b-D1			55	-
N10b-D5			50	-
N10b-D6			52	-
N10b-D8			53	-
N10b-A1			52	-
N10b-A2			51	-
N10b-A4			47	-
N10b-A5			55	-
N10b-A6			55	-
N10b-A8			53	-

Table 5.6: Fixed noise assessment results – unmitigated case (nighttime)

NSRs ID	Period	Criteria (ANL-5), dB(A)	Daytime max predicted noise level, dB(A)	Exceedance over ANL-5 dB(A)
N10b-B1	Nighttime	45	43	-
N10b-B2			39	-
N10b-B4			35	-
N10b-B5			43	-
N10b-B8			40	-
N10b-D1			40	-
N10b-D5			36	-
N10b-D6			39	-
N10b-D8			40	-
N10b-A1			33	-
N10b-A2			32	-
N10b-A4			30	-
N10b-A5			34	-
N10b-A6			38	-
N10b-A8			37	-

5.6 Firework Display Noise Assessment

5.6.1 On-site firework display noise measurements were conducted at two

locations (#F1 and #F2) to determine background noise level and 15-minute equivalent noise level ($L_{eq\ (15\ min)}$) during firework display period. The firework display noise measurement locations are summarized in **Table 5.6** and illustrated in **Appendix 5.6**.

Table 5.7 Possible noise source from Disneyland

Measurement locations	Description
#F1	At the existing Lookout Point
#F2	At the existing breakwater

5.6.2 For each noise measurement, ambient measurements were taken immediately before and after the firework display to establish the Background Noise Level (BNL). Measured Noise level (MNL) was also taken for the 15-minute timeframe during firework display. Based on these measurements, the Corrected Noise Level (CNL) was calculated and compared against the noise criterion as discussed in **Appendix 5.1**.

5.6.2.1 The predicted firework display noise levels at the two measurement locations are summarized in **Table 5.7**. Detailed calculation of firework display noise results is shown in **Appendix 5.7**.

Table 5.8: Summary of firework display noise assessment results

Noise Level	Noise Impacts, $L_{eq\ (15\ min)}$, dB(A)	
	F1	F2
Corrected Noise Level	52	53
Noise Criterion	55	
Exceedance	-	-

Note:

[1] Facade correction has been considered in noise calculation.

5.6.2.2 Two firework display noise measurement at F1 and F2 are approximately located at 3.9 km and 2.7 km from Disneyland and are within the noise criterion of $L_{eq\ (15\ min)}$ 55 dB(A). The proposed layout of Area 10b will be located further away from Disneyland than the distance between F2 from Disneyland. Hence, the existing firework display at Disneyland is not anticipated to generate adverse noise impacts.

5.7 Recommended Mitigation Measures

5.7.1.1 The noise assessments results have shown that noise impact due to road traffic, marine traffic, fixed noise, and fireworks are not anticipated.

5.7.1.2 As stated in **Section 5.5**, a podium structure will be provided for Area 10b to avoid direct line of sight between the noise sources and the surrounding residential developments. The relocation of existing noise sources will be fully enclosed within the podium structure except the ingress / egress of such facilities and consideration of such facilities should made reference to HKPSG.

5.7.1.3 In addition, as discussed in **Section 5.2**, a number of considerations have been incorporated in the layout design of Area 10b (see **Figure 5-2**) to reduce the fixed noise impact due to these activities. Those design include an 8m tall solid wall next to kaito pier, an 8.8m tall solid wall next to goods delivery pier and 7.8m tall solid wall at 3-storey low rise development which was near to goods delivery pier.

5.8 Conclusion

5.8.1.1 A noise impact assessment has been conducted to evaluate the operational impacts based on the current layout.

5.8.1.2 Road traffic noise impact has been reviewed. Results indicate that the road traffic noise impact would not be anticipated.

5.8.1.3 A preliminary assessment has been for marine noise impact based on measurement data. Results indicate that the noise impacts on NSRs would below the measured background noise level and hence further mitigation measure is not required.

5.8.1.4 A preliminary assessment has been conducted for fixed noise impact based on site measurement and operational information from operators. With implementing the consideration in layout design (such as solid walls) and acoustic mat for conveyor belt, temporary noise barrier for crane, use of silencer / acoustic louvre), adverse fixed noise impacts would not be anticipated.

5.8.1.5 A preliminary assessment has been conducted for firework display noise impact on site measurement and observation. Results indicate that the firework display noise would not cause adverse impact.

6 Water Quality Assessment

6.1 Description of the Environment

6.1.1 Existing Water Environment

6.1.1.1 The project sites fall within the Southern Water Control Zone (WCZ) and are located at Discovery Valley at east Lantau, downstream of Lo Fu Tau and Discovery Bay Reservoir. Tai Pak Wan, a non-gazetted beach, is within the boundary of Discovery Bay. Besides, a Coastal Protection Area is located at the northern edge of Tai Pak Tsui Peninsula to conserve the natural coastline.

6.1.1.2 Area 10b is located at the seawall in the southwest side of Tai Pak Tsui Peninsula. Nim Shue Wan adjoins the southern boundary of Area 10b and the water current in Nim Shue Wan is generally calm. Surface runoff from existing land area is discharged into Nim Sue Wan.

6.1.2 Existing Sewerage System

6.1.2.1 Discovery Bay has been implemented with a sewerage system to collect all the sewage and wastewater generated from daily activities. All the existing sewage and wastewater collected from the sewerage system is diverted to Siu Ho Wan Sewerage Treatment Works via pumping stations and the outfall is located at north Lantau which is far away from Discovery Bay.

6.1.3 Water Quality Sensitive Receivers

6.1.3.1 A review has been conducted to identify the Water Quality Sensitive Receivers (WSRs) in the vicinity that may be impacted by the potential development area. The following table summarizes these WSRs and they are illustrated in **Figure 6-1**. The relevant legislation and standards related to water quality are summarised in **Appendix 6.1**.

Table 6.1 Water quality sensitive receivers

Water Sensitive Receivers [1]	**Description**
WSR01 – Discovery Bay Reservoir	Primary reservoir for flushing, located upstream of the potential development areas
WSR 02 – Discovery Bay Reservoir Spillway and	Spillway from Discovery Bay Reservoir and the tributaries, chainage runs along Discovery Valley Road and downstream to

Water Sensitive Receivers [1]	Description
Tributaries	Tsoi Yuen Wan
WSR03 – Nim Shue Wan Stream	Natural stream downstream from the existing golf course to Nim Shue Wan
WSR04 – Tai Pak Wan	Non-gazetted beach downstream to Discovery Bay Reservoir Spillway
WSR05 – Hai Tei Wan Marina	Marina at Hai Tei Wan next to Discovery Bay Road
WSR 06 – Nim Shue Wan	Nim Shue Wan
WSR07 – Tai Pak Tsui Peninsula Coastal Protection Area (CPA)	Protected natural shoreline at north of Tai Pak Tsui Peninsula

Note:
[1] The nearest water gathering ground is located at 5.6 km away

6.2 Identification and Evaluation of Environmental Impacts during Construction Phase

6.2.1 Pollution Sources

Site Runoff

6.2.1.1 During rainstorm events, construction site runoff would come from all over the works site. These surface runoff might be polluted by:

- Runoff and erosion from site surfaces, earth working areas and stockpiles;
- Wash water from dust suppression sprays and wheel washing facilities; and
- Chemicals spillage such as fuel, oil, solvents and lubricants from maintenance of construction machinery and equipment.

6.2.1.2 Construction runoff may cause physical, biological and chemical effects. The physical effects include potential blockage of drainage channels and increase of suspended solid levels in the Southern WCZ. Runoff containing significant amounts of concrete and cement-derived material may cause primary chemical effects such as increasing turbidity and discoloration, elevation in pH, and accretion of solids. A number of secondary effects may also result in toxic effects to water biota due to elevated pH values, and reduced decay rates of faecal micro-organisms and photosynthetic rate due to the decreased light penetration. All the best practices will be implemented to reduce and minimise the generation of construction run-off.

Sewage from Workforce

6.2.1.3 Sewage effluents will arise from the sanitary facilities provided for the on-site construction workforce. According to Table T-2 of Guidelines for Estimating Sewage Flows for Sewage Infrastructure Planning, the unit flow is 0.15 m^3/day/employed population. The characteristics of sewage would include high levels of BOD_5, Ammonia and *E. coli* counts. Since sufficient portable chemical toilets and sewage holding tanks will be provided, no adverse water quality impact is anticipated.

Construction of Decking-Over Piles Along Waterfronts

6.2.1.4 The low-rise residential buildings in Area 10b will be constructed on the southwest seashore of Tai Pak Tsui Peninsula adjoining Nim Shue Wan (WSR04) and the entrance of Hai Tai Wan Marina (WSR03). As discussed in **Section 2**, the existing seafront would be expanding by a width of 9-34m. According to the latest design, in order to minimize hydrodynamic and water quality impact, the new platform along the coastline would be constructed by decking-over piles and only minor modification works would be required for the existing seawall, including relocation of existing piers, will need to be conducted below water level, and the details will be established in the detailed design stage. To avoid/minimise water quality impacts due to the piling works, steel casings will firstly be installed at the proposed pile locations. The steel casings extend above the sea and will prevent soil or rock arisings from being disposed of into the sea. The arisings will be removed from within the piles to a barge anchored close to the piles. Once the materials inside the casings were removed, steel reinforcements/structural sections will be lowered inside the casing and then followed by concreting work. To control the sediment plume that may be dispersed to nearby WSRs during seabed disturbance, environmental friendly construction methods such as installing silt curtains should be considered. However, further studies would need to be conducted to determine the size and spacing of the piles etc.

Dredging

6.2.1.5 It may be necessary to conduct some dredging to facilitate the implementation of the submarine outfall, subject to its ultimate location, which would be determined in the detailed design stage. The dredging process would be carried out by closed-grab dredger and other appropriate mitigation measures to control the dispersion of the

sediment plume, such as installing silt curtains.

Wastewater from Decontamination Works

6.2.1.6 As the existing site comprises bus repair workshop, boat servicing yard, etc. should land decontamination works be carried out during construction phase of this area, the method for handling and disposal of wastewater contaminated with chemical waste should be addressed. As a general site practice of soil decontamination works (i.e. Stabilization/ Solidification or Biopile), impermeable sheeting should be used to cover stockpiles of the treated soil to prevent dust and runoff. Concrete bunds surrounding the treatment area should also be implemented to collect the possible spillage or leachate generated and recycled back to the treatment. In case there is any sign of excess leachate present within the site, the excess leachate should be diverted to a designated storage area for temporary storage and collected by a licensed chemical waste collector.

6.3 Recommended Mitigation Measures during Construction Phase

6.3.1 General Construction Activities the Potential Development Area

Site Runoff and Sewage from Workforce

6.3.1.1 Given the relatively small amount of site formation work for Area 10b, the water quality impacts during construction phase is not anticipated. Nevertheless, standard good site practices such as perimeter cut off drains, silt removal facilities, temporary toilet etc. would still be required. For site runoff, perimeter cut off with internal drainage works and erosion and sedimentation control facilities around the site area shall be implemented. Channels, earth bunds and sand bag barriers would also be provided on site to direct storm water to silt removal facilities. In addition, the design of temporary on-site drainage should prevent runoff going through site surface, construction machinery and equipment to avoid polluted runoff. Sedimentation tanks with sufficient capacity should also be provided as mitigation measure for settling surface runoff prior to disposal. Also, discharge into the marina will be avoided. With the implementation of the above mitigation measures, it is anticipated that the impacts from discharge of site runoff / wastewater

is not insurmountable. A comprehensive list of those standard measures is given in **Appendix 6.2**.

6.3.1.2 During the construction works for the platform along the waterfront of Area 10b, open sea dredging would be avoided and a deck will be constructed over piles. As compared to the conventional reclamation process that would demand dredging, the current methodology would avoid the release of significant amount of sediment which may have certain impacts on the neighbouring WSRs. The following good practice shall apply for the construction of piles and any dredging works, if necessary for the future submarine outfall.

- Install efficient cage-typed silt curtains, i.e. at least 80% SS reduction, at the point of dredging/filling to control the dispersion of SS;
- Water quality monitoring should be implemented to ensure effective control of water pollution and recommend additional mitigation measures required;
- The descent speed of grabs should be controlled to minimize the seabed impact and to reduce the volume of over-dredging;
- Make use of closed-grab dredger to conduct any dredging works; and
- All vessels should be sized so that adequate clearance is maintained between vessels and the seabed in all tide conditions, to ensure that undue turbidity is not generated by turbulence from vessel movement or propeller wash.

6.4 Identification and Evaluation of Environmental Impacts during Operational Phase

6.4.1.1 EPD advised in May 2015 that the design capacity of the SHWSTW has been allocated for the treatment of the sewage arising from the development of the Expansion of Hong Kong International Airport into a Three Runway System, the new town development under Tung Chung New Town Expansion and the Penny's Bay Phase 2 development, etc. Therefore, SHWSTW has no spare capacity to cater for the sewage arising from any proposed Discovery Bay further development and the Sewerage Authority has no plan to increase the design capacity of the SHWSTW in the short and medium terms.

6.4.1.2 Therefore, the current proposal is to receive the additional sewage from Area 10b, a new sewage treatment plant within Discovery Bay would need to be commissioned. A discharge license will be obtained under the WPCO prior to discharge. The design flow rate of the proposed

new sewage treatment plant would be around 1,100 m^3 per day (i.e. based on an estimated population of 2,813 for Area 10b and each has a flow rate of 370L/day (ADWF) and hence around 1,080m^3/day in total as per EPD's Technical Paper Report No. EPD/TP1/05-Guidelines for Estimating Sewage Infrastructure Planning (GESF)). A tentative marine outfall is proposed as shown in **Figure 6-1** near Area 10b. The peaking hourly flow rate would be approximately 75L/s according to table T5 of GESF by adopting a peak factor of 6. The details of effluent standard has been presented in Annex E Technical Note - Preliminary Water Quality Assessment.

6.4.1.3 Secondary or better treatment such as Membrane Bioreactor (MBR) would be implemented in the proposed sewage treatment works if the new marine outfall is located at a location near to the shore. The outfall location will be determined during the detailed design stage without affecting the land use compatibility. Nevertheless, the current tentative location is located at the area where the water depth is deeper (~4.5m) and the current is stronger. It is also at around 300m from the marina and at least 6km from the fish culture zone in Cheung Sha Wan and Ma Wan. Besides, the current tentative location is 1.3km away from Tai Pak Wan where, although not a gazetted beach, many people uses that for recreational uses. This additional effluent would have impacts on both water quality and marine ecology. However, with the implementation of suitable treatment method, it is anticipated that the discharge from the sewage treatment works would meet the criteria of WPCO.

6.4.1.4 A preliminary water quality impact assessment has been conducted for the tentative marine outfall (see **Appendix 6.3**). The assessment indicates that the water quality in the vicinity of the marine-based WSRs would be in compliance with Water Quality Objectives (WQOs) in suspended solid, *E. coli* and unionised ammonia. Although exceedance of Total Inorganic Nitrogen (TIN) under WQO is observed, the contribution of the high TIN level is due to the background from Pearl River estuary. The proposed treatment level is also comparable to the treatment level of the existing STW near South Lantau and the proposed South Lantau STW. Detailed discussions are shown in **Appendix 6.3**. Any emergency discharge can be readily mitigated by implementing suitable standby measures and back-up retention facilities to be developed during detailed design stage.

6.4.1.5 The platform along the waterfront will be supported by decking over

piles with a narrow strip of approximately 9-34m only. The pile arrays will be generally along flow directions and will not block any major flow streamlines within Nim Shue Wan (WSR04). Thus, hydrodynamic impact and the associate change to water quality regime is unlikely to be significant.

6.4.1.6 Furthermore, cumulative impacts from the discharge of treated effluent for the development of Area 6f would be negligible. The discharge of treated effluent of Area 6f would be near Discovery Bay Plaza where the closest WSR would be WSR04 (Tai Pak Wan). Tai Pak Tsui Peninsula CPA has a width of 700m from east to west such that it would shield the plume from the proposed outfall of Area 10b from that of Area 6f. In addition, the shortest distance for effluent travelling from the tentative outfall location to WSR04 would be at least 2km. Hence, it is anticipated the interaction between plumes from the STWs would be insignificant due to large separation and dilution effect.

6.4.1.7 A preliminary quantitative water quality assessment can be referred to **Appendix 6.3**.

6.4.2 Mitigation Measures

6.4.2.1 The following contingency measures are proposed in case of any emergency discharge:

Booster Pump System:

- 100% standby pump capacity
- Stockpile a spare pump of 50% pumping capacity
- Dual feed power supply
- Emergency communication mechanism amongst Government departments.

Rising Mains:

- Concrete surrounding to the twin rising mains

6.4.2.2 The following initial measures can be considered as mitigation to control the emergency overflows from the Sewage Treatment Work

thereby polluting the stream and the receiving water bodies at Discovery Bay:

- Provide an emergency overflow pipe from the proposed STW at Area 10b to existing sewage pumping station no. 2 (SPS2) located at the junction of Discovery Bay Road and Discovery Bay Valley Road then to another existing sewage pumping station no. 3 (SPS3). **Figure 6-2** shows the outline of the facilities. During emergency situation, sewage from the STW can overflow to the existing Discovery Bay sewerage network that pumps sewage flows to Siu Ho Wan Sewage Treatment Works
    - Each existing SPS in Discovery Bay has 2 duty pumps and 1 standby pump with a duty capacity of 32,832 m^3/day and a standby capacity of 16,416 m^3/day respectively. As the maximum existing flow for SPS3 is estimated to be around 27,750 m^3/day, it can cater additional sewage during emergency situation from the discharge of Area 10b which would constitute only 4% of the total SPS capacity
    - To avoid overflow during normal condition, the following measures are proposed to be adopted subject to detail design: (1) The overflow pipe is designed at a higher level than the inflow pipe so the overflow will only happen during emergency case when the whole proposed STW at Area 10b is down; (2) The valve on the overflow pipe could only be opened under authorization by senior management; and (3) There will be flow meter device on the normal effluent pipes and the emergency overflow pipes to monitor the flow condition on both pipes as part of the routine operation of the proposed STW at Area 10b. Those data could be submitted to relevant government department to supervise the operation of the proposed STW at Area 10b where required
- Dual feed power supply for the Sewage Treatment Work

6.5 Conclusion

6.5.1.1 The potential issues that may arise during both the construction and operational phases have been identified. While a number of issues has been considered by implementing good design (e.g. decking over instead of conventional reclamation), a quantitative water quality model shall be concluded at detailed assessment to refine the design and construction methodology so as to minimise any impacts as much as practicable. During operational phase, sewage generated will be treated in a new sewage treatment work. According to the results from the water quality assessment, most of the pollution concentration would comply with relevant criteria. For TIN, the background concentration has exceeded the WQO already. The discharge concentration has therefore been to a level comparable with other STWs in South Lantau.

The assessment results should also be adopted to evaluate the need for mitigation measures required. Any emergency discharge can be mitigated by implementing suitable standby measures and contingency measures to be developed during detailed design stage. Initial mitigation measures would also be provided to control the emergency overflows.

6.5.1.2 Nevertheless, the Applicant of Area 10b still commits to review the effectiveness of any suitable technology available at the time of detailed design that could deliver discharge limits that are as good as that proposed now. In particular, it is noted that some of the existing STWs beyond South Lantau can achieve an even lower total nitrogen concentration, say 10 mg/L in Peng Chau STW. The possibility to reduce the total nitrogen level to similar level will be further explored during the detailed design stage.

7 Other Aspects

7.1 Review of Waste Management Issues

7.1.1.1 As mentioned in **Section 2**, the potential development at Area 10b of Discovery Bay include residential premises together with the necessary infrastructure and landscaping elements. A podium structure would be built to cover the existing maintenance activities. In order to cater for the additional residential development, an additional narrow strip of reclamation would be proposed in form as a decking with a width of 9-34m.

7.1.1.2 Although the construction methodologies are yet to be developed in subsequent detail design stage, the construction and reclamation work would adopt an environmentally friendly approach. With the implementation of good site practices and waste reduction measures, the quantity of construction of demolition waste is estimated to be around 29,000 m^3.

7.1.1.3 Consent from Waste Disposal Authority would be obtained prior to the disposal of potential sewage screenings and sludge which to be produced from the proposed STW.

7.2 Review on Land Contamination Issues

7.2.1.1 A desktop review has been conducted by studying the previous aerial photos for the concerned areas for the potential development area. These photos have provided useful information to ascertain any historical land uses that may have potential for land contamination. The relevant legislation and standards relating to land contamination is given in **Appendix 7.1** and the related historic aerial photos is given in **Appendix 7.2**. The following table summarises these findings.

Table 7.1 Summary of historical aerial photographs for Area 10b

Year	Description
1973	• Mainly nature terrain and coastline with a number of villages scattering around. • No signs for industrial developments
1982	• Reclamation works in Area 10b were in progress. • The seawall in the marina was formed
1993	• Most of the site formation work and reclamation works had been completed. • The scale of the marina was less than that currently being operated.

Year	Description
2012	• Not much difference to that in 1993 except the scale of the marina was larger than that in the 90's.

7.2.2 Description of Environment

7.2.2.1 Site surveys were conducted between May and June of 2014 to ground truth the findings from desktop review to identify any land uses within the potential development area that may have the potential for contamination in soil and groundwater. Photos taken during the site inspection showing the land uses within each of the area are given in **Section 3**. The following paragraphs summarises the findings from the surveys.

7.2.2.2 The area within Area 10b is currently occupied by a number of services facilities including the depot for vehicles, petrol / LPG filling station, staff quarters, Kaito etc. The areas within those depot, petrol / LPG filling stations are paved with concrete. Some of these area may have storage for dangerous goods as well. According to the EPD's Guidance Note for Contamination Land Assessment and Remediation, these land uses have the potential for land contamination.

7.2.3 Identification of Potentially Contaminated Areas

7.2.3.1 As discussed in the above sections, locations where land contamination would be more likely would be the depot for buses and golf cars and petrol / LPG filling stations.

7.2.3.2 According to the EPD's *Guidance Note for Contaminated Land Assessment and Remediation* (GN), project proponents and professionals responsible for major works or re-development on sites associated within industrial operations listed in the GN (including depot and LPG filling stations) should, before commencement of any works, carry out a site assessment to determine whether the site is contaminated and assess the extent of any contamination and, if necessary, implement proper remedial measures to restore the land to an acceptable condition for its intended purpose.

7.2.3.3 For the purpose of this study, it is recommended a Contamination Assessment Plan (CAP) to be prepared after the rezoning approval and prior to implementation. The CAP shall cover the whole potential development area and would recommend the need for Site Investigation (SI) to collect soil and ground water samples for analysis, and any subsequent actions, as per the statutory requirements.

7.2.3.4 Following the completion of environmental SI and lab testing works, the project proponent would prepare the Contamination Assessment Report (CAR) which would present the findings of the SI and evaluate the level and extent of potential contamination. The potential environmental and human health impact based on the extent of potential contamination identified would also be evaluated.

7.2.3.5 If land contamination is identified during the proposed environmental SI and remediation is required, a Remediation Action Plan (RAP) will be prepared. The objectives of RAP are:

- To undertake further site investigation where required;
- To evaluate and recommend appropriate remedial measures for the contaminated materials identified in the assessment;
- To recommend good handling practices for the contaminated materials during the remediation works;
- To recommend approximate handling and disposal measures; and
- To formulate optimal and cost-effective mitigation and remedial measures for EPD's agreement.

7.2.3.6 A Remediation Report (RR), if required, would also be prepared to demonstrate that the clean-up works are adequate. No construction / development works would be carried out within the potentially contaminated areas prior to the agreement of the RR with EPD.

7.2.4 Conclusion

7.2.4.1 An initial land contamination appraisal has been conducted to identify any locations within the potential development area that may have the potential for contamination in soil and groundwater. The appraisal mainly includes a review of the desktop information and supplemented with site surveys.

7.2.4.2 Based on the findings at this stage, the depot area and petrol / LPG filling stations within Area 10b have been identified as potential locations for contamination. For the purpose of this report, it is recommended that a CAP to be prepared after the rezoning approval and prior to implementation. Where necessary, environmental site investigation shall be conducted to collect soil and groundwater samples to confirm the presence of any contamination, and any subsequent actions.

7.3 Review on Ecological Issues

7.3.1.1 As discussed in **Section 1**, the potential development area have been included in the approved Discovery Bay Master Plan 6.0E7h(a), and has been permitted to development, some being implemented, despite the fact that some of the planning parameters would need to be amended. For those area included in the approved Master Plan, site clearance and formation work could be commenced to implement the development parameters in the approved Master Plan.

7.3.1.2 Reclamation and dredging works are proposed for the development at Area 10b. However, the extent of reclamation and dredging will be within the boundary of the boundary approved under the Foreshore and Seabed Ordinance in 1977. Hence, by virtue of Clause 9(2)(c) of the EIAO, the reclamation and dredging works are exempted from the EIAO. The proposed extent of reclamation area can be referred to **Figure 2-2**.

7.3.1.3 As discussed in **Section 1.3.5.1**, depending on the future discussion with DSD, there may be a need for a new sewage treatment plant for Area 10b. The effluent discharge would have certain impact on marine ecology. Similarly, the dredging works which might be necessary for implementation of future submarine outfall would also inevitably generate sediment plume which would have certain impacts in marine ecology.

7.3.1.4 Together with suspected presence of species of conservation concern in Nim Shue Wan, such as seagrass and corals, marine ecological impacts are anticipated. Under such circumstances, series of mitigation measures have been recommended in **Section 6.3**, including the installation of silt-curtain and controlling of descent speed of grab for the marine construction works and the pile of the deckover would be designed to avoid blocking any flow streamline during the operational phase.

7.3.1.5 Similarly, for dredging works which might be required for the implementation of future submarine outfall, good measures including the use of silt curtains would be adopted. Hence, adverse direct and indirect impacts are not considered significant

7.3.1.6 Out of the 6.25 ha of Area 10b, developed area occupies 5.12 ha which is approximately 82% of the site area. Only 1.13 ha (or 18%) of the area accommodates trees and plantation. The current development plan has exercised due consideration in avoiding and minimising terrestrial ecological impact by utilising all the 5.12 ha of developed area. For the 1.13 ha of existing area with trees and plantation, only 0.74 ha of that would be directly impacted.

7.3.1.7 Given the developed nature of Area 10b, it is considered that the terrestrial ecological impacts associated with the captioned development, if any, would be minor. The affected vegetated area is a patch of standalone plantation within the developed area in the centre of the site that, which has limited connectivity with other natural habitats in the vicinity. Furthermore, the area is mostly urbanised and

subject to moderate to high anthropogenic disturbance, hence the ecological value of the area should be relatively low.

7.3.1.8 As discussed in **Section 6.4.1.4**, a new sewage treatment plant will be built to receive and treat the sewage generated from the additional population from Area 10b. The treated sewage would then be discharged to a new marine outfall in **Figure 6-1**. According to the results from the supplementary water quality assessment (**Appendix 6.3**), most of the pollution concentrations would comply with relevant criteria. For TIN, the background concentration has exceeded the WQO already. The discharge concentration has therefore been reduced as much as practicable to ensure that the increase in TIN is minimised.

7.4 Review on Fisheries

7.4.1.1 The nearest fish culture zones (FCZs) are Cheung Sha Wan and Ma Wan which are located at more than 6.5 km and 6 km away respectively. Given these large separation distance, together with the use of deck-over approach for the reclamation and mitigation measures such as silt curtains, both direct and indirect impacts are considered insignificant.

7.4.1.2 The distance with the nearest nursery and spawning ground for fisheries resources in the southern waters is at least 6.5km away from the proposed discharge location. Given the effluent discharged from the proposed STW meets the statutory standard together with the large separation distance, direct or indirect adverse impacts on the nursery and spawning ground for fisheries resources are not anticipated.

7.4.1.3 According to the Port Survey published by AFCD in 2006, the number of fishing fleets using the waters immediately outside Area 10b was around 100-400 per grid cell, of which majority of them were small vessels/ sampan under 15m in length. The fisheries production within the area was around 100-200 kg/ha in Year 2006. Direct impact on fishing grounds is not anticipated as there would be no reclamation works at the location of the submarine outfall. For indirect impacts, water quality change due to effluent discharge from the submarine outfall could potentially affect capture fisheries production. However, given the proposed STW would only have a daily flow rate of 1,100m3 and the effluent concentration would be monitored and controlled

properly meeting statutory standards. The water quality impact to the nearby marine waters should be minimal.

7.4.1.4 Although dredging works, if necessary, may be required to implement the future submarine outfall, mitigation measures such as silt curtain would be provided to reduce any potential impacts. The potential impact would be temporary and properly controlled. Therefore, the impacts on capture fisheries production during both construction and operation should be minimal.

8 Conclusion

8.1.1 An environmental assessment has been conducted to review the potential development area, Area 10b, for Discovery Bay. Key aspects that have been assessed include air quality, noise and water quality. Potential issues on land contamination and ecology have also been reviewed. Those relating to sewerage and drainage, and water supply are separately presented in another report.

8.1.2 All the relevant noise and air quality emission sources in the vicinity that would have impacts on the proposed developments have been identified and assessed. The strength of these sources have been established by measurement or from best available information and subsequently included in the assessment. Results indicate that the noise and air quality impacts on planned developments would comply with the relevant noise criteria and hence further mitigation measures are not required. The need for any additional mitigation measures for the bus depot shall be subjected to the subsequent statutory EIA.

8.1.2.1 Although most of the development would not involve major marine works, some minor reclamation work and dredging work would still be required for Area 10b. By adopting a non-dredged approach such as decking over piles and other good site practices, any release of sediment would be readily controlled and would have been minimised. The need for any additional mitigation measures shall be subject to the findings from the detailed cumulative impact assessment to be conducted as part of the subsequent statutory EIA.

8.1.2.2 Depending on future discussion with DSD, a sewage treatment work may be required and further details including location of marine outfall will be determined during the subsequent statutory EIA where applicable.

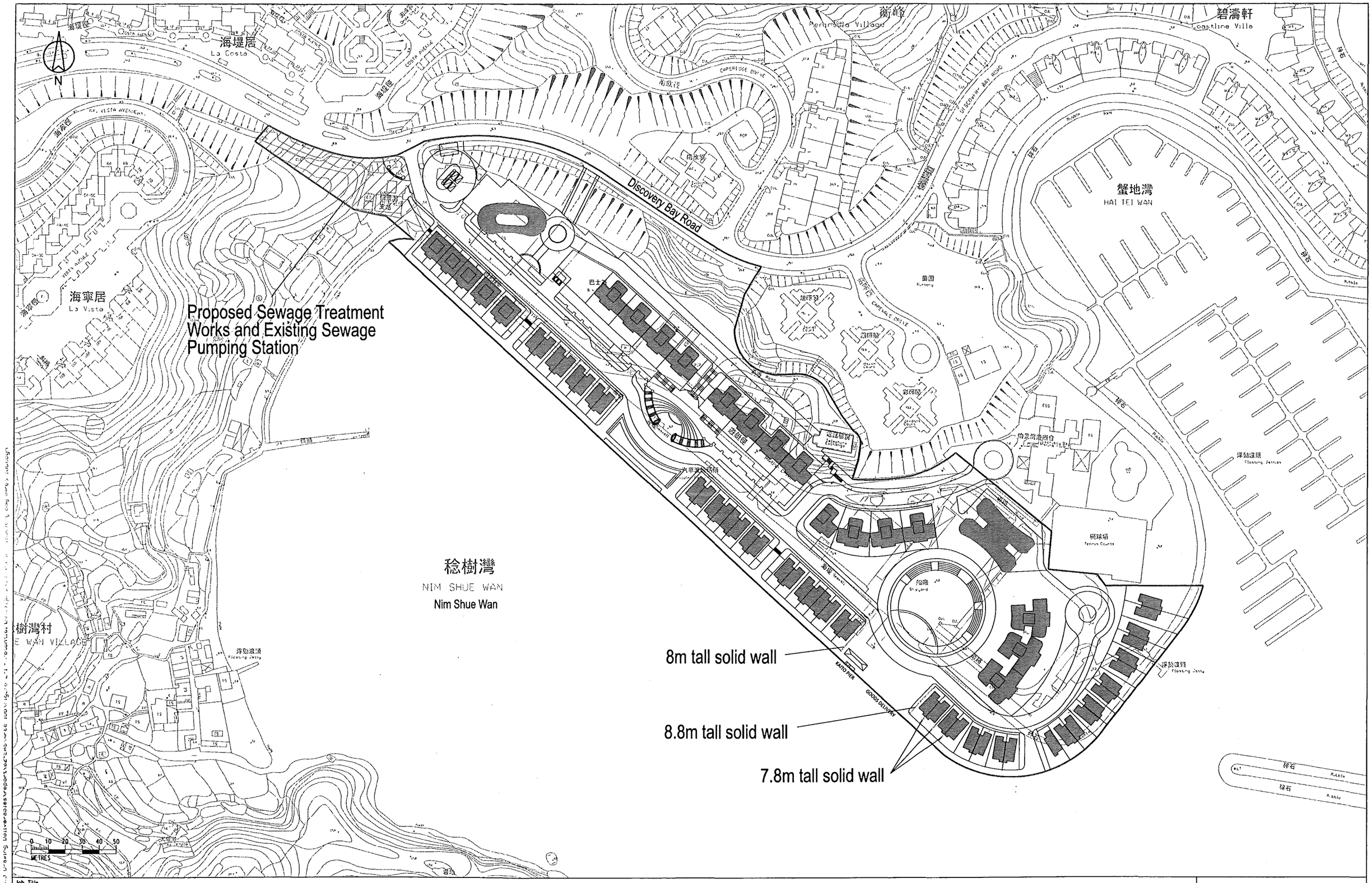
8.1.2.3 Sewage generated during operational phase will be treated in a new sewage treatment plant and discharged into the marine pipeline leading to the marine outfall at sea bottom near Area 10b. According to the results from the supplementary water quality assessment, most of the pollution concentrations would comply with relevant criteria. For TIN, the background concentration has exceeded the WQO already. The discharge concentration has therefore been reduced as much as practicable to ensure that the increase in TIN is minimised. Any emergency discharge can be mitigated by implementing suitable

standby measures and contingency measures to be developed during detailed design stage. Initial mitigation measures would also be provided to control the emergency overflows.

8.1.2.4 Potential for land contamination due to the operation of the existing bus depot and services area has been identified. Further investigation should be conducted after the rezoning and prior to implementation to collect soil and water samples as required, and hence any subsequent remediation actions to fulfil the statutory requirements.

8.1.2.5 Depending on the need and design of the sewage treatment works and dredging works for the outfall outside the reclamation area, subsequent statutory EIA may be required to further investigate any potential environmental impacts.

8.1.2.6 In the aspect of ecology, terrestrial ecological impact due the proposed development would not be significant. Impacts to marine ecology and fisheries would be minimized by proper control and monitoring of treated effluent discharged from the proposed STW.



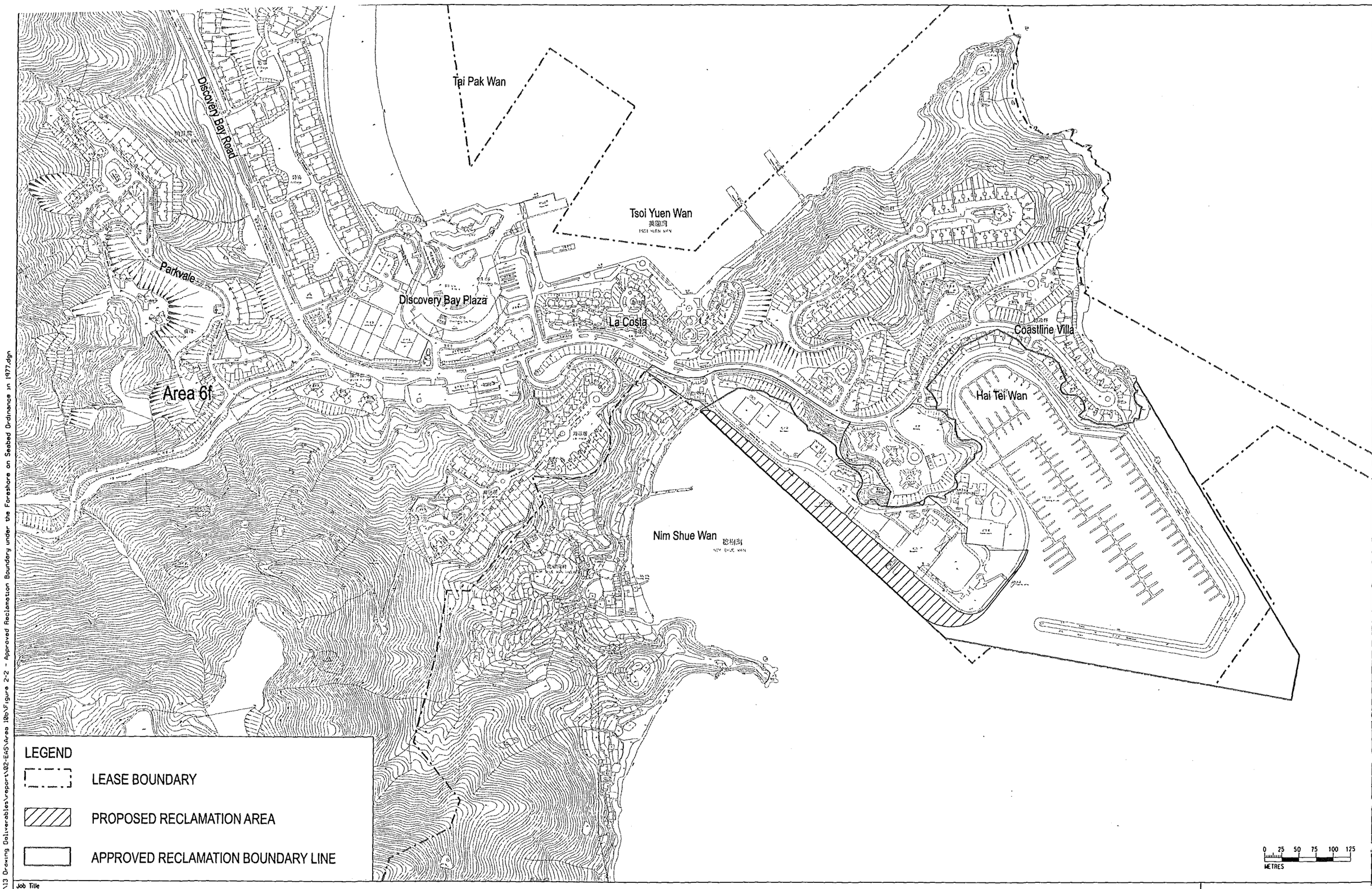
Job Title

DISCOVERY BAY - OPTIMIZATION OF LAND USE

FIGURE 2-1

Date	Scale	Drawing Title
OCT 16	1 : 2000	POTENTIAL DEVELOPMENT AREA IN DISCOVERY BAY (AREA 10b)
Drawn	Job No.	
MW	235928	

ARUP



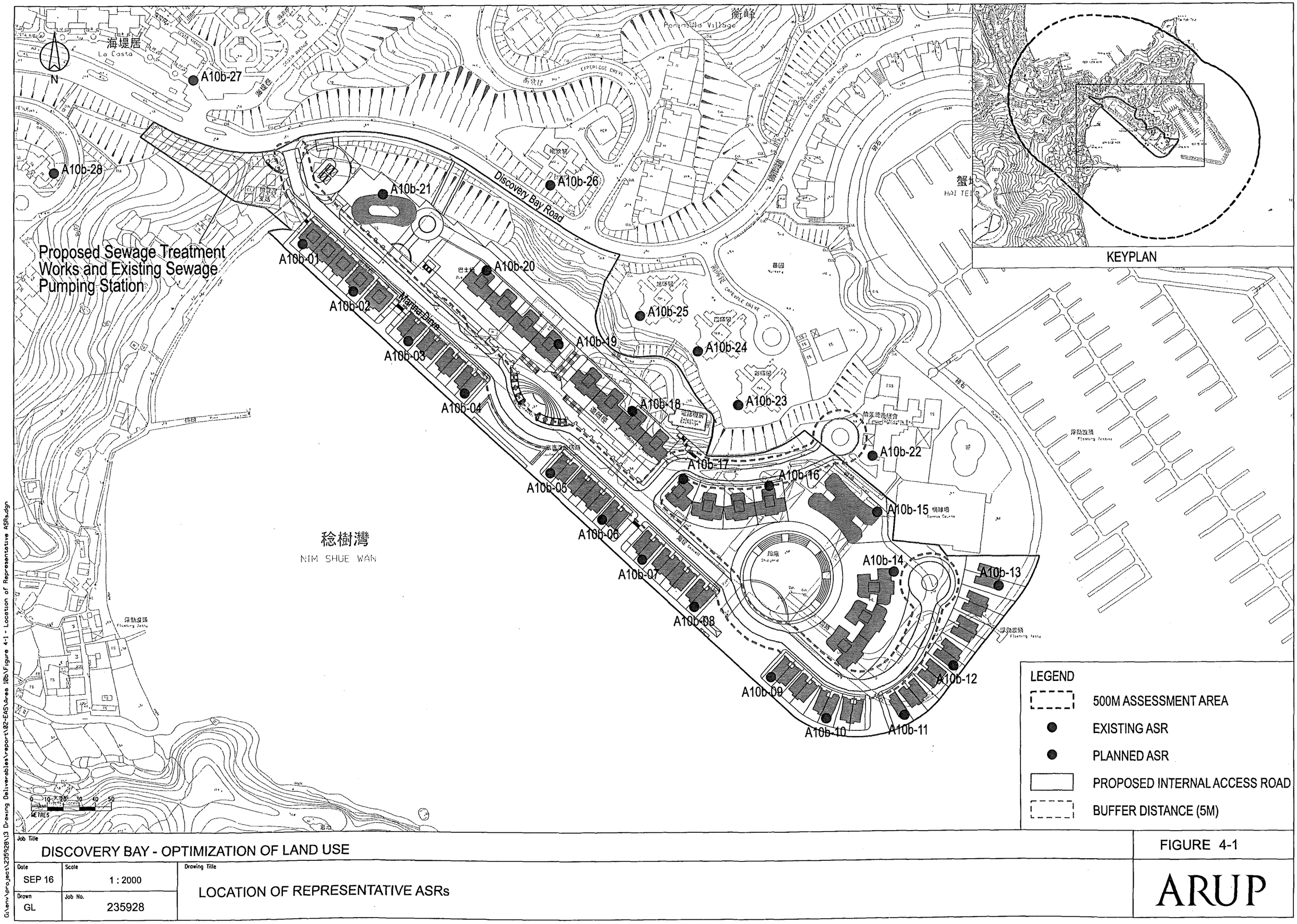
G:\env\project\235928\13 Drawing Deliverables\report\02-EIA\Area 10b\Figure 2-2 - Approved Reclamation Boundary under the Foreshore on Seabed Ordinance in 1977.dgn

Job Title
DISCOVERY BAY - OPTIMIZATION OF LAND USE

FIGURE 2-2

Date	Scale	Drawing Title
FEB 17	1:5000	APPROVED RECLAMATION BOUNDARY UNDER THE FORESHORE ON SEABED ORDINANCE IN 1977
Drawn: GL	Job No.: 235928	

ARUP



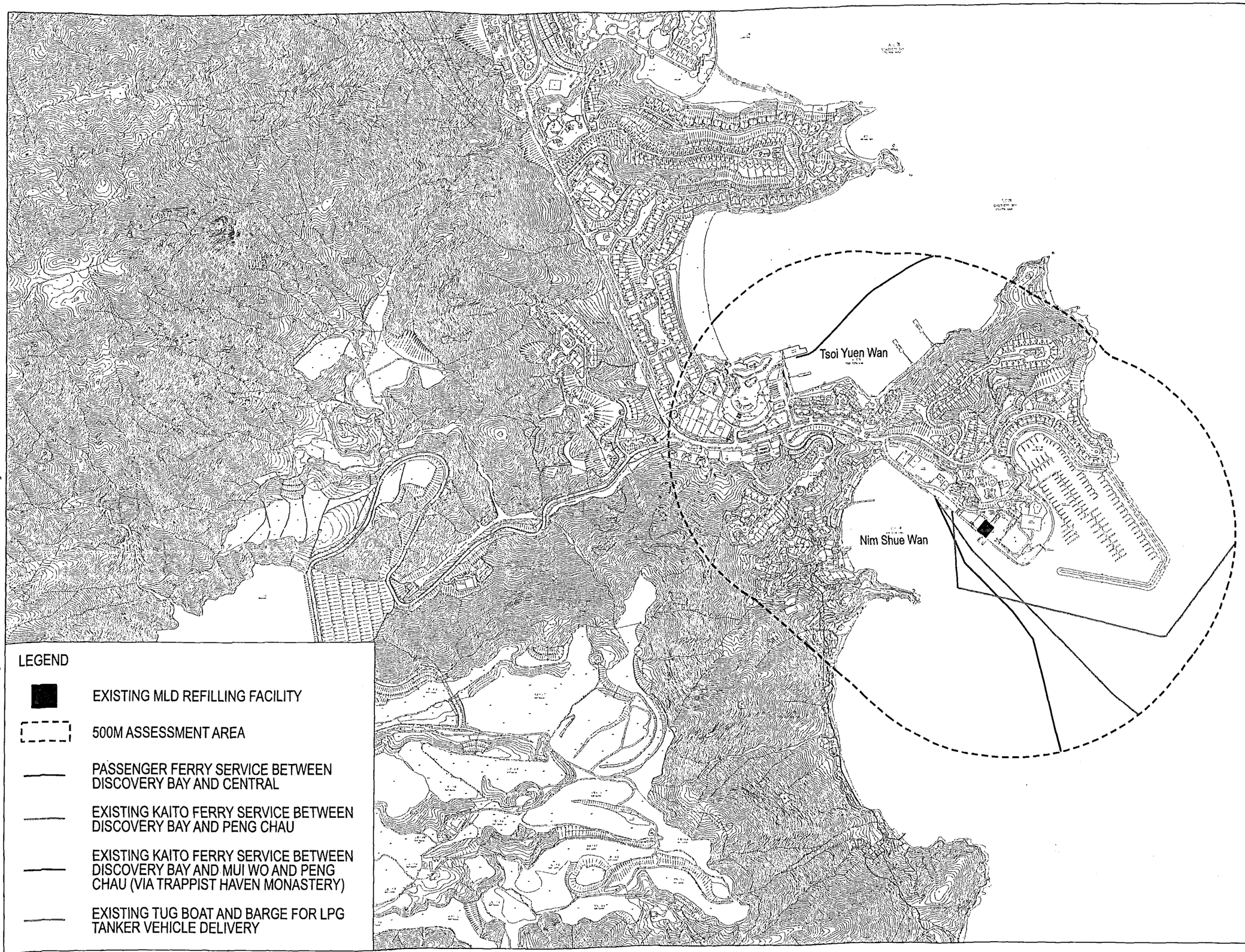
G:\env\project\235928\V3 Drawing Deliverables\report\02-EAS\Area 10b\Figure 4-1 - Location of Representative ASRs.dgn

Job Title
DISCOVERY BAY - OPTIMIZATION OF LAND USE

FIGURE 4-1

Date	Scale	Drawing Title
SEP 16	1 : 2000	LOCATION OF REPRESENTATIVE ASRs
Drawn	Job No.	
GL	235928	

ARUP



G:\env\project\235928\13 Drawing Deliverables\report\02-EAS\Area 10b\Figure 4-2 - Current Navigation Routes of Vessels within Assessmen Area.dgn

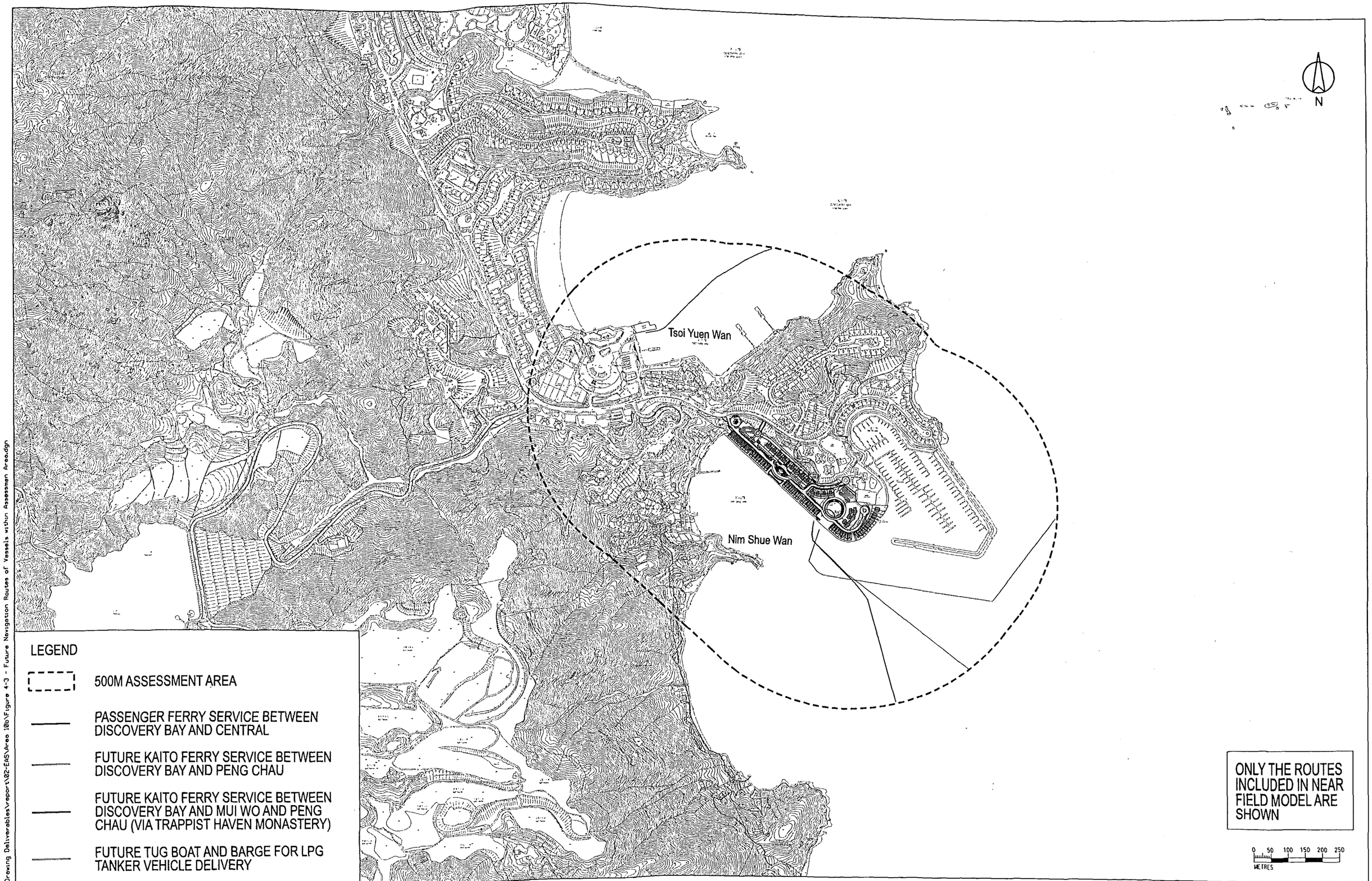
Job Title
DISCOVERY BAY - OPTIMIZATION OF LAND USE

FIGURE 4-2

Date	Scale
OCT 16	1:10000
Drawn	Job No.
GL	235928

Drawing Title
CURRENT NAVIGATION ROUTES OF VESSELS WITHIN ASSESSMENT AREA

ARUP



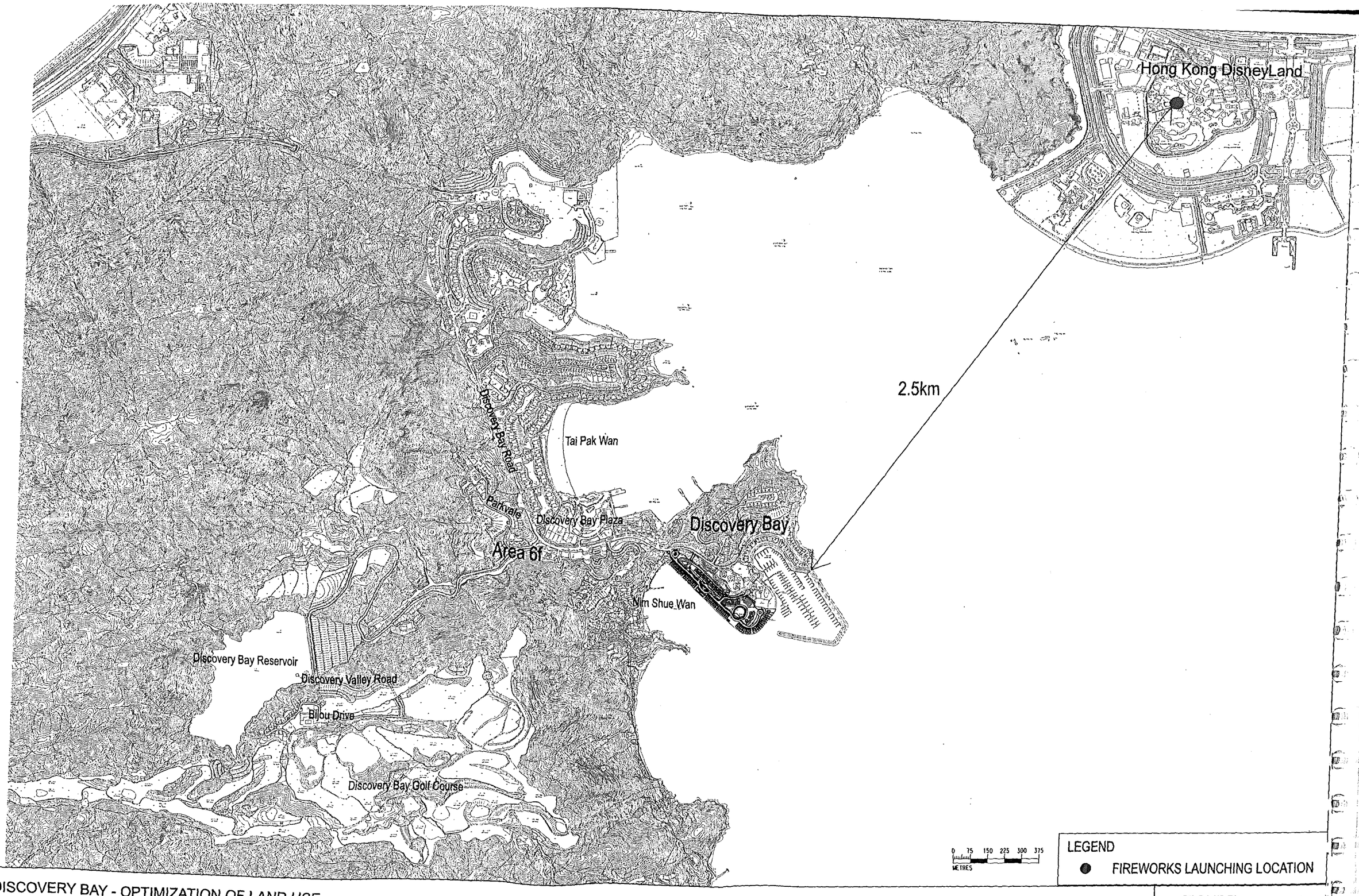
G:\env\project\235928\13 Drawing Deliverables\report\02-EAS\Area 10b\Figure 4-3 - Future Navigation Routes of Vessels within Assessmen

Job Title
DISCOVERY BAY - OPTIMIZATION OF LAND USE

FIGURE 4-3

Date	Scale	Drawing Title
JAN 17	1:10000	Future Navigation Routes of Vessels within Assessment Area
Drawn: MW	Job No.: 235928	

ARUP



Job Title
DISCOVERY BAY - OPTIMIZATION OF LAND USE

Date	Scale	Drawing Title	FIGURE 4-4
OCT 16	AS SHOWN	Fireworks Launching Location	ARUP
Drawn MW	Job No. 235928		

C:\Work projects\235928\13 Drawing Deliverables\report\02-EAS\Area 18b\Figure 4-4 - Fireworks Launching Location.dgn

N

LEGEND

----- 500M ASSESSMENT AREA

——— CONTOURS

AQO=200 µg/m³

0 50 100 150 200 250
METRES

Job Title

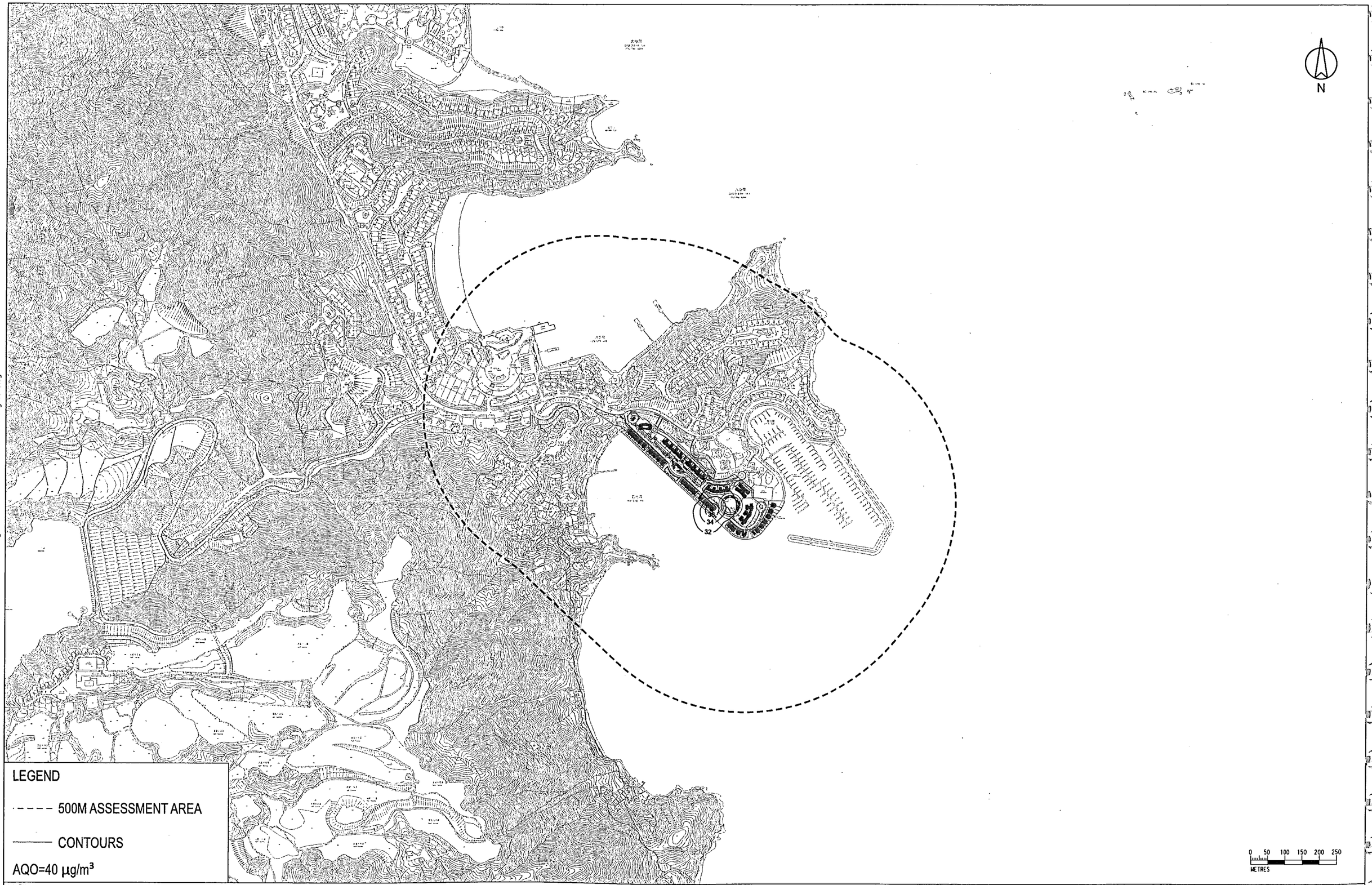
DISCOVERY BAY - OPTIMIZATION OF LAND USE

Date	Scale	Drawing Title
OCT 16	1:10000	Contours of Cumulative 19th highest 1-hour NO_2 Concentration at 5m above ground
Drawn	Job No.	
GL	235928	

FIGURE 4-5

ARUP

G:\env\project\235928\13 Drawing Deliverables\report\02-EA5\Area 10b\Figure 4-5_Contours of Cumulative 19th highest 1-hour NO2 Concentration at 5m above ground.dgn



G:\env\project\235928\13 Drawing Deliverables\report\02-EAS\Area 10b\Figure 4-6_Contours of Cumulative Annual-average NO2 Concentration at 5m above ground.dgn

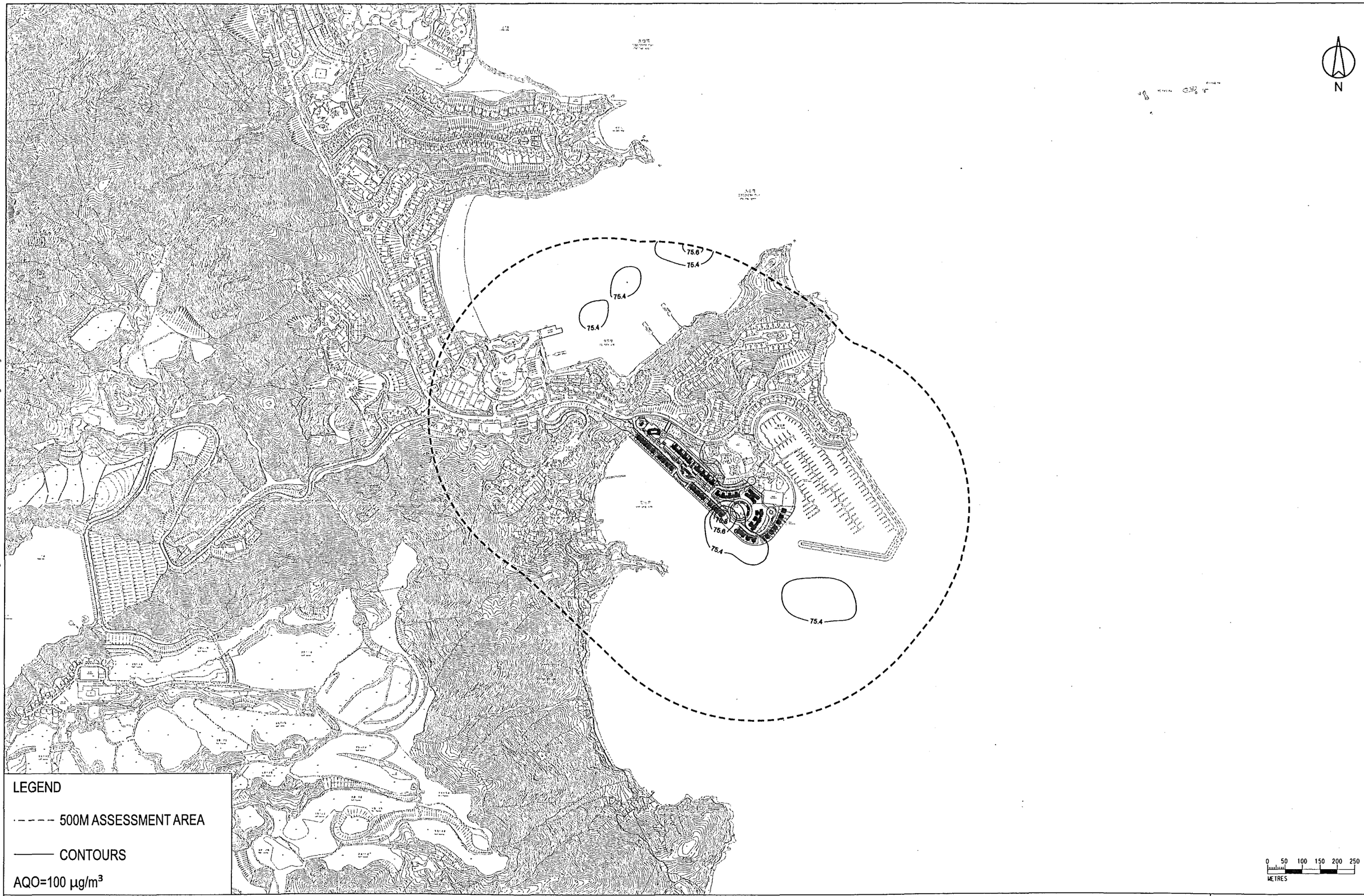
Job Title
DISCOVERY BAY - OPTIMIZATION OF LAND USE

FIGURE 4-6

Date	Scale
OCT 16	1:10000
Drawn	Job No.
GL	235928

Drawing Title
Contours of Cumulative Annual-average NO_2 Concentration at 5m above ground

ARUP



G:\env\project\235928\13 Drawing Deliverables\report\02-EAS\Area 10b\Figure 4-7_Contours of Cumulative 10th highest 24-hour RSP Concentration at 10m above groundgn

Job Title: DISCOVERY BAY - OPTIMIZATION OF LAND USE			FIGURE 4-7
Date: OCT 16	Scale: 1:10000	Drawing Title: Contours of Cumulative 10th highest 24-hour RSP Concentration at 10m above ground	ARUP
Drawn: GL	Job No.: 235928		

N

LEGEND

- - - - - 500M ASSESSMENT AREA

——— CONTOURS

AQO=50 µg/m³

0 50 100 150 200 250
METRES

Job Title

DISCOVERY BAY - OPTIMIZATION OF LAND USE

FIGURE 4-8

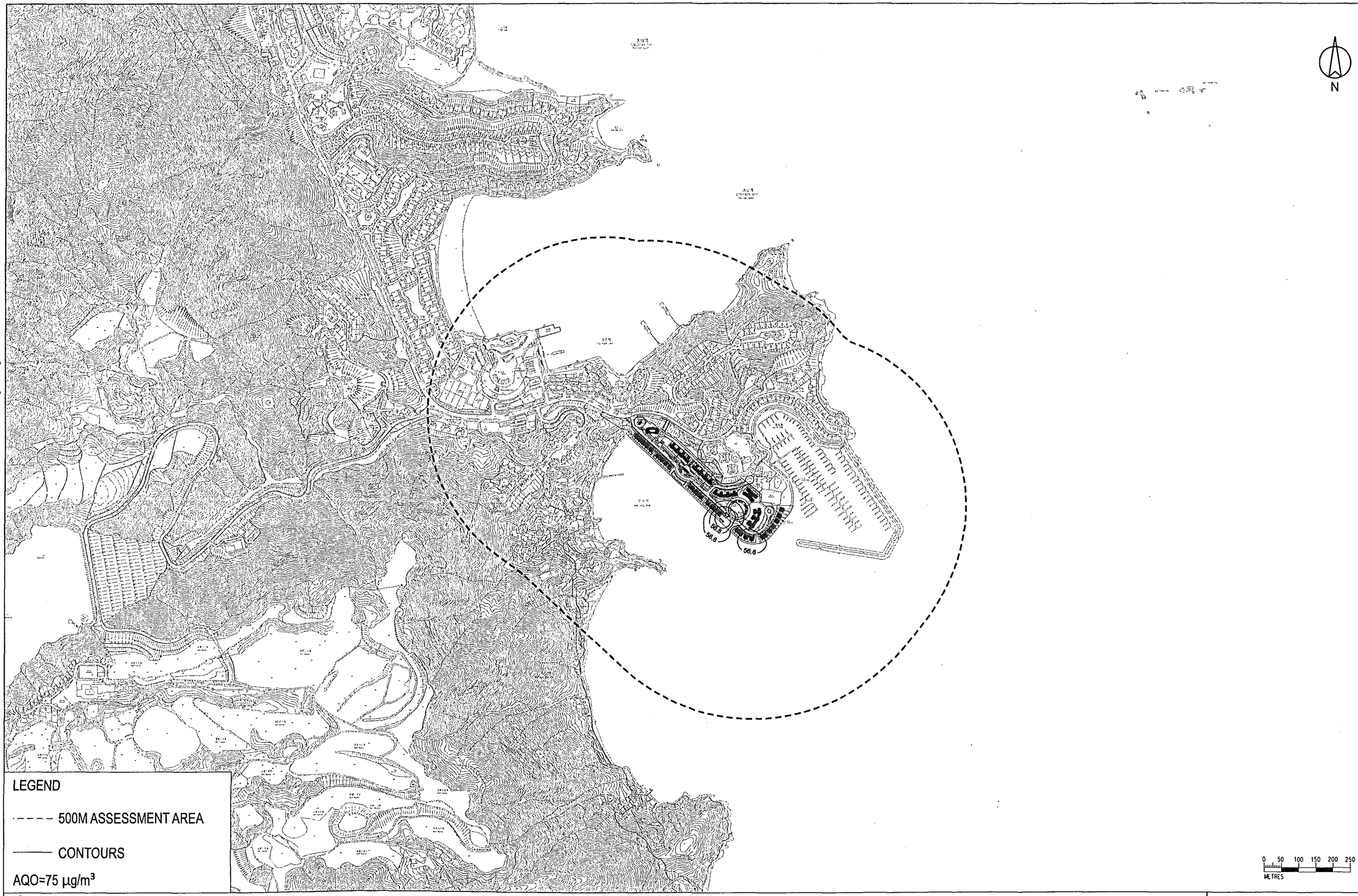
Date	Scale
OCT 16	1:10000
Drawn	Job No.
GL	235928

Drawing Title

Contours of Cumulative Annual-average RSP Concentration at 5m above ground

ARUP

G:\env\project\235928\13 Drawing Deliverables\report\02-EAS\Area 10b\Figure 4-8_Contours of Cumulative Annual-average RSP Concentration at 5m above ground.dgn



G:\env\project\235928\13 Drawing Deliverables\report\02-EAS\Area 10b\Figure 4-9_Contours of Cumulative 10th highest 24-hour FSP Concentration at 5m above ground.dgn

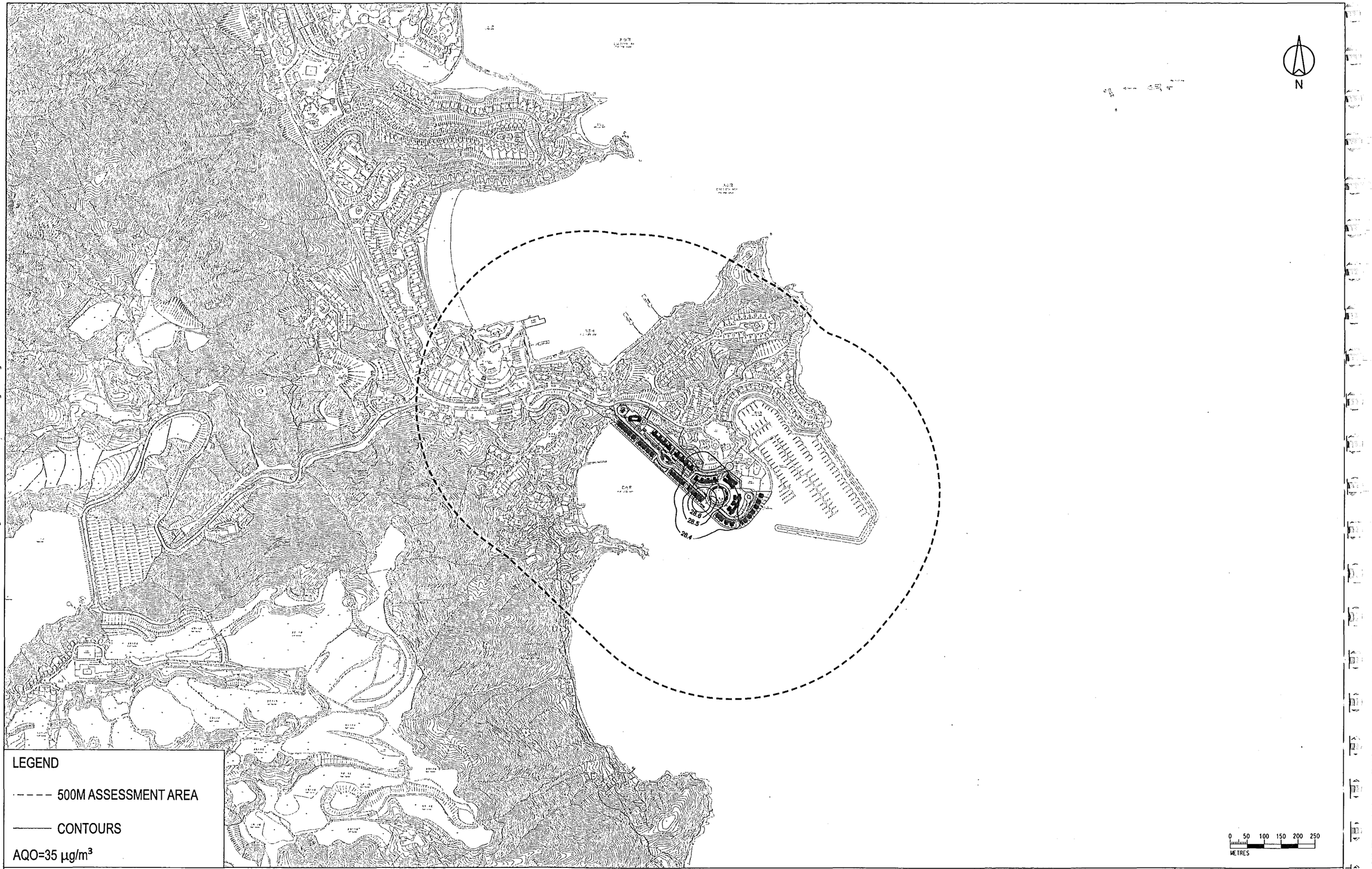
Job Title
DISCOVERY BAY - OPTIMIZATION OF LAND USE

FIGURE 4-9

Date	Scale
OCT 16	1:10000
Drawn	Job No.
GL	235928

Drawing Title
Contours of Cumulative 10th highest 24-hour FSP Concentration at 5m above ground

ARUP



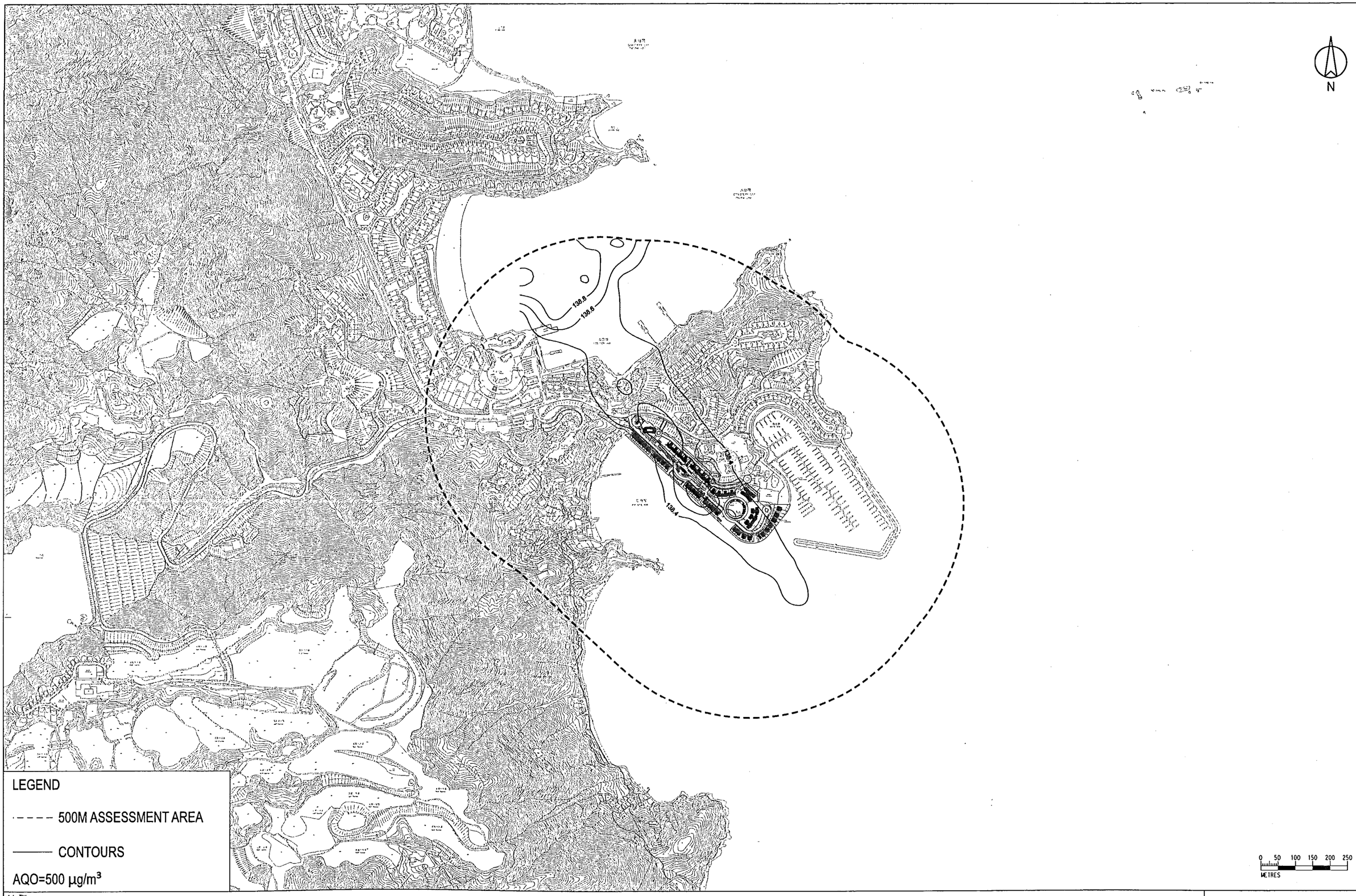
G:\env\project\235928\13 Drawing Deliverables\report\02-EAS\Area 10b\Figure 4-10_Contours of Cumulative Annual-average FSP Concentration at 5m above groundgn

Job Title
DISCOVERY BAY - OPTIMIZATION OF LAND USE

FIGURE 4-10

Date	Scale	Drawing Title
OCT 16	1:10000	Contours of Cumulative Annual-average FSP Concentration at 5m above ground
Drawn	Job No.	
GL	235928	

ARUP



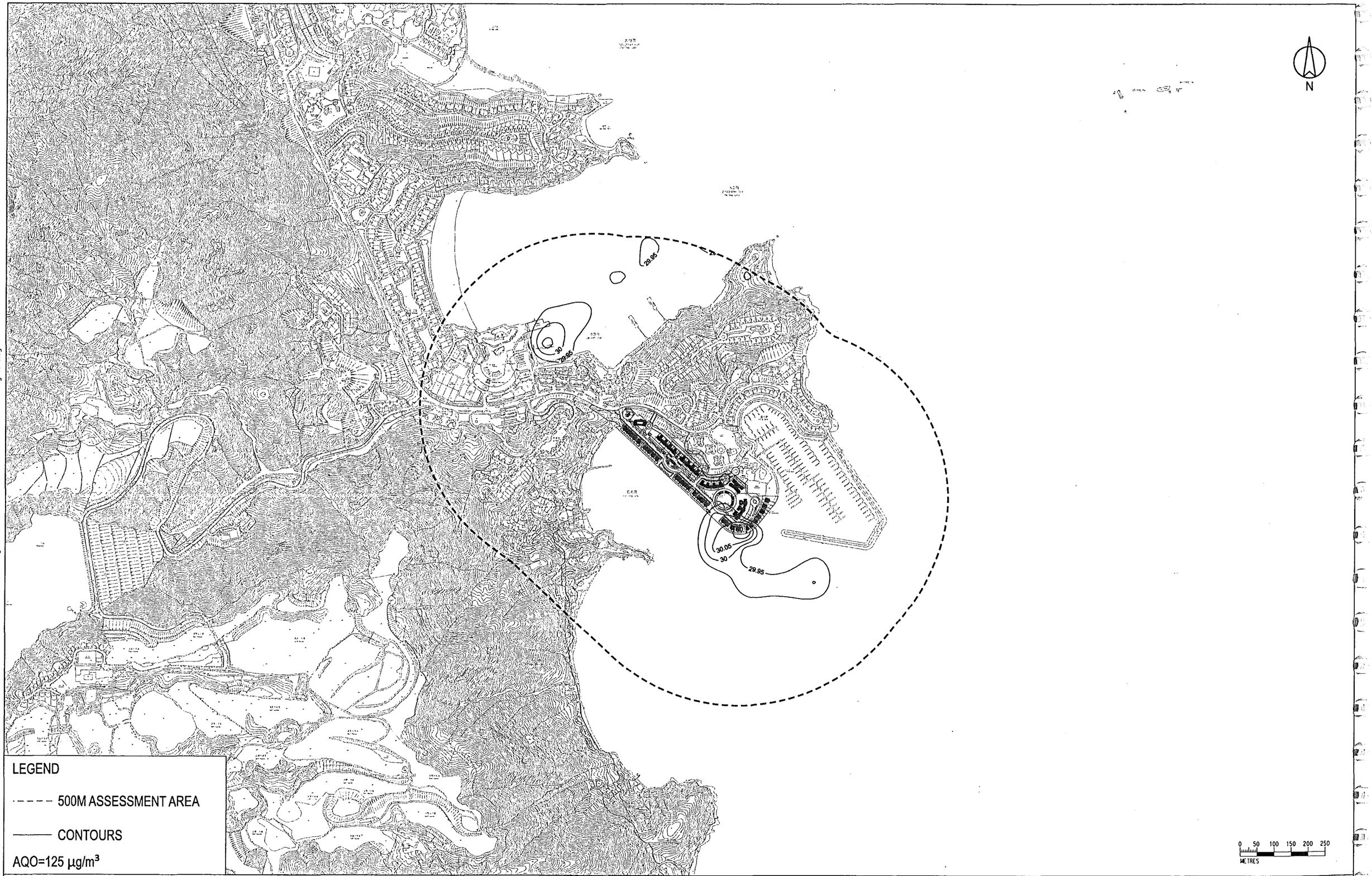
G:\env\project\235928\13 Drawing Deliverables\report\02-EASA-rev 10b\Figure 4-11_Contours of Cumulative Maximum 10-minute SO2 Concentration at 40m above ground.dgn

Job Title
DISCOVERY BAY - OPTIMIZATION OF LAND USE

FIGURE 4-11

Date	Scale	Drawing Title
OCT 16	1:10000	Contours of Cumulative Maximum 10-minute SO_2 Concentration at 40m above ground
Drawn: GL	Job No.: 235928	

ARUP



LEGEND

- - - - - 500M ASSESSMENT AREA

——— CONTOURS

AQO=125 µg/m³

0 50 100 150 200 250
METRES

Job Title

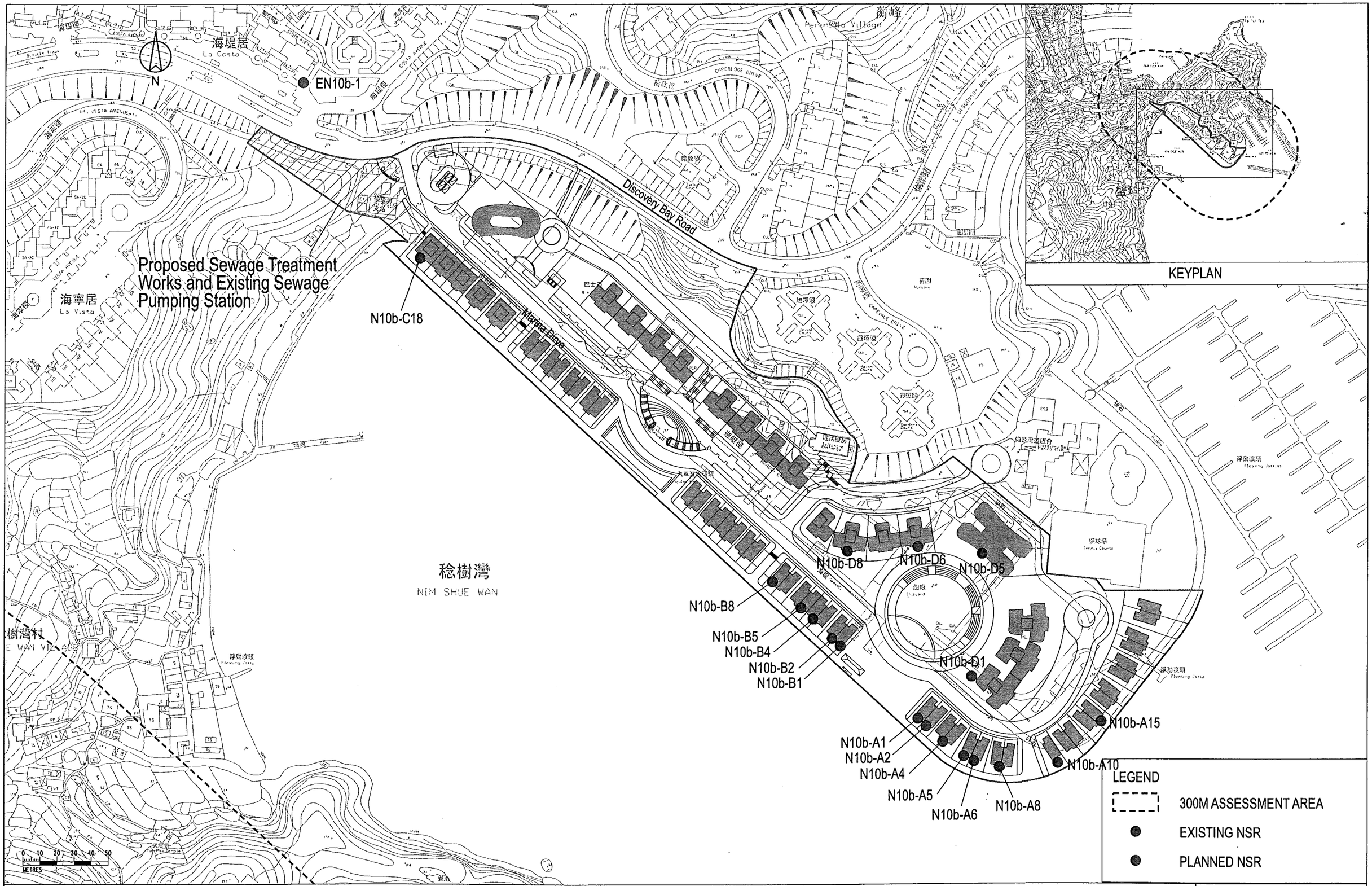
DISCOVERY BAY - OPTIMIZATION OF LAND USE

FIGURE 4-12

Date	Scale	Drawing Title
OCT 16	1:10000	Contours of Cumulative 4th highest 24-hour SO_2 Concentration at 20m above ground
Drawn	Job No.	
GL	235928	

ARUP

G:\env\projects\235928\13 Drawing Deliverables\report\02-EAS\Area 10b\Figure 4-12_Contours of Cumulative 4th highest 24-hour SO2 Concentration at 20m above ground.dgn



G:\env\projects\235928\13 Drawing Deliverables\report\02-EAS\Area 10b\Figure 5-1 - Layout and Selected NSRs.dgn

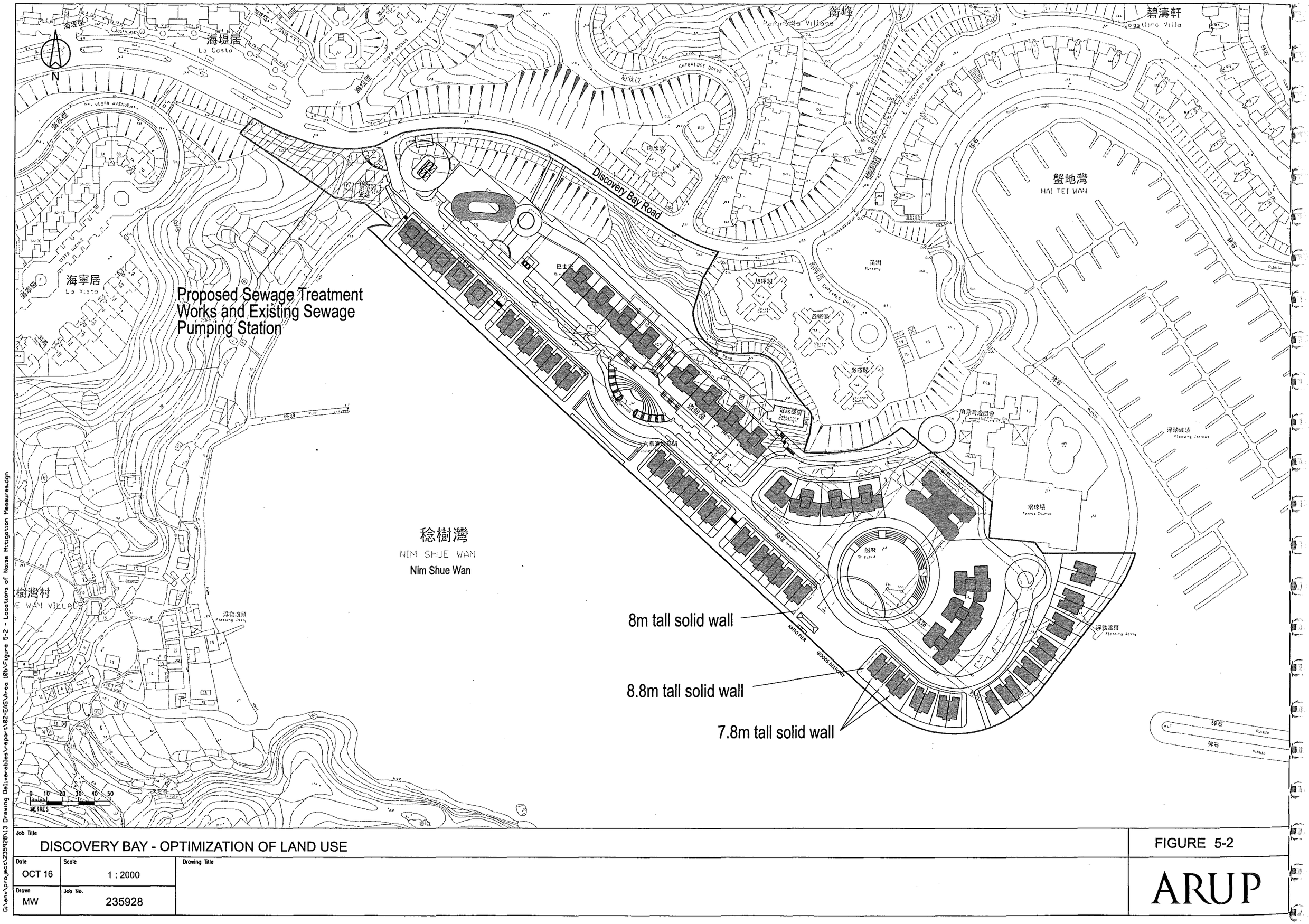
Job Title

DISCOVERY BAY - OPTIMIZATION OF LAND USE

FIGURE 5-1

Date	Scale	Drawing Title
OCT 16	1 : 2000	LAYOUT AND SELECTED NSRs OF AREA 10B
Drawn	Job No.	
MW	235928	

ARUP



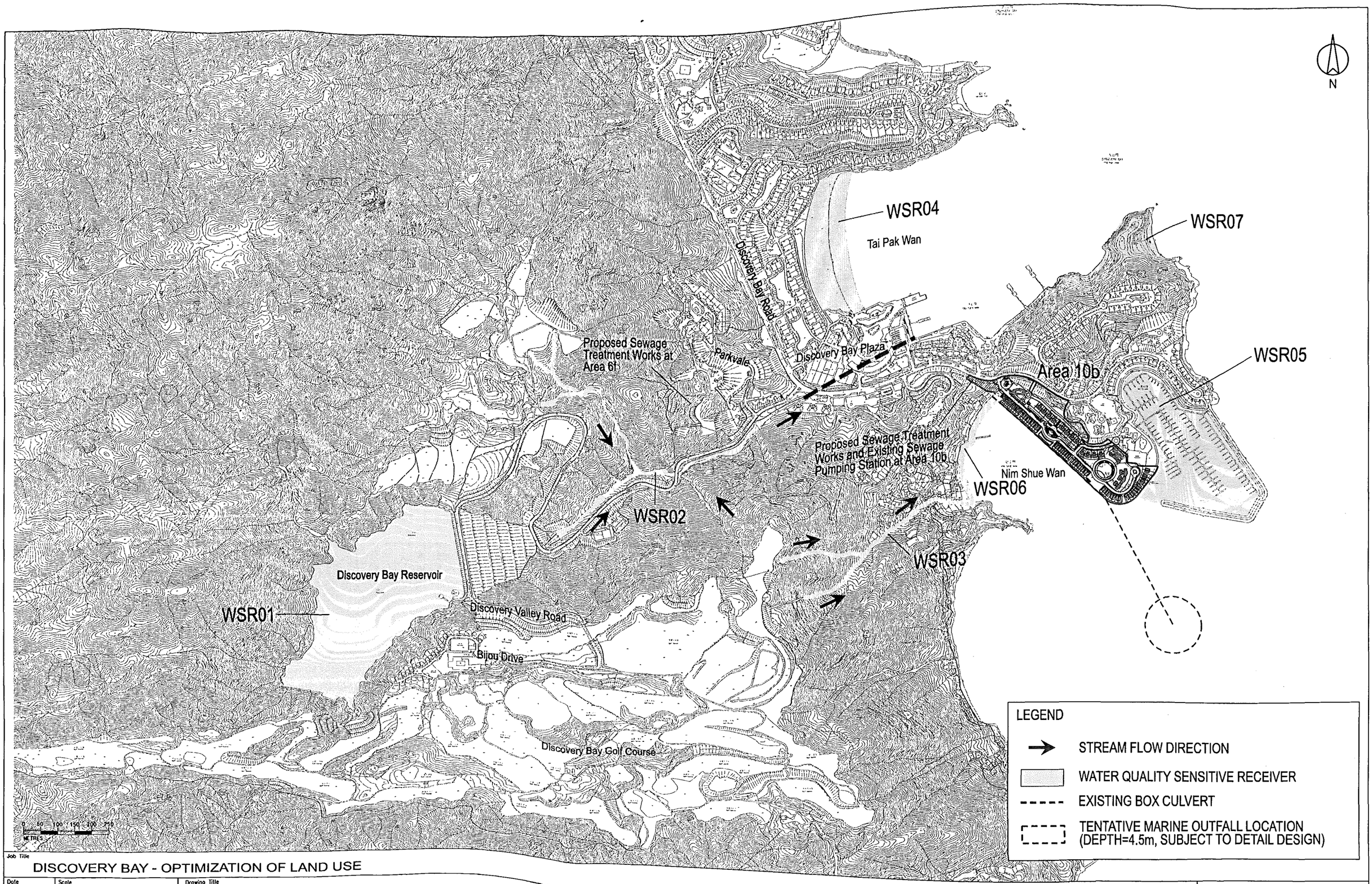
G:\env\project\235928\13 Drawing Deliverables\report\02-EAS\Area 10b\Figure 5-2 - Locations of Noise Mitigation Measures.dgn

Job Title
DISCOVERY BAY - OPTIMIZATION OF LAND USE

Date	Scale	Drawing Title
OCT 16	1 : 2000	
Drawn	Job No.	
MW	235928	

FIGURE 5-2

ARUP



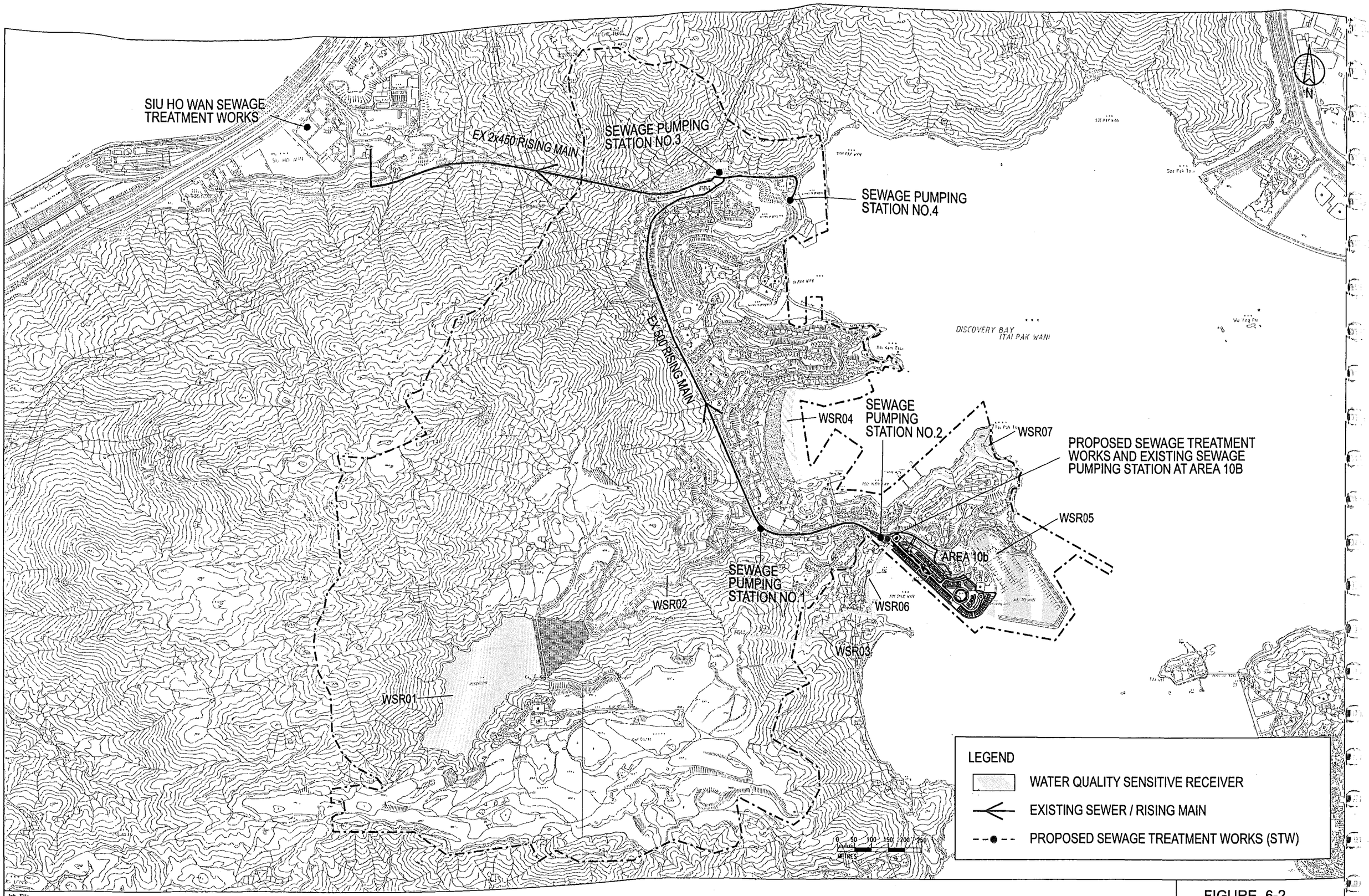
G:\env\project\235928\3 Drawing Deliverables\report\82-EAS\Area 10b\Figure 6-1 - Water Quality Sensitive Receivers_Area10b.dgn

Job Title
DISCOVERY BAY - OPTIMIZATION OF LAND USE

Date	Scale	Drawing Title
JAN 17	1:10000	Water Quality Sensitive Receivers
Drawn: GL	Job No.: 235928	

FIGURE 6-1

ARUP



G:\env\project\235928\13 Drawing Deliverables\other\20170123_WSR_10b\Figure 3.dgn

Job Title
DISCOVERY BAY - OPTIMIZATION OF LAND USE

Date	Scale	Drawing Title
JAN 17	AS SHOWN	EXISTING SEWERAGE LAYOUT PLAN
Drawn	Job No.	
GL	235928	

FIGURE 6-2

ARUP

Appendix 4.1

Legislation and Standards for Air Quality Impact Assessment

Legislation and Standards for Air Quality Impact Assessment

AQO Pollutants

In accordance with the Air Quality Objectives (AQOs) under Air Pollution Control Ordinance (APCO), the relevant AQOs applicable for this environmental assessment are given in **Table A4.1a** below.

Table A4.1a: Hong Kong Air Quality Objectives

Pollutant	Limits on Concentration, µg/m³ [1] (Number of Exceedance per year allowed in brackets)				
	10-min	**1-hr**	**8-hr**	**24-hr [2]**	**Annual [2]**
Sulphur Dioxide (SO_2)	500 (3)			125 (3)	
Respirable Suspended Particulates (RSP, or PM_{10}) [3]				100 (9)	50 (0)
Fine Suspended Particulates (FSP, or $PM_{2.5}$) [4]				75 (9)	35 (0)
Carbon Monoxide (CO)		30,000 (0)	10,000 (0)		
Nitrogen Dioxide (NO_2)		200 (18)			40 (0)
Photochemical Oxidants (as ozone, O_3)			160 (9)		
Lead (Pb)					0.5 (0)

Note:
[1] Measured at 293K and 101.325 kPa.
[2] Arithmetic mean.
[3] Respirable suspended particulates (RSP) means suspended particulates in air with a nominal aerodynamic diameter of 10 micrometres or smaller.
[4] Fine suspended particulates (FSP) means suspended particulates in air with a nominal aerodynamic diameter of 2.5 micrometres or smaller.

Non-AQOs Pollutants

According to the approved EIA study "*Construction of an International Theme Park in Penny's Bay of North Lantau together with its Essential Associated Infrastructures – Environmental Impact Assessment*" (AEIAR-032/2000), hereafter called "Theme Park EIA", a total of six heavy metals, including aluminium, antimony, barium, strontium,

copper and titanium, was identified as the major pollutants emitted during fireworks displays at Disneyland Park.

There are no statutory criteria for these non-AQO pollutants. Hence, international guidelines from World Health Organization (WHO), and toxicity data from Integrated Risk information System (IRIS) of USEPA and from Office of Environmental Health Hazard Assessment (OEHHA) of California Environmental Protection Agency have been reviewed. Besides, the criteria that adopted in the Theme Park EIA have also been compared. The proposed assessment criteria for non-AQO pollutants to be adopted in this assessment are summarized in **Table A4.1b** below.

Table A4.1b: Assessment criteria for non-AQO pollutants

Pollutant	Limit on Concentration, µg/m³ [5]				
	WHO [1]	USEPA [2]	OEHHA [3]	Theme Park EIA [4]	Adopted for this Study
Acute (1-hour average)					
Aluminium	NA	NA	NA	NA	NA
Antimony	NA	NA	NA	NA	NA
Barium	NA	NA	NA	NA	NA
Strontium	NA	NA	NA	NA	NA
Copper	NA	NA	100	NA	100
Titanium	NA	NA	NA	NA	NA
Chronic (Annual average, or otherwise specified)					
Aluminium	NA	NA	NA	100[6]	100
Antimony	NA	NA	NA	5[7]	5
Barium	500 (8-hr average)	NA	NA	5[7]	500 (8-hr average) 5 (Annual average)
Strontium	NA	NA	NA	NA	NA
Copper	NA	NA	2.4	2.4[8]	2.4
Titanium	NA	NA	NA	100[6]	100

Note:

[1] WHO – "Barium and Barium Compounds", World Health Organization (Geneva, 2001)

[2] USEPA – Integrated Risk information System of USEPA

[3] OEHHA – Office of Environmental Health Hazard Assessment of California Environmental Protection Agency

[4] Theme Park EIA – Table 3.5n of the approved EIA study "*Construction of an International Theme Park in Penny's Bay of North Lantau together with its Essential Associated Infrastructures – Environmental Impact Assessment*" (AEIAR-032/2000)

[5] NA - Not applicable

[6] Reference to "*Occupational Exposure Limits*" published by UK Health & Safety Executive with a safety factor of 100 applied for conversing time-weight-average value to long term exposure limit and to allow for variability in human response to chemicals.

[7] Reference to "A Reference Note on Occupational Exposure Limits for Chemical Substances in the Work Environment" published by Hong Kong Labour Department with a safety factor of 100

applied for conversing time-weight-average value to long term exposure limit and to allow for variability in human response to chemicals.

[8] Reference to California Air Resources Board (CARB).

Appendix 4.2

Methodology of Air Quality Assessment

Methodology of Air Quality Assessment

Marine Vessels Emission

NO_2, RSP, FSP and SO_2 will be emitted due to fuel combustion from marine vessels and are considered as the key assessment pollutants for this study.

According to EPD's "*Study on Marine Vessels Emission Inventory*", the emission from vessels are calculated using the following equations:

$$\text{Total Emission}_{(\text{pollutant})} = \Sigma\ \text{Emission}_{(\text{pollutant, activity mode, equipment})}$$

$$\text{Emission}_{(\text{pollutant, activity mode, equipment})} = P \times FL \times T \times EF$$

Where P is the engine power (kW);

FL is fractional load of engine in a specific mode;

T is operation time-in-mode; and

EF is emission factor of the engine.

Information on the engine powers, engine load factors, and time-in-modes have been obtained from the operators and where the time-in-modes are not available, they will be estimated by site survey as far as possible. Where engine power and load factors are unavailable, reference has been made to EPD's "*Study on Marine Vessels Emission Inventory*". Details are discussed in the sections below.

Passenger Ferry Service between Discovery Bay and Central

The latest passenger ferry schedule was obtained from the Transport Department's website including the arrival and departure of passenger ferries during weekdays, Saturday, and Sunday and public Holidays.

According to the operational information, there are two types of vessels, including Catamaran Ferry (6 vessels in total) and Monohull Ferry (2 vessels in total) in operation for the service. As there is no information on which vessel type being used in individual trip, the weighted averages of emissions from the vessels are adopted as the best estimation. Detailed calculations are given in **Annex A4.2-1**. Information on the main engine and auxiliary engine powers provided by the operator are also given in **Annex A4.2-1**.

According to Appendix 3.25 of the approved EIA study "*West Kowloon Cultural District*" (AEIAR-178/2013), mechanical power equals to the product of force and velocity (i.e. Mechanical power = Force x Velocity) that force is assumed to be a constant. As a result, the load factor is proportional to speed. Therefore, the main engine

load factors can be determined by the ratio of the speed under each operating mode (hotelling, manoeuvring, slow cruise and fairway cruise) to the maximum design speed of the vessel (i.e. Main Engine Load Factor = Speed of each mode / Maximum Design Speed of the Ferry).

The maximum design speeds of the ferries have been provided by the operator. However, since the operators do not have the statistics on speeds under manoeuvring and slow cruise mode, the average speeds (i.e. 4.5 knots and 10 knots, respectively) by referencing to Table 3-24 of the EPD's "*Study on Marine Vessels Emission Inventory*" have been assumed. For fairway cruise mode, the maximum navigation speeds of the ferries within Discovery Bay provided by the operator are adopted.

Information on the auxiliary engine load factors are not available from the operator. Hence, the auxiliary engine load factors of "Macau/Pearl River Delta (PRD) fast ferry" in Table 4-10 of the EPD's "*Study on Marine Vessels Emission Inventory*" are adopted.

Time-in-modes (TIMs) under manoeuvring and slow cruise modes have been made reference to that of "PRD fast ferries" in Table 4-15 of the EPD's "*Study on Marine Vessels Emission Inventory*" as the Discovery Bay/Central passenger ferry service are composed of Catamaran Ferries and Monohull Ferries, similar to PRD fast ferry. For the fairway cruise mode, TIM is estimated by using the following equation:

TIM of fairway cruise mode
= Length of navigation route under fairway cruise mode / Speed of fairway cruise mode

Length of navigation route under fairway cruise mode
= Total length of navigation route – (TIM of manoeuvring mode x Speed of manoeuvring mode) – (TIM of slow cruise mode x Speed of slow cruise mode)

Besides, site surveys have been also conducted to observe the hotelling time of ferries during arrival and departure at Discovery Bay.

Emission factors of NOx, RSP and FSP are referenced to Table 4-17 of the EPD's "*Study on Marine Vessels Emission Inventory*", assuming similar to that of the Macau/PRD fast ferries with diesel engine. With effective of the Air Pollution Control (Marine Light Diesel) Regulation on 1st April, 2014, the fuel sulphur content limit of the MLD is 0.05%. The SO_2 emission factors have been corrected based on the following equation:

SO_2 emission factor (g/kWh)
= Brake specific fuel consumption (BSFC) x 2 x 0.97753 x Fuel Sulphur Fraction

Calculations of the emission from passenger ferry service between Discovery Bay and Central, and the emission rates adopted for modelling are given in **Annex A4.2-1**.

Kaito Ferry Services between Discovery Bay and Peng Chau and Mui Wo

There are two navigation routes for the kaito ferry services between Discovery Bay and Peng Chau, including 1) the ferries travelling between Discovery Bay and Peng Chau directly, and 2) the ferries travelling between Discovery Bay and Peng Chau via Trappist Haven Monastery. On the other hand, there is only one navigation route for the kaito ferry service travelling between Discovery Bay and Mui Wo directly.

The latest kaito ferry schedules are obtained from the Transport Department's website, including the arrival/departure profiles on weekdays, Saturday, and Sunday and public holidays.

Information on the main engine and auxiliary engine powers are not available from the operator. Hence, reference has been made to Table 4-5 and Table 4-6 of the EPD's "*Study on Marine Vessels Emission Inventory*", respectively. According to the "2013 Port of Hong Kong Statistical Table" published by the Marine Department, all the licensed Primitive Vessels (i.e. kaito) have the registered tonnage less than 300 tons. Therefore, the main engine and auxiliary engine powers of the smallest vessel size (i.e. GRT 0-499 tons) in Table 4-5 and Table 4-6 of the EPD's "*Study on Marine Vessels Emission Inventory*" are adopted. As the engine sizes of the kaito ferries are relatively small compared with other river trade vessels, the engine powers adopted in the assessment are considered conservative.

The approaches on determining the load factors, TIMs, and emission factors are similar to that of passenger ferry as described above. Details and the calculation are given in **Annex A4.2-1**.

Tug boat and barge (Delivery of LPG Tanker Vehicles, Gas Bottle Delivery and Sand Barge)

There is a barge towed by a tug boat for delivering LPG tanker vehicles to Discovery Bay once every 5 to 6 days (i.e. about 5 to 6 times per month) during daytime from 7:00 a.m. to 7:00 p.m. However, as mentioned in **Section 4.3.4.10**, a continuous operation of the tug boat/barge for LPG tanker vehicles delivery is assumed to cover the operations of gas bottle vessel and the sand barge. In particular, one arrival and departure activities per hour and a continuous emission (i.e. 60 minute per hour) from the vessel during hotelling at the berth location from 7:00 a.m. to 7:00 p.m. during weekdays have been adopted for the assessment.

Information on the main engines and auxiliary engines power of the tug boat and the barge has been provided by the operator and given in **Annex A4.2-1**.

The approaches on determining the load factors, TIMs, and emission factors are similar to that of passenger ferry as described above. Details and the calculation are given in **Annex A4.2-1**.

Emission from Fireworks Displays

According to the Theme Park EIA, 42% of the total mass of the fireworks is emitted to the atmosphere and it is assumed that all of these mass will be turned into RSP as worst case scenario (i.e. 2.6kg for low-level shows and 14.7kg for mid-level shows). Details and the calculations are given in **Annex A4.2-2**.

In the EIA, two mid-level and three low-levels were modelled at the same hour every night as a worst case scenario and the shows were modelled as separate volume sources, 27,000m^3 (i.e. 30 x 30 x 30m) and 8,000m^3 (i.e. 20 x 20 x 20m) for mid-level and low-level shows, respectively. The same assumptions are also adopted in this Study with the latest fireworks displays schedule obtained from the Disneyland Park's website.

There is no information on the modelling bursting heights of the fireworks in the Theme Park EIA. A site survey has been conducted to estimate the bursting height of the fireworks. It was found that there are mainly two levels of fireworks bursting at height of about 150 mPD and 120 mPD, which are considered within the EPs' conditions that the bursting height limit of the fireworks displays in Disneyland Park is 150 mPD. Therefore, the bursting heights of 150 mPD and 120 mPD for mid-level shows and low-level shows are assumed for modelling purpose, respectively.

There is no conversion factor from RSP to FSP emission from fireworks displays. Therefore, the FSP emission from fireworks is assumed to be the same as the RSP emission for worst case assessment.

Besides, the Theme Park EIA had also considered the impacts due to heavy metals in which their concentrations were estimated by the percentage composition of heavy metal compounds within the mass of the particulate emission. The maximum 1-hour concentration, maximum 8-hour concentration and annual concentration of the heavy metals at ASRs are therefore estimated from RSP concentrations using the conversion factors in this approved EIA as presented in **Table A4.2a** below.

Table A4.2a: Conversion factors from RSP assessment results to heavy metals concentration

Heavy Metal	Percentage Composition in the pyrotechnics products	Conversion from RSP assessment results (without background) to heavy metals concentration
Aluminium	2.93%	RSP x 0.0293
Antimony	1.28%	RSP x 0.0128
Barium	3.06%	RSP x 0.0306
Strontium	1.64%	RSP x 0.0164
Copper	0.92%	RSP x 0.0092
Titanium	0.40%	RSP x 0.0040

Note:

[1] The percentage compositions of heavy metals in the pyrotechnics used for fireworks displays in Disneyland Theme Park are referenced to Section 3.5.75 of the approved EIA Study "*Construction of an International Theme Park in Penny's Bay of North Lantau together with its Essential Associated Infrastructures – Environmental Impact Assessment*" (AEIAR-032/2000)

Dispersion Modelling Approach

The USEPA approved model, Industrial Source Complex - Short Term 3 (ISCST3), has been adopted to model the marine vessels emission and fireworks displays emission. The modelling parameters are listed in **Table A4.2b**.

Table A4.2b: Modelling parameters for ISCST3

Parameter	Input
Modelling mode	Rural with terrain effect
Meteorological data	Year 2010 MM5 data extracted from PATH model
Stability Class	Estimation from PCRAMMET model
Mixing Height	Year 2010 MM5 data extracted from PATH model and is capped to 121m as per the real metrological data recoded by Hong Kong Observatory in Year 2010

For the treatment of calm hours, the approach recommended in the "*Guideline on Air Quality on Air Quality Models Version 05 (USEPA"* is adopted.

Ozone Limiting Method (OLM) is adopted for the conversion of NO_x to NO_2 based on the predicted O_3 level from PATH model. The tailpipe NO_2/NO_x ratio is assumed to be 10%.

According to **Table 4.1** in the main text, the highest building of the proposed development is 71m above ground. Therefore, the impacts on the ASRs are assessed at height of 1.5m, 5m, 10m, 20m, 30m, 40m, 50m, 60m, 70m and 80m above local ground.

Cumulative Impact of Criteria Air Pollutants

As mentioned in **Section 2.3.1.1**, the population intake year of the development will be tentatively beyond Year 2020, the PATH model hourly outputs based on Year 2020 emission inventories is therefore used directly as the future background air quality for AQO pollutants. Far-field emission sources (i.e. all those outside 500m assessment area) including roads, marine, airports, power plants and industries within the Pearl River Delta Economic Zone and Hong Kong were considered in the PATH model. Details of the PATH Model and related emission inventory can be found in EPD's web site.

It is understood that there is no hourly FSP concentrations available form PATH model. According to EPD's "*Guidelines on the Estimation of PM2.5 for Air Quality Assessment in Hong Kong*", the conservative corrections from RSP concentrations to FSP concentrations are shown in the **Table A4.2c**.

Table A4.2c: Conversion factors for RSP/FSP

Annual ($\mu g/m^3$)	Daily ($\mu g/m^3$)
FSP = 0.71 x RSP	FSP = 0.75 x RSP

For SO_2, there is no 10-mintue average SO_2 concentration available in PATH model. According to EPD's *Guidelines on the Estimation of 10-mintue average SO_2 concentration for Air Quality Assessment in Hong Kong*, conversion factors from hourly SO_2 concentration to 10-minute average SO_2 concentration based on the stability class-dependent multiplicative factors have been adopted. They are given in **Table A4.2d** below.

Table A4.2d: Conversion factor for 10-mintue average SO_2 concentration

Stability Class	A	B	C	D	E	F
Conversion Factor	2.45	2.45	1.82	1.43	1.35	1.35

The cumulative operational air quality is a combination of the emission impacts contributed from the near-field and far field sources (i.e. at local scale and background air quality impact from other concurrent and regional sources) on hourly basis.

OLM is used for conversion of NO_x to NO_2 based on the O_3 level from PATH directly.

In consideration of the number of exceedance allowance of the hourly and daily AQO, the pollutant concentrations after the AQO's allowance limits (e.g. the 19th highest 1-hour NO_2 concentrations, 10th highest 24-hour RSP/ FSP concentrations, maximum 10-minute SO_2 and 4th highest 24-hour SO_2 concentrations) are determined at each ASR. The annual predicted concentrations are also assessed and all predicted levels are then compared with the AQOs.

For heavy metals, there is no background concentration available in the PATH model. Therefore, the average of the annual monitoring concentrations of aluminium, barium and copper for the latest 5 available years (i.e. Year 2011 – Year 2015) at Tung Chung Station, the nearest station to the proposed development, are adopted as their corresponding background concentrations (**Table A4.2e**). For antimony, strontium and titanium, there is no monitoring data and their background concentrations are assumed as 0 $\mu g/m^3$.

Table A4.2e: Annual monitoring heavy metal concentration at Tung Chung Station (i.e. Year 2011 – Year 2015)

Year	Annual average concentration ($\mu g/m^3$)		
	Aluminium	Barium	Copper
2011	0.226	0.016	0.060
2012	0.171	0.014	0.047
2013	0.208	0.015	0.132
2014	0.179	0.013	0.150
2015	0.163	0.013	0.174
5 years average	0.189	0.014	0.113

Appendix A4.2-1

Calculation of Marine Vessels Emissions

Engine Power and Load Factors under Different Operation Mode of Main Engine

Vessel Type	Main Engine Power (kW)	Maximum Design Speed of the Vessel (Knots)	Vessel Speed (Knots)				Load Factor [3]			
			Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise
Catamaran Ferry	3870 [1]	34[1]	0.0	4.5[2]	10.0[2]	28.0[1]	0.00	0.13	0.29	0.82
Monohull Ferry	1680 [1]	24[1]	0.0	4.5[2]	10.0[2]	22.0[1]	0.00	0.19	0.42	0.92

Note:

[1] Information provided by the operator.

[2] Vessel speeds under maneuvering (1-8 knots) and slow cruise (8-12 knots) are referenced to Table 3-24 of EPD's "Study on Marine Vessels Emission Inventory". The average speed of each mode is adopted for assessment purpose.

[3] Mechanical Power = Force x Velocity

Assume force is constant, thus load factor is proportional to speed (with reference to approved EIA for West Kowloon Cultural District (AEIAR-178/2013))

Therefore, load factor of each mode = Speed of each mode / Maximum Design Speed of the Vessel

Engine Power and Load Factors under Different Operation Mode of Auxiliary Engine

Vessel Type	Auxiliary Engine Power (kW)	Load Factor			
		Hotelling	Maneuvering	Slow Cruise	Fairway Cruise
Catamaran Ferry	170[1]	0.45[2]	0.45[2]	0.45[2]	0.45[2]
Monohull Ferry	182[1]	0.45[2]	0.45[2]	0.45[2]	0.45[2]

[1] Information provided by the operator.

[2] No available information from operator. The load factors are referenced to PRD Ferry in Table 4-10 of EPD's "Study on Marine Vessels Emission Inventory"

Time-in-mode

Vessel Type		Time-in-mode (minutes)			
		Hotelling	Maneuvering	Slow Cruise	Fairway Cruise
Catamaran Ferry	Arrival	5.00 [1]	1.20 [2]	1.20 [2]	0.17[4]
	Departure	5.00 [1]	1.80 [2]	1.39 [3]	0.00[3]
Monohull Ferry	Arrival	5.00 [1]	1.20 [2]	1.20 [2]	0.21[4]
	Departure	5.00 [1]	1.80 [2]	1.39 [3]	0.00[3]

Note:

[1] The hotelling time is collected from site survey

[2] TIM of maneuvering and slow cruise is referenced to Table 4.15 of EPD's "Study on Marine Vessels Emission Inventory"

[3] The total length of navigation route adopted in the near-field model is 680m for Central Ferry. During departure, the ferry will leave the modelled navigation route under slow cruise mode.

Therefore, TIM of slow cruise (departure) = Length of navigation route under slow cruise / vessel speed under slow cruise

Length of navigation route under slow cruise = Total navigation route length adopted in the near-field model - Length of navigation route under maneuvering

Length of navigation route under maneuvering = TIM of maneuvering x vessel speed under maneuvering

[4] TIM of fairway cruise = Length of navigation route under fairway cruise / vessel speed under fairway cruise

Length of navigation route under fairway cruise = Total navigation route length adopted in the near-field model (680m) - Length of navigation route under maneuvering - Length of navigation route under slow cruise

Length of navigation route under maneuvering = TIM of maneuvering x vessel speed under maneuvering

Length of navigation route under slow cruise = TIM of slow cruise x vessel speed under slow cruise

Emission Factors of Main Engine and Auxiliary Engine

Engine Type	Emission Factors (g/Kwh)				Brake Specific Fuel Consumption (BSFC) [4]	Fuel Sulphur Content (%) [5]
	NO_x	RSP	FSP	SO_2 [3]		
Main Engine [1]	13.20	0.31	0.29	0.21	213	0.05
Auxiliary Engine [2]	10.00	0.31	0.29	0.21	217	0.05

Note:

[1] The emission factors of main engine (diesel) of Macau/PRD ferry in Table 4-17 of EPD's "Study on Marine Vessels Emission Inventory" are adopted.

[2] The emission factors of auxiliary engine (diesel) of Macau/PRD ferry in Table 4-17 of EPD's "Study on Marine Vessels Emission Inventory" are adopted.

[3] The emission factors of SO_2 are corrected with the fuel sulphur content according to Section 4.2.31 of EPD's "Study on Marine Vessels Emission Inventory" using the following equation:

SO_2 Emission Factor = BSFC x 2 x 0.9755 x Fuel Sulphur Fraction

[4] BSFC of the vessel is referenced to Table 4-17 of EPD's "Study on Marine Vessels Emission Inventory".

[5] With effective of the Air Pollution Control (Marine Light Diesel) Regulation on 1st April, 2014, the fuel sulphur content limit of the MLD is 0.05%.

Daily Profile of Passenger Ferry Service between Discovery Bay and Central [1]

Hours	Number of Trip					
	Arrival [2]			Departure [3]		
	Weekday	Saturday	Sunday / Public Holiday	Weekday	Saturday	Sunday / Public Holiday
01	2	2	2	2	3	3
02	1	2	2	1	1	1
03	1	1	1	1	1	1
04	1	1	1	0	0	0
05	0	0	0	1	1	1
06	1	1	1	0	0	0
07	1	1	1	3	2	2
08	2	2	1	4	3	1
09	3	2	2	4	4	2
10	2	3	2	2	2	2
11	2	2	2	2	2	2
12	2	2	2	2	2	2
13	2	2	2	2	2	2
14	2	2	2	2	2	2
15	2	2	2	2	2	2
16	3	2	2	2	2	2
17	2	2	2	2	2	2
18	2	2	2	2	2	2
19	3	2	2	3	2	2
20	3	2	2	2	2	2
21	2	2	2	2	2	2
22	2	2	2	2	2	2
23	2	2	2	2	2	2
24	2	2	2	2	2	2

Note:

[1] The daily schedule and sailing time of the ferry service is referenced to Transport Department's website.

[2] The hour of arrival is determined by the departure time at central and the sailing time to arrive Discovery Bay.

E.g. If a ferry departs from Central at 12:40 (Hour 13) and the sailing time is 25 minutes from Transport Department's website, it will arrive Discovery Bay at 13:05 (Hour 14).

The arrival hour of the ferry is therefore Hour 14.

[3] The hour of departure is the hour that the ferry departs at the Discovery Bay.

Daily NO_x emission (Weekdays)

Hour	Number of Trip		Total Emission (g)[1]																Weighted Average Emission (g)[2]								Weighted Average Emission Rate adopted in the dispersion model (g/s)	
			Catamaran Ferry								Monohull Ferry								Arrival				Departure					
			Arrival				Departure				Arrival				Departure													
	Arrival	Departure	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling[3]	Navigation[3]
01	2	2	128	301	632	236	128	452	733	0	137	199	402	148	137	299	467	0	130	276	574	214	130	413	667	0	7.21E-02	5.96E-01
02	1	1	64	151	316	118	64	226	367	0	68	100	201	74	68	149	234	0	65	138	287	107	65	207	333	0	3.60E-02	2.98E-01
03	1	1	64	151	316	118	64	226	367	0	68	100	201	74	68	149	234	0	65	138	287	107	65	207	333	0	3.60E-02	2.98E-01
04	1	0	64	151	316	118	0	0	0	0	68	100	201	74	0	0	0	0	65	138	287	107	0	0	0	0	1.80E-02	1.48E-01
05	0	1	0	0	0	0	64	226	367	0	0	0	0	0	68	149	234	0	0	0	0	0	65	207	333	0	1.80E-02	1.50E-01
06	1	0	64	151	316	118	0	0	0	0	68	100	201	74	0	0	0	0	65	138	287	107	0	0	0	0	1.80E-02	1.48E-01
07	1	3	64	151	316	118	191	677	1,100	0	68	100	201	74	205	448	701	0	65	138	287	107	195	620	1000	0	7.21E-02	5.98E-01
08	2	4	128	301	632	236	255	903	1,467	0	137	199	402	148	273	597	934	0	130	276	574	214	260	827	1333	0	1.08E-01	8.96E-01
09	3	4	191	452	947	354	255	903	1,467	0	205	299	604	223	273	597	934	0	195	413	861	321	260	827	1333	0	1.26E-01	1.04E+00
10	2	2	128	301	632	236	128	452	733	0	137	199	402	148	137	299	467	0	130	276	574	214	130	413	667	0	7.21E-02	5.96E-01
11	2	2	128	301	632	236	128	452	733	0	137	199	402	148	137	299	467	0	130	276	574	214	130	413	667	0	7.21E-02	5.96E-01
12	2	2	128	301	632	236	128	452	733	0	137	199	402	148	137	299	467	0	130	276	574	214	130	413	667	0	7.21E-02	5.96E-01
13	2	2	128	301	632	236	128	452	733	0	137	199	402	148	137	299	467	0	130	276	574	214	130	413	667	0	7.21E-02	5.96E-01
14	2	2	128	301	632	236	128	452	733	0	137	199	402	148	137	299	467	0	130	276	574	214	130	413	667	0	7.21E-02	5.96E-01
15	2	2	128	301	632	236	128	452	733	0	137	199	402	148	137	299	467	0	130	276	574	214	130	413	667	0	7.21E-02	5.96E-01
16	3	2	191	452	947	354	128	452	733	0	205	299	604	223	137	299	467	0	195	413	861	321	130	413	667	0	9.01E-02	7.43E-01
17	2	2	128	301	632	236	128	452	733	0	137	199	402	148	137	299	467	0	130	276	574	214	130	413	667	0	7.21E-02	5.96E-01
18	2	2	128	301	632	236	128	452	733	0	137	199	402	148	137	299	467	0	130	276	574	214	130	413	667	0	7.21E-02	5.96E-01
19	3	3	191	452	947	354	191	677	1,100	0	205	299	604	223	205	448	701	0	195	413	861	321	195	620	1000	0	1.08E-01	8.93E-01
20	3	2	191	452	947	354	128	452	733	0	205	299	604	223	137	299	467	0	195	413	861	321	130	413	667	0	9.01E-02	7.43E-01
21	2	2	128	301	632	236	128	452	733	0	137	199	402	148	137	299	467	0	130	276	574	214	130	413	667	0	7.21E-02	5.96E-01
22	2	2	128	301	632	236	128	452	733	0	137	199	402	148	137	299	467	0	130	276	574	214	130	413	667	0	7.21E-02	5.96E-01
23	2	2	128	301	632	236	128	452	733	0	137	199	402	148	137	299	467	0	130	276	574	214	130	413	667	0	7.21E-02	5.96E-01
24	2	2	128	301	632	236	128	452	733	0	137	199	402	148	137	299	467	0	130	276	574	214	130	413	667	0	7.21E-02	5.96E-01
Daily Emission (g)			2,869	6,774	14,211	5,315	2,996	10,612	17,232	0	3,071	4,479	9,053	3,339	3,208	7,018	10,978	0	2,919	6,200	12,921	4,821	3,049	9,713	15,669	0		
Total Daily Emission (g)			60,008								41,146								55,292									

Note:

[1] Total Emission = (Main Engine Emission + Auxiliary Engine Emission) x Number of Trip

Emission = Engine Power (kW) x Loading Factor x Time-in-mode (hr) X Emission Factor (g/kWh)

[2] As there is no information on the vessel types used in each trip, the weighted emission from Catamaran Ferry and Monohull Ferry is adopted for assessment. As advised by the operator, the number of vessels for Catamaran Ferry and Monohull Ferry is 6 and 2 vessels respectively.

[3] Emission during Hotelling = total emission of hotelling during arrival and departure

Emission during Navigation = total emission of navigation (Maneuvering + Slow Cruise + Fairway Cruise) during arrival and departure

Daily NO_x emission (Saturday)

Hour	Number of Trip		Total Emission (g)[1]																Weighted Average Emission (g)[2]								Weighted Average Emission Rate adopted in the dispersion model (g/s)	
			Catamaran Ferry								Monohull Ferry								Arrival				Departure					
			Arrival				Departure				Arrival				Departure													
	Arrival	Departure	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling[3]	Navigation[3]
01	2	3	128	301	632	236	191	677	1,100	0	137	199	402	148	205	448	701	0	130	276	574	214	195	620	1000	0	9.01E-02	7.46E-01
02	2	1	128	301	632	236	64	226	367	0	137	199	402	148	68	149	234	0	130	276	574	214	65	207	333	0	5.41E-02	4.46E-01
03	1	1	64	151	316	118	64	226	367	0	68	100	201	74	68	149	234	0	65	138	287	107	65	207	333	0	3.60E-02	2.98E-01
04	1	0	64	151	316	118	0	0	0	0	68	100	201	74	0	0	0	0	65	138	287	107	0	0	0	0	1.80E-02	1.48E-01
05	0	1	0	0	0	0	64	226	367	0	0	0	0	0	68	149	234	0	0	0	0	0	65	207	333	0	1.80E-02	1.50E-01
06	1	0	64	151	316	118	0	0	0	0	68	100	201	74	0	0	0	0	65	138	287	107	0	0	0	0	1.80E-02	1.48E-01
07	1	2	64	151	316	118	128	452	733	0	68	100	201	74	137	299	467	0	65	138	287	107	130	413	667	0	5.41E-02	4.48E-01
08	2	3	128	301	632	236	191	677	1,100	0	137	199	402	148	205	448	701	0	130	276	574	214	195	620	1000	0	9.01E-02	7.46E-01
09	2	4	128	301	632	236	255	903	1,467	0	137	199	402	148	273	597	934	0	130	276	574	214	260	827	1333	0	1.08E-01	8.96E-01
10	3	2	191	452	947	354	128	452	733	0	205	299	604	223	137	299	467	0	195	413	861	321	130	413	667	0	9.01E-02	7.43E-01
11	2	2	128	301	632	236	128	452	733	0	137	199	402	148	137	299	467	0	130	276	574	214	130	413	667	0	7.21E-02	5.96E-01
12	2	2	128	301	632	236	128	452	733	0	137	199	402	148	137	299	467	0	130	276	574	214	130	413	667	0	7.21E-02	5.96E-01
13	2	2	128	301	632	236	128	452	733	0	137	199	402	148	137	299	467	0	130	276	574	214	130	413	667	0	7.21E-02	5.96E-01
14	2	2	128	301	632	236	128	452	733	0	137	199	402	148	137	299	467	0	130	276	574	214	130	413	667	0	7.21E-02	5.96E-01
15	2	2	128	301	632	236	128	452	733	0	137	199	402	148	137	299	467	0	130	276	574	214	130	413	667	0	7.21E-02	5.96E-01
16	2	2	128	301	632	236	128	452	733	0	137	199	402	148	137	299	467	0	130	276	574	214	130	413	667	0	7.21E-02	5.96E-01
17	2	2	128	301	632	236	128	452	733	0	137	199	402	148	137	299	467	0	130	276	574	214	130	413	667	0	7.21E-02	5.96E-01
18	2	2	128	301	632	236	128	452	733	0	137	199	402	148	137	299	467	0	130	276	574	214	130	413	667	0	7.21E-02	5.96E-01
19	2	2	128	301	632	236	128	452	733	0	137	199	402	148	137	299	467	0	130	276	574	214	130	413	667	0	7.21E-02	5.96E-01
20	2	2	128	301	632	236	128	452	733	0	137	199	402	148	137	299	467	0	130	276	574	214	130	413	667	0	7.21E-02	5.96E-01
21	2	2	128	301	632	236	128	452	733	0	137	199	402	148	137	299	467	0	130	276	574	214	130	413	667	0	7.21E-02	5.96E-01
22	2	2	128	301	632	236	128	452	733	0	137	199	402	148	137	299	467	0	130	276	574	214	130	413	667	0	7.21E-02	5.96E-01
23	2	2	128	301	632	236	128	452	733	0	137	199	402	148	137	299	467	0	130	276	574	214	130	413	667	0	7.21E-02	5.96E-01
24	2	2	128	301	632	236	128	452	733	0	137	199	402	148	137	299	467	0	130	276	574	214	130	413	667	0	7.21E-02	5.96E-01
Daily Emission (g)			2,741	6,472	13,579	5,078	2,869	10,160	16,499	0	2,935	4,280	8,651	3,191	3,071	6,719	10,511	0	2,790	5,924	12,347	4,607	2,919	9,300	15,002	0		
Total Daily Emission (g)			57,399								39,358								52,889									

Note:

[1] Total Emission = (Main Engine Emission + Auxiliary Engine Emission) x Number of Trip

Emission = Engine Power (kW) x Loading Factor x Time-in-mode (hr) X Emission Factor (g/kWh)

[2] As there is no information on the vessel types used in each trip, the weighted emission from Catamaran Ferry and Monohull Ferry is adopted for assessment. As advised by the operator, the number of vessels for Catamaran Ferry and Monohull Ferry is 6 and 2 vessels respectively.

[3] Emission during Hotelling = total emission of hotelling during arrival and departure

Emission during Navigation = total emission of navigation (Maneuvering + Slow Cruise + Fairway Cruise) during arrival and departure

Daily NO_x emission (Sunday and Public Holidays)

Hour	Number of Trip		Total Emission (g)[1]																Weighted Average Emission (g)[2]								Weighted Average Emission Rate adopted in the dispersion model (g/s)	
			Catamaran Ferry								Monohull Ferry								Arrival				Departure					
			Arrival				Departure				Arrival				Departure													
	Arrival	Departure	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling[3]	Navigation[3]
01	2	3	128	301	632	236	191	677	1,100	0	137	199	402	148	205	448	701	0	130	276	574	214	195	620	1000	0	9.01E-02	7.46E-01
02	2	1	128	301	632	236	64	226	367	0	137	199	402	148	68	149	234	0	130	276	574	214	65	207	333	0	5.41E-02	4.46E-01
03	1	1	64	151	316	118	64	226	367	0	68	100	201	74	68	149	234	0	65	138	287	107	65	207	333	0	3.60E-02	2.98E-01
04	1	0	64	151	316	118	0	0	0	0	68	100	201	74	0	0	0	0	65	138	287	107	0	0	0	0	1.80E-02	1.48E-01
05	0	1	0	0	0	0	64	226	367	0	0	0	0	0	68	149	234	0	0	0	0	0	65	207	333	0	1.80E-02	1.50E-01
06	1	0	64	151	316	118	0	0	0	0	68	100	201	74	0	0	0	0	65	138	287	107	0	0	0	0	1.80E-02	1.48E-01
07	1	2	64	151	316	118	128	452	733	0	68	100	201	74	137	299	467	0	65	138	287	107	130	413	667	0	5.41E-02	4.48E-01
08	1	1	64	151	316	118	64	226	367	0	68	100	201	74	68	149	234	0	65	138	287	107	65	207	333	0	3.60E-02	2.98E-01
09	2	2	128	301	632	236	128	452	733	0	137	199	402	148	137	299	467	0	130	276	574	214	130	413	667	0	7.21E-02	5.96E-01
10	2	2	128	301	632	236	128	452	733	0	137	199	402	148	137	299	467	0	130	276	574	214	130	413	667	0	7.21E-02	5.96E-01
11	2	2	128	301	632	236	128	452	733	0	137	199	402	148	137	299	467	0	130	276	574	214	130	413	667	0	7.21E-02	5.96E-01
12	2	2	128	301	632	236	128	452	733	0	137	199	402	148	137	299	467	0	130	276	574	214	130	413	667	0	7.21E-02	5.96E-01
13	2	2	128	301	632	236	128	452	733	0	137	199	402	148	137	299	467	0	130	276	574	214	130	413	667	0	7.21E-02	5.96E-01
14	2	2	128	301	632	236	128	452	733	0	137	199	402	148	137	299	467	0	130	276	574	214	130	413	667	0	7.21E-02	5.96E-01
15	2	2	128	301	632	236	128	452	733	0	137	199	402	148	137	299	467	0	130	276	574	214	130	413	667	0	7.21E-02	5.96E-01
16	2	2	128	301	632	236	128	452	733	0	137	199	402	148	137	299	467	0	130	276	574	214	130	413	667	0	7.21E-02	5.96E-01
17	2	2	128	301	632	236	128	452	733	0	137	199	402	148	137	299	467	0	130	276	574	214	130	413	667	0	7.21E-02	5.96E-01
18	2	2	128	301	632	236	128	452	733	0	137	199	402	148	137	299	467	0	130	276	574	214	130	413	667	0	7.21E-02	5.96E-01
19	2	2	128	301	632	236	128	452	733	0	137	199	402	148	137	299	467	0	130	276	574	214	130	413	667	0	7.21E-02	5.96E-01
20	2	2	128	301	632	236	128	452	733	0	137	199	402	148	137	299	467	0	130	276	574	214	130	413	667	0	7.21E-02	5.96E-01
21	2	2	128	301	632	236	128	452	733	0	137	199	402	148	137	299	467	0	130	276	574	214	130	413	667	0	7.21E-02	5.96E-01
22	2	2	128	301	632	236	128	452	733	0	137	199	402	148	137	299	467	0	130	276	574	214	130	413	667	0	7.21E-02	5.96E-01
23	2	2	128	301	632	236	128	452	733	0	137	199	402	148	137	299	467	0	130	276	574	214	130	413	667	0	7.21E-02	5.96E-01
24	2	2	128	301	632	236	128	452	733	0	137	199	402	148	137	299	467	0	130	276	574	214	130	413	667	0	7.21E-02	5.96E-01
Daily Emission (g)			2,614	6,171	12,948	4,842	2,614	9,257	15,032	0	2,798	4,081	8,248	3,043	2,798	6,122	9,576	0	2,660	5,649	11,773	4,392	2,660	8,473	13,668	0		
Total Daily Emission (g)			53,478								36,667								49,275									

Note:

[1] Total Emission = (Main Engine Emission + Auxiliary Engine Emission) x Number of Trip

Emission = Engine Power (kW) x Loading Factor x Time-in-mode (hr) X Emission Factor (g/kWh)

[2] As there is no information on the vessel types used in each trip, the weighted emission from Catamaran Ferry and Monohull Ferry is adopted for assessment. As advised by the operator, the number of vessels for Catamaran Ferry and Monohull Ferry is 6 and 2 vessels respectively.

[3] Emission during Hotelling = total emission of hotelling during arrival and departure

Emission during Navigation = total emission of navigation (Maneuvering + Slow Cruise + Fairway Cruise) during arrival and departure

Daily RSP emission (Weekdays)

Hour	Number of Trip		Total Emission (g)[1]																Weighted Average Emission (g)[2]								Weighted Average Emission Rate adopted in the dispersion model (g/s)	
			Catamaran Ferry								Monohull Ferry								Arrival				Departure					
			Arrival				Departure				Arrival				Departure													
	Arrival	Departure	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling[3]	Navigation[3]
01	2	2	4.0	7.3	15.1	5.6	4.0	10.9	17.5	0.0	4.2	4.9	9.7	3.5	4.2	7.4	11.3	0.0	4.0	6.7	13.7	5.1	4.0	10.1	15.9	0.0	2.23E-03	1.43E-02
02	1	1	2.0	3.6	7.5	2.8	2.0	5.5	8.7	0.0	2.1	2.5	4.8	1.8	2.1	3.7	5.6	0.0	2.0	3.4	6.9	2.5	2.0	5.0	8.0	0.0	1.12E-03	7.15E-03
03	1	1	2.0	3.6	7.5	2.8	2.0	5.5	8.7	0.0	2.1	2.5	4.8	1.8	2.1	3.7	5.6	0.0	2.0	3.4	6.9	2.5	2.0	5.0	8.0	0.0	1.12E-03	7.15E-03
04	1	0	2.0	3.6	7.5	2.8	0.0	0.0	0.0	0.0	2.1	2.5	4.8	1.8	0.0	0.0	0.0	0.0	2.0	3.4	6.9	2.5	0.0	0.0	0.0	0.0	5.59E-04	3.54E-03
05	0	1	0.0	0.0	0.0	0.0	2.0	5.5	8.7	0.0	0.0	0.0	0.0	0.0	2.1	3.7	5.6	0.0	0.0	0.0	0.0	0.0	2.0	5.0	8.0	0.0	5.59E-04	3.61E-03
06	1	0	2.0	3.6	7.5	2.8	0.0	0.0	0.0	0.0	2.1	2.5	4.8	1.8	0.0	0.0	0.0	0.0	2.0	3.4	6.9	2.5	0.0	0.0	0.0	0.0	5.59E-04	3.54E-03
07	1	3	2.0	3.6	7.5	2.8	5.9	16.4	26.2	0.0	2.1	2.5	4.8	1.8	6.3	11.1	16.9	0.0	2.0	3.4	6.9	2.5	6.0	15.1	23.9	0.0	2.23E-03	1.44E-02
08	2	4	4.0	7.3	15.1	5.6	7.9	21.9	35.0	0.0	4.2	4.9	9.7	3.5	8.5	14.8	22.5	0.0	4.0	6.7	13.7	5.1	8.0	20.1	31.9	0.0	3.35E-03	2.15E-02
09	3	4	5.9	10.9	22.6	8.4	7.9	21.9	35.0	0.0	6.3	7.4	14.5	5.3	8.5	14.8	22.5	0.0	6.0	10.1	20.6	7.6	8.0	20.1	31.9	0.0	3.91E-03	2.51E-02
10	2	2	4.0	7.3	15.1	5.6	4.0	10.9	17.5	0.0	4.2	4.9	9.7	3.5	4.2	7.4	11.3	0.0	4.0	6.7	13.7	5.1	4.0	10.1	15.9	0.0	2.23E-03	1.43E-02
11	2	2	4.0	7.3	15.1	5.6	4.0	10.9	17.5	0.0	4.2	4.9	9.7	3.5	4.2	7.4	11.3	0.0	4.0	6.7	13.7	5.1	4.0	10.1	15.9	0.0	2.23E-03	1.43E-02
12	2	2	4.0	7.3	15.1	5.6	4.0	10.9	17.5	0.0	4.2	4.9	9.7	3.5	4.2	7.4	11.3	0.0	4.0	6.7	13.7	5.1	4.0	10.1	15.9	0.0	2.23E-03	1.43E-02
13	2	2	4.0	7.3	15.1	5.6	4.0	10.9	17.5	0.0	4.2	4.9	9.7	3.5	4.2	7.4	11.3	0.0	4.0	6.7	13.7	5.1	4.0	10.1	15.9	0.0	2.23E-03	1.43E-02
14	2	2	4.0	7.3	15.1	5.6	4.0	10.9	17.5	0.0	4.2	4.9	9.7	3.5	4.2	7.4	11.3	0.0	4.0	6.7	13.7	5.1	4.0	10.1	15.9	0.0	2.23E-03	1.43E-02
15	2	2	4.0	7.3	15.1	5.6	4.0	10.9	17.5	0.0	4.2	4.9	9.7	3.5	4.2	7.4	11.3	0.0	4.0	6.7	13.7	5.1	4.0	10.1	15.9	0.0	2.23E-03	1.43E-02
16	3	2	5.9	10.9	22.6	8.4	4.0	10.9	17.5	0.0	6.3	7.4	14.5	5.3	4.2	7.4	11.3	0.0	6.0	10.1	20.6	7.6	4.0	10.1	15.9	0.0	2.79E-03	1.78E-02
17	2	2	4.0	7.3	15.1	5.6	4.0	10.9	17.5	0.0	4.2	4.9	9.7	3.5	4.2	7.4	11.3	0.0	4.0	6.7	13.7	5.1	4.0	10.1	15.9	0.0	2.23E-03	1.43E-02
18	2	2	4.0	7.3	15.1	5.6	4.0	10.9	17.5	0.0	4.2	4.9	9.7	3.5	4.2	7.4	11.3	0.0	4.0	6.7	13.7	5.1	4.0	10.1	15.9	0.0	2.23E-03	1.43E-02
19	3	3	5.9	10.9	22.6	8.4	5.9	16.4	26.2	0.0	6.3	7.4	14.5	5.3	6.3	11.1	16.9	0.0	6.0	10.1	20.6	7.6	6.0	15.1	23.9	0.0	3.35E-03	2.15E-02
20	3	2	5.9	10.9	22.6	8.4	4.0	10.9	17.5	0.0	6.3	7.4	14.5	5.3	4.2	7.4	11.3	0.0	6.0	10.1	20.6	7.6	4.0	10.1	15.9	0.0	2.79E-03	1.78E-02
21	2	2	4.0	7.3	15.1	5.6	4.0	10.9	17.5	0.0	4.2	4.9	9.7	3.5	4.2	7.4	11.3	0.0	4.0	6.7	13.7	5.1	4.0	10.1	15.9	0.0	2.23E-03	1.43E-02
22	2	2	4.0	7.3	15.1	5.6	4.0	10.9	17.5	0.0	4.2	4.9	9.7	3.5	4.2	7.4	11.3	0.0	4.0	6.7	13.7	5.1	4.0	10.1	15.9	0.0	2.23E-03	1.43E-02
23	2	2	4.0	7.3	15.1	5.6	4.0	10.9	17.5	0.0	4.2	4.9	9.7	3.5	4.2	7.4	11.3	0.0	4.0	6.7	13.7	5.1	4.0	10.1	15.9	0.0	2.23E-03	1.43E-02
24	2	2	4.0	7.3	15.1	5.6	4.0	10.9	17.5	0.0	4.2	4.9	9.7	3.5	4.2	7.4	11.3	0.0	4.0	6.7	13.7	5.1	4.0	10.1	15.9	0.0	2.23E-03	1.43E-02
Daily Emission (g)			89	164	339	126	93	257	411	0	95	111	218	79	99	173	265	0	91	151	309	114	95	236	374	0		
Total Daily Emission (g)			1479								1041								1369									

Note:

[1] Total Emission = (Main Engine Emission + Auxiliary Engine Emission) x Number of Trip
Emission = Engine Power (kW) x Loading Factor x Time-in-mode (hr) X Emission Factor (g/kWh)

[2] As there is no information on the vessel types used in each trip, the weighted emission from Catamaran Ferry and Monohull Ferry is adopted for assessment. As advised by the operator, the number of vessels for Catamaran Ferry and Monohull Ferry is 6 and 2 vessels respectively.

[3] Emission during Hotelling = total emission of hotelling during arrival and departure
Emission during Navigation = total emission of navigation (Maneuvering + Slow Cruise + Fairway Cruise) during arrival and departure

Daily RSP emission (Saturday)

Hour	Number of Trip		Total Emission (g)[1]																Weighted Average Emission (g)[2]								Weighted Average Emission Rate adopted in the dispersion model (g/s)	
			Catamaran Ferry								Monohull Ferry								Arrival				Departure					
			Arrival				Departure				Arrival				Departure													
	Arrival	Departure	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling[3]	Navigation[3]
01	2	3	4.0	7.3	15.1	5.6	5.9	16.4	26.2	0.0	4.2	4.9	9.7	3.5	6.3	11.1	16.9	0.0	4.0	6.7	13.7	5.1	6.0	15.1	23.9	0.0	2.79E-03	1.79E-02
02	2	1	4.0	7.3	15.1	5.6	2.0	5.5	8.7	0.0	4.2	4.9	9.7	3.5	2.1	3.7	5.6	0.0	4.0	6.7	13.7	5.1	2.0	5.0	8.0	0.0	1.68E-03	1.07E-02
03	1	1	2.0	3.6	7.5	2.8	2.0	5.5	8.7	0.0	2.1	2.5	4.8	1.8	2.1	3.7	5.6	0.0	2.0	3.4	6.9	2.5	2.0	5.0	8.0	0.0	1.12E-03	7.15E-03
04	1	0	2.0	3.6	7.5	2.8	0.0	0.0	0.0	0.0	2.1	2.5	4.8	1.8	0.0	0.0	0.0	0.0	2.0	3.4	6.9	2.5	0.0	0.0	0.0	0.0	5.59E-04	3.54E-03
05	0	1	0.0	0.0	0.0	0.0	2.0	5.5	8.7	0.0	0.0	0.0	0.0	0.0	2.1	3.7	5.6	0.0	0.0	0.0	0.0	0.0	2.0	5.0	8.0	0.0	5.59E-04	3.61E-03
06	1	0	2.0	3.6	7.5	2.8	0.0	0.0	0.0	0.0	2.1	2.5	4.8	1.8	0.0	0.0	0.0	0.0	2.0	3.4	6.9	2.5	0.0	0.0	0.0	0.0	5.59E-04	3.54E-03
07	1	2	2.0	3.6	7.5	2.8	4.0	10.9	17.5	0.0	2.1	2.5	4.8	1.8	4.2	7.4	11.3	0.0	2.0	3.4	6.9	2.5	4.0	10.1	15.9	0.0	1.68E-03	1.08E-02
08	2	3	4.0	7.3	15.1	5.6	5.9	16.4	26.2	0.0	4.2	4.9	9.7	3.5	6.3	11.1	16.9	0.0	4.0	6.7	13.7	5.1	6.0	15.1	23.9	0.0	2.79E-03	1.79E-02
09	2	4	4.0	7.3	15.1	5.6	7.9	21.9	35.0	0.0	4.2	4.9	9.7	3.5	8.5	14.8	22.5	0.0	4.0	6.7	13.7	5.1	8.0	20.1	31.9	0.0	3.35E-03	2.15E-02
10	3	2	5.9	10.9	22.6	8.4	4.0	10.9	17.5	0.0	6.3	7.4	14.5	5.3	4.2	7.4	11.3	0.0	6.0	10.1	20.6	7.6	4.0	10.1	15.9	0.0	2.79E-03	1.78E-02
11	2	2	4.0	7.3	15.1	5.6	4.0	10.9	17.5	0.0	4.2	4.9	9.7	3.5	4.2	7.4	11.3	0.0	4.0	6.7	13.7	5.1	4.0	10.1	15.9	0.0	2.23E-03	1.43E-02
12	2	2	4.0	7.3	15.1	5.6	4.0	10.9	17.5	0.0	4.2	4.9	9.7	3.5	4.2	7.4	11.3	0.0	4.0	6.7	13.7	5.1	4.0	10.1	15.9	0.0	2.23E-03	1.43E-02
13	2	2	4.0	7.3	15.1	5.6	4.0	10.9	17.5	0.0	4.2	4.9	9.7	3.5	4.2	7.4	11.3	0.0	4.0	6.7	13.7	5.1	4.0	10.1	15.9	0.0	2.23E-03	1.43E-02
14	2	2	4.0	7.3	15.1	5.6	4.0	10.9	17.5	0.0	4.2	4.9	9.7	3.5	4.2	7.4	11.3	0.0	4.0	6.7	13.7	5.1	4.0	10.1	15.9	0.0	2.23E-03	1.43E-02
15	2	2	4.0	7.3	15.1	5.6	4.0	10.9	17.5	0.0	4.2	4.9	9.7	3.5	4.2	7.4	11.3	0.0	4.0	6.7	13.7	5.1	4.0	10.1	15.9	0.0	2.23E-03	1.43E-02
16	2	2	4.0	7.3	15.1	5.6	4.0	10.9	17.5	0.0	4.2	4.9	9.7	3.5	4.2	7.4	11.3	0.0	4.0	6.7	13.7	5.1	4.0	10.1	15.9	0.0	2.23E-03	1.43E-02
17	2	2	4.0	7.3	15.1	5.6	4.0	10.9	17.5	0.0	4.2	4.9	9.7	3.5	4.2	7.4	11.3	0.0	4.0	6.7	13.7	5.1	4.0	10.1	15.9	0.0	2.23E-03	1.43E-02
18	2	2	4.0	7.3	15.1	5.6	4.0	10.9	17.5	0.0	4.2	4.9	9.7	3.5	4.2	7.4	11.3	0.0	4.0	6.7	13.7	5.1	4.0	10.1	15.9	0.0	2.23E-03	1.43E-02
19	2	2	4.0	7.3	15.1	5.6	4.0	10.9	17.5	0.0	4.2	4.9	9.7	3.5	4.2	7.4	11.3	0.0	4.0	6.7	13.7	5.1	4.0	10.1	15.9	0.0	2.23E-03	1.43E-02
20	2	2	4.0	7.3	15.1	5.6	4.0	10.9	17.5	0.0	4.2	4.9	9.7	3.5	4.2	7.4	11.3	0.0	4.0	6.7	13.7	5.1	4.0	10.1	15.9	0.0	2.23E-03	1.43E-02
21	2	2	4.0	7.3	15.1	5.6	4.0	10.9	17.5	0.0	4.2	4.9	9.7	3.5	4.2	7.4	11.3	0.0	4.0	6.7	13.7	5.1	4.0	10.1	15.9	0.0	2.23E-03	1.43E-02
22	2	2	4.0	7.3	15.1	5.6	4.0	10.9	17.5	0.0	4.2	4.9	9.7	3.5	4.2	7.4	11.3	0.0	4.0	6.7	13.7	5.1	4.0	10.1	15.9	0.0	2.23E-03	1.43E-02
23	2	2	4.0	7.3	15.1	5.6	4.0	10.9	17.5	0.0	4.2	4.9	9.7	3.5	4.2	7.4	11.3	0.0	4.0	6.7	13.7	5.1	4.0	10.1	15.9	0.0	2.23E-03	1.43E-02
24	2	2	4.0	7.3	15.1	5.6	4.0	10.9	17.5	0.0	4.2	4.9	9.7	3.5	4.2	7.4	11.3	0.0	4.0	6.7	13.7	5.1	4.0	10.1	15.9	0.0	2.23E-03	1.43E-02
Daily Emission (g)			85	157	324	120	89	246	393	0	91	106	208	76	95	166	253	0	86	144	295	109	91	226	358	0		
Total Daily Emission (g)			1415								996								1310									

Note:

[1] Total Emission = (Main Engine Emission + Auxiliary Engine Emission) x Number of Trip

Emission = Engine Power (kW) x Loading Factor x Time-in-mode (hr) X Emission Factor (g/kWh)

[2] As there is no information on the vessel types used in each trip, the weighted emission from Catamaran Ferry and Monohull Ferry is adopted for assessment. As advised by the operator, the number of vessels for Catamaran Ferry and Monohull Ferry is 6 and 2 vessels respectively.

[3] Emission during Hotelling = total emission of hotelling during arrival and departure

Emission during Navigation = total emission of navigation (Maneuvering + Slow Cruise + Fairway Cruise) during arrival and departure

Daily RSP emission (Sunday and Public Holidays)

Hour	Number of Trip		Total Emission (g)[1]																Weighted Average Emission (g)[2]								Weighted Average Emission Rate adopted in the dispersion model (g/s)	
			Catamaran Ferry								Monohull Ferry								Arrival				Departure					
			Arrival				Departure				Arrival				Departure													
	Arrival	Departure	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling[3]	Navigation[3]
01	2	3	4.0	7.3	15.1	5.6	5.9	16.4	26.2	0.0	4.2	4.9	9.7	3.5	6.3	11.1	16.9	0.0	4.0	6.7	13.7	5.1	6.0	15.1	23.9	0.0	2.79E-03	1.79E-02
02	2	1	4.0	7.3	15.1	5.6	2.0	5.5	8.7	0.0	4.2	4.9	9.7	3.5	2.1	3.7	5.6	0.0	4.0	6.7	13.7	5.1	2.0	5.0	8.0	0.0	1.68E-03	1.07E-02
03	1	1	2.0	3.6	7.5	2.8	2.0	5.5	8.7	0.0	2.1	2.5	4.8	1.8	2.1	3.7	5.6	0.0	2.0	3.4	6.9	2.5	2.0	5.0	8.0	0.0	1.12E-03	7.15E-03
04	1	0	2.0	3.6	7.5	2.8	0.0	0.0	0.0	0.0	2.1	2.5	4.8	1.8	0.0	0.0	0.0	0.0	2.0	3.4	6.9	2.5	0.0	0.0	0.0	0.0	5.59E-04	3.54E-03
05	0	1	0.0	0.0	0.0	0.0	2.0	5.5	8.7	0.0	0.0	0.0	0.0	0.0	2.1	3.7	5.6	0.0	0.0	0.0	0.0	0.0	2.0	5.0	8.0	0.0	5.59E-04	3.61E-03
06	1	0	2.0	3.6	7.5	2.8	0.0	0.0	0.0	0.0	2.1	2.5	4.8	1.8	0.0	0.0	0.0	0.0	2.0	3.4	6.9	2.5	0.0	0.0	0.0	0.0	5.59E-04	3.54E-03
07	1	2	2.0	3.6	7.5	2.8	4.0	10.9	17.5	0.0	2.1	2.5	4.8	1.8	4.2	7.4	11.3	0.0	2.0	3.4	6.9	2.5	4.0	10.1	15.9	0.0	1.68E-03	1.08E-02
08	1	1	2.0	3.6	7.5	2.8	2.0	5.5	8.7	0.0	2.1	2.5	4.8	1.8	2.1	3.7	5.6	0.0	2.0	3.4	6.9	2.5	2.0	5.0	8.0	0.0	1.12E-03	7.15E-03
09	2	2	4.0	7.3	15.1	5.6	4.0	10.9	17.5	0.0	4.2	4.9	9.7	3.5	4.2	7.4	11.3	0.0	4.0	6.7	13.7	5.1	4.0	10.1	15.9	0.0	2.23E-03	1.43E-02
10	2	2	4.0	7.3	15.1	5.6	4.0	10.9	17.5	0.0	4.2	4.9	9.7	3.5	4.2	7.4	11.3	0.0	4.0	6.7	13.7	5.1	4.0	10.1	15.9	0.0	2.23E-03	1.43E-02
11	2	2	4.0	7.3	15.1	5.6	4.0	10.9	17.5	0.0	4.2	4.9	9.7	3.5	4.2	7.4	11.3	0.0	4.0	6.7	13.7	5.1	4.0	10.1	15.9	0.0	2.23E-03	1.43E-02
12	2	2	4.0	7.3	15.1	5.6	4.0	10.9	17.5	0.0	4.2	4.9	9.7	3.5	4.2	7.4	11.3	0.0	4.0	6.7	13.7	5.1	4.0	10.1	15.9	0.0	2.23E-03	1.43E-02
13	2	2	4.0	7.3	15.1	5.6	4.0	10.9	17.5	0.0	4.2	4.9	9.7	3.5	4.2	7.4	11.3	0.0	4.0	6.7	13.7	5.1	4.0	10.1	15.9	0.0	2.23E-03	1.43E-02
14	2	2	4.0	7.3	15.1	5.6	4.0	10.9	17.5	0.0	4.2	4.9	9.7	3.5	4.2	7.4	11.3	0.0	4.0	6.7	13.7	5.1	4.0	10.1	15.9	0.0	2.23E-03	1.43E-02
15	2	2	4.0	7.3	15.1	5.6	4.0	10.9	17.5	0.0	4.2	4.9	9.7	3.5	4.2	7.4	11.3	0.0	4.0	6.7	13.7	5.1	4.0	10.1	15.9	0.0	2.23E-03	1.43E-02
16	2	2	4.0	7.3	15.1	5.6	4.0	10.9	17.5	0.0	4.2	4.9	9.7	3.5	4.2	7.4	11.3	0.0	4.0	6.7	13.7	5.1	4.0	10.1	15.9	0.0	2.23E-03	1.43E-02
17	2	2	4.0	7.3	15.1	5.6	4.0	10.9	17.5	0.0	4.2	4.9	9.7	3.5	4.2	7.4	11.3	0.0	4.0	6.7	13.7	5.1	4.0	10.1	15.9	0.0	2.23E-03	1.43E-02
18	2	2	4.0	7.3	15.1	5.6	4.0	10.9	17.5	0.0	4.2	4.9	9.7	3.5	4.2	7.4	11.3	0.0	4.0	6.7	13.7	5.1	4.0	10.1	15.9	0.0	2.23E-03	1.43E-02
19	2	2	4.0	7.3	15.1	5.6	4.0	10.9	17.5	0.0	4.2	4.9	9.7	3.5	4.2	7.4	11.3	0.0	4.0	6.7	13.7	5.1	4.0	10.1	15.9	0.0	2.23E-03	1.43E-02
20	2	2	4.0	7.3	15.1	5.6	4.0	10.9	17.5	0.0	4.2	4.9	9.7	3.5	4.2	7.4	11.3	0.0	4.0	6.7	13.7	5.1	4.0	10.1	15.9	0.0	2.23E-03	1.43E-02
21	2	2	4.0	7.3	15.1	5.6	4.0	10.9	17.5	0.0	4.2	4.9	9.7	3.5	4.2	7.4	11.3	0.0	4.0	6.7	13.7	5.1	4.0	10.1	15.9	0.0	2.23E-03	1.43E-02
22	2	2	4.0	7.3	15.1	5.6	4.0	10.9	17.5	0.0	4.2	4.9	9.7	3.5	4.2	7.4	11.3	0.0	4.0	6.7	13.7	5.1	4.0	10.1	15.9	0.0	2.23E-03	1.43E-02
23	2	2	4.0	7.3	15.1	5.6	4.0	10.9	17.5	0.0	4.2	4.9	9.7	3.5	4.2	7.4	11.3	0.0	4.0	6.7	13.7	5.1	4.0	10.1	15.9	0.0	2.23E-03	1.43E-02
24	2	2	4.0	7.3	15.1	5.6	4.0	10.9	17.5	0.0	4.2	4.9	9.7	3.5	4.2	7.4	11.3	0.0	4.0	6.7	13.7	5.1	4.0	10.1	15.9	0.0	2.23E-03	1.43E-02
Daily Emission (g)			81	150	309	114	81	224	359	0	87	101	199	72	87	151	231	0	82	137	281	104	82	206	327	0		
Total Daily Emission (g)			1,318								928								1,220									

Note:

[1] Total Emission = (Main Engine Emission + Auxiliary Engine Emission) x Number of Trip

Emission = Engine Power (kW) x Loading Factor x Time-in-mode (hr) X Emission Factor (g/kWh)

[2] As there is no information on the vessel types used in each trip, the weighted emission from Catamaran Ferry and Monohull Ferry is adopted for assessment. As advised by the operator, the number of vessels for Catamaran Ferry and Monohull Ferry is 6 and 2 vessels respectively.

[3] Emission during Hotelling = total emission of hotelling during arrival and departure

Emission during Navigation = total emission of navigation (Maneuvering + Slow Cruise + Fairway Cruise) during arrival and departure

Daily FSP emission (Weekdays)

Hour	Number of Trip		Total Emission (g)[1]														Weighted Average Emission (g)[2]								Weighted Average Emission Rate adopted in the dispersion model (g/s)	
			Catamaran Ferry								Monohull Ferry								Arrival				Departure					
			Arrival				Departure				Arrival				Departure													
	Arrival	Departure	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling[3]	Navigation[3]
01	2	2	3.7	6.8	14.1	5.2	3.7	10.2	16.4	0.0	4.0	4.6	9.1	3.3	4.0	6.9	10.5	0.0	3.8	6.3	12.8	4.7	3.8	9.4	14.9	0.0	2.09E-03	1.34E-02
02	1	1	1.8	3.4	7.0	2.6	1.8	5.1	8.2	0.0	2.0	2.3	4.5	1.7	2.0	3.5	5.3	0.0	1.9	3.1	6.4	2.4	1.9	4.7	7.5	0.0	1.05E-03	6.69E-03
03	1	1	1.8	3.4	7.0	2.6	1.8	5.1	8.2	0.0	2.0	2.3	4.5	1.7	2.0	3.5	5.3	0.0	1.9	3.1	6.4	2.4	1.9	4.7	7.5	0.0	1.05E-03	6.69E-03
04	1	0	1.8	3.4	7.0	2.6	0.0	0.0	0.0	0.0	2.0	2.3	4.5	1.7	0.0	0.0	0.0	0.0	1.9	3.1	6.4	2.4	0.0	0.0	0.0	0.0	5.23E-04	3.31E-03
05	0	1	0.0	0.0	0.0	0.0	1.8	5.1	8.2	0.0	0.0	0.0	0.0	0.0	2.0	3.5	5.3	0.0	0.0	0.0	0.0	0.0	1.9	4.7	7.5	0.0	5.23E-04	3.38E-03
06	1	0	1.8	3.4	7.0	2.6	0.0	0.0	0.0	0.0	2.0	2.3	4.5	1.7	0.0	0.0	0.0	0.0	1.9	3.1	6.4	2.4	0.0	0.0	0.0	0.0	5.23E-04	3.31E-03
07	1	3	1.8	3.4	7.0	2.6	5.5	15.4	24.5	0.0	2.0	2.3	4.5	1.7	5.9	10.4	15.8	0.0	1.9	3.1	6.4	2.4	5.6	14.1	22.4	0.0	2.09E-03	1.34E-02
08	2	4	3.7	6.8	14.1	5.2	7.4	20.5	32.7	0.0	4.0	4.6	9.1	3.3	7.9	13.8	21.1	0.0	3.8	6.3	12.8	4.7	7.5	18.8	29.8	0.0	3.14E-03	2.01E-02
09	3	4	5.5	10.2	21.1	7.8	7.4	20.5	32.7	0.0	5.9	6.9	13.6	5.0	7.9	13.8	21.1	0.0	5.6	9.4	19.3	7.1	7.5	18.8	29.8	0.0	3.66E-03	2.34E-02
10	2	2	3.7	6.8	14.1	5.2	3.7	10.2	16.4	0.0	4.0	4.6	9.1	3.3	4.0	6.9	10.5	0.0	3.8	6.3	12.8	4.7	3.8	9.4	14.9	0.0	2.09E-03	1.34E-02
11	2	2	3.7	6.8	14.1	5.2	3.7	10.2	16.4	0.0	4.0	4.6	9.1	3.3	4.0	6.9	10.5	0.0	3.8	6.3	12.8	4.7	3.8	9.4	14.9	0.0	2.09E-03	1.34E-02
12	2	2	3.7	6.8	14.1	5.2	3.7	10.2	16.4	0.0	4.0	4.6	9.1	3.3	4.0	6.9	10.5	0.0	3.8	6.3	12.8	4.7	3.8	9.4	14.9	0.0	2.09E-03	1.34E-02
13	2	2	3.7	6.8	14.1	5.2	3.7	10.2	16.4	0.0	4.0	4.6	9.1	3.3	4.0	6.9	10.5	0.0	3.8	6.3	12.8	4.7	3.8	9.4	14.9	0.0	2.09E-03	1.34E-02
14	2	2	3.7	6.8	14.1	5.2	3.7	10.2	16.4	0.0	4.0	4.6	9.1	3.3	4.0	6.9	10.5	0.0	3.8	6.3	12.8	4.7	3.8	9.4	14.9	0.0	2.09E-03	1.34E-02
15	2	2	3.7	6.8	14.1	5.2	3.7	10.2	16.4	0.0	4.0	4.6	9.1	3.3	4.0	6.9	10.5	0.0	3.8	6.3	12.8	4.7	3.8	9.4	14.9	0.0	2.09E-03	1.34E-02
16	3	2	5.5	10.2	21.1	7.8	3.7	10.2	16.4	0.0	5.9	6.9	13.6	5.0	4.0	6.9	10.5	0.0	5.6	9.4	19.3	7.1	3.8	9.4	14.9	0.0	2.61E-03	1.67E-02
17	2	2	3.7	6.8	14.1	5.2	3.7	10.2	16.4	0.0	4.0	4.6	9.1	3.3	4.0	6.9	10.5	0.0	3.8	6.3	12.8	4.7	3.8	9.4	14.9	0.0	2.09E-03	1.34E-02
18	2	2	3.7	6.8	14.1	5.2	3.7	10.2	16.4	0.0	4.0	4.6	9.1	3.3	4.0	6.9	10.5	0.0	3.8	6.3	12.8	4.7	3.8	9.4	14.9	0.0	2.09E-03	1.34E-02
19	3	3	5.5	10.2	21.1	7.8	5.5	15.4	24.5	0.0	5.9	6.9	13.6	5.0	5.9	10.4	15.8	0.0	5.6	9.4	19.3	7.1	5.6	14.1	22.4	0.0	3.14E-03	2.01E-02
20	3	2	5.5	10.2	21.1	7.8	3.7	10.2	16.4	0.0	5.9	6.9	13.6	5.0	4.0	6.9	10.5	0.0	5.6	9.4	19.3	7.1	3.8	9.4	14.9	0.0	2.61E-03	1.67E-02
21	2	2	3.7	6.8	14.1	5.2	3.7	10.2	16.4	0.0	4.0	4.6	9.1	3.3	4.0	6.9	10.5	0.0	3.8	6.3	12.8	4.7	3.8	9.4	14.9	0.0	2.09E-03	1.34E-02
22	2	2	3.7	6.8	14.1	5.2	3.7	10.2	16.4	0.0	4.0	4.6	9.1	3.3	4.0	6.9	10.5	0.0	3.8	6.3	12.8	4.7	3.8	9.4	14.9	0.0	2.09E-03	1.34E-02
23	2	2	3.7	6.8	14.1	5.2	3.7	10.2	16.4	0.0	4.0	4.6	9.1	3.3	4.0	6.9	10.5	0.0	3.8	6.3	12.8	4.7	3.8	9.4	14.9	0.0	2.09E-03	1.34E-02
24	2	2	3.7	6.8	14.1	5.2	3.7	10.2	16.4	0.0	4.0	4.6	9.1	3.3	4.0	6.9	10.5	0.0	3.8	6.3	12.8	4.7	3.8	9.4	14.9	0.0	2.09E-03	1.34E-02
Daily Emission (g)			83	154	317	117	87	241	384	0	89	104	204	74	93	162	247	0	85	141	289	107	88	221	350	0		
Total Daily Emission (g)			1383								974								1281									

Note:

[1] Total Emission = (Main Engine Emission + Auxiliary Engine Emission) x Number of Trip

Emission = Engine Power (kW) x Loading Factor x Time-in-mode (hr) X Emission Factor (g/kWh)

[2] As there is no information on the vessel types used in each trip, the weighted emission from Catamaran Ferry and Monohull Ferry is adopted for assessment. As advised by the operator, the number of vessels for Catamaran Ferry and Monohull Ferry is 6 and 2 vessels respectively.

[3] Emission during Hotelling = total emission of hotelling during arrival and departure

Emission during Navigation = total emission of navigation (Maneuvering + Slow Cruise + Fairway Cruise) during arrival and departure

Daily FSP emission (Saturday)

Hour	Number of Trip		Total Emission (g)[1]																Weighted Average Emission (g)[2]								Weighted Average Emission Rate adopted in the dispersion model (g/s)	
			Catamaran Ferry								Monohull Ferry																	
			Arrival				Departure				Arrival				Departure				Arrival				Departure					
	Arrival	Departure	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling[3]	Navigation[3]
01	2	3	3.7	6.8	14.1	5.2	5.5	15.4	24.5	0.0	4.0	4.6	9.1	3.3	5.9	10.4	15.8	0.0	3.8	6.3	12.8	4.7	5.6	14.1	22.4	0.0	2.61E-03	1.68E-02
02	2	1	3.7	6.8	14.1	5.2	1.8	5.1	8.2	0.0	4.0	4.6	9.1	3.3	2.0	3.5	5.3	0.0	3.8	6.3	12.8	4.7	1.9	4.7	7.5	0.0	1.57E-03	1.00E-02
03	1	1	1.8	3.4	7.0	2.6	1.8	5.1	8.2	0.0	2.0	2.3	4.5	1.7	2.0	3.5	5.3	0.0	1.9	3.1	6.4	2.4	1.9	4.7	7.5	0.0	1.05E-03	6.69E-03
04	1	0	1.8	3.4	7.0	2.6	0.0	0.0	0.0	0.0	2.0	2.3	4.5	1.7	0.0	0.0	0.0	0.0	1.9	3.1	6.4	2.4	0.0	0.0	0.0	0.0	5.23E-04	3.31E-03
05	0	1	0.0	0.0	0.0	0.0	1.8	5.1	8.2	0.0	0.0	0.0	0.0	0.0	2.0	3.5	5.3	0.0	0.0	0.0	0.0	0.0	1.9	4.7	7.5	0.0	5.23E-04	3.38E-03
06	1	0	1.8	3.4	7.0	2.6	0.0	0.0	0.0	0.0	2.0	2.3	4.5	1.7	0.0	0.0	0.0	0.0	1.9	3.1	6.4	2.4	0.0	0.0	0.0	0.0	5.23E-04	3.31E-03
07	1	2	1.8	3.4	7.0	2.6	3.7	10.2	16.4	0.0	2.0	2.3	4.5	1.7	4.0	6.9	10.5	0.0	1.9	3.1	6.4	2.4	3.8	9.4	14.9	0.0	1.57E-03	1.01E-02
08	2	3	3.7	6.8	14.1	5.2	5.5	15.4	24.5	0.0	4.0	4.6	9.1	3.3	5.9	10.4	15.8	0.0	3.8	6.3	12.8	4.7	5.6	14.1	22.4	0.0	2.61E-03	1.68E-02
09	2	4	3.7	6.8	14.1	5.2	7.4	20.5	32.7	0.0	4.0	4.6	9.1	3.3	7.9	13.8	21.1	0.0	3.8	6.3	12.8	4.7	7.5	18.8	29.8	0.0	3.14E-03	2.01E-02
10	3	2	5.5	10.2	21.1	7.8	3.7	10.2	16.4	0.0	5.9	6.9	13.6	5.0	4.0	6.9	10.5	0.0	5.6	9.4	19.3	7.1	3.8	9.4	14.9	0.0	2.61E-03	1.67E-02
11	2	2	3.7	6.8	14.1	5.2	3.7	10.2	16.4	0.0	4.0	4.6	9.1	3.3	4.0	6.9	10.5	0.0	3.8	6.3	12.8	4.7	3.8	9.4	14.9	0.0	2.09E-03	1.34E-02
12	2	2	3.7	6.8	14.1	5.2	3.7	10.2	16.4	0.0	4.0	4.6	9.1	3.3	4.0	6.9	10.5	0.0	3.8	6.3	12.8	4.7	3.8	9.4	14.9	0.0	2.09E-03	1.34E-02
13	2	2	3.7	6.8	14.1	5.2	3.7	10.2	16.4	0.0	4.0	4.6	9.1	3.3	4.0	6.9	10.5	0.0	3.8	6.3	12.8	4.7	3.8	9.4	14.9	0.0	2.09E-03	1.34E-02
14	2	2	3.7	6.8	14.1	5.2	3.7	10.2	16.4	0.0	4.0	4.6	9.1	3.3	4.0	6.9	10.5	0.0	3.8	6.3	12.8	4.7	3.8	9.4	14.9	0.0	2.09E-03	1.34E-02
15	2	2	3.7	6.8	14.1	5.2	3.7	10.2	16.4	0.0	4.0	4.6	9.1	3.3	4.0	6.9	10.5	0.0	3.8	6.3	12.8	4.7	3.8	9.4	14.9	0.0	2.09E-03	1.34E-02
16	2	2	3.7	6.8	14.1	5.2	3.7	10.2	16.4	0.0	4.0	4.6	9.1	3.3	4.0	6.9	10.5	0.0	3.8	6.3	12.8	4.7	3.8	9.4	14.9	0.0	2.09E-03	1.34E-02
17	2	2	3.7	6.8	14.1	5.2	3.7	10.2	16.4	0.0	4.0	4.6	9.1	3.3	4.0	6.9	10.5	0.0	3.8	6.3	12.8	4.7	3.8	9.4	14.9	0.0	2.09E-03	1.34E-02
18	2	2	3.7	6.8	14.1	5.2	3.7	10.2	16.4	0.0	4.0	4.6	9.1	3.3	4.0	6.9	10.5	0.0	3.8	6.3	12.8	4.7	3.8	9.4	14.9	0.0	2.09E-03	1.34E-02
19	2	2	3.7	6.8	14.1	5.2	3.7	10.2	16.4	0.0	4.0	4.6	9.1	3.3	4.0	6.9	10.5	0.0	3.8	6.3	12.8	4.7	3.8	9.4	14.9	0.0	2.09E-03	1.34E-02
20	2	2	3.7	6.8	14.1	5.2	3.7	10.2	16.4	0.0	4.0	4.6	9.1	3.3	4.0	6.9	10.5	0.0	3.8	6.3	12.8	4.7	3.8	9.4	14.9	0.0	2.09E-03	1.34E-02
21	2	2	3.7	6.8	14.1	5.2	3.7	10.2	16.4	0.0	4.0	4.6	9.1	3.3	4.0	6.9	10.5	0.0	3.8	6.3	12.8	4.7	3.8	9.4	14.9	0.0	2.09E-03	1.34E-02
22	2	2	3.7	6.8	14.1	5.2	3.7	10.2	16.4	0.0	4.0	4.6	9.1	3.3	4.0	6.9	10.5	0.0	3.8	6.3	12.8	4.7	3.8	9.4	14.9	0.0	2.09E-03	1.34E-02
23	2	2	3.7	6.8	14.1	5.2	3.7	10.2	16.4	0.0	4.0	4.6	9.1	3.3	4.0	6.9	10.5	0.0	3.8	6.3	12.8	4.7	3.8	9.4	14.9	0.0	2.09E-03	1.34E-02
24	2	2	3.7	6.8	14.1	5.2	3.7	10.2	16.4	0.0	4.0	4.6	9.1	3.3	4.0	6.9	10.5	0.0	3.8	6.3	12.8	4.7	3.8	9.4	14.9	0.0	2.09E-03	1.34E-02
Daily Emission (g)			79	147	303	112	83	230	368	0	85	99	195	71	89	155	237	0	81	135	276	102	85	212	335	0		
Total Daily Emission (g)			1323								931								1225									

Note:

[1] Total Emission = (Main Engine Emission + Auxiliary Engine Emission) x Number of Trip

Emission = Engine Power (kW) x Loading Factor x Time-in-mode (hr) X Emission Factor (g/kWh)

[2] As there is no information on the vessel types used in each trip, the weighted emission from Catamaran Ferry and Monohull Ferry is adopted for assessment. As advised by the operator, the number of vessels for Catamaran Ferry and Monohull Ferry is 6 and 2 vessels respectively.

[3] Emission during Hotelling = total emission of hotelling during arrival and departure

Emission during Navigation = total emission of navigation (Maneuvering + Slow Cruise + Fairway Cruise) during arrival and departure

Daily FSP emission (Sunday and Public Holidays)

Hour	Number of Trip		Total Emission (g)[1]																Weighted Average Emission (g)[2]								Weighted Average Emission Rate adopted in the dispersion model (g/s)	
			Catamaran Ferry								Monohull Ferry								Arrival				Departure					
			Arrival				Departure				Arrival				Departure													
	Arrival	Departure	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling[3]	Navigation[3]
01	2	3	3.7	6.8	14.1	5.2	5.5	15.4	24.5	0.0	4.0	4.6	9.1	3.3	5.9	10.4	15.8	0.0	3.8	6.3	12.8	4.7	5.6	14.1	22.4	0.0	2.61E-03	1.68E-02
02	2	1	3.7	6.8	14.1	5.2	1.8	5.1	8.2	0.0	4.0	4.6	9.1	3.3	2.0	3.5	5.3	0.0	3.8	6.3	12.8	4.7	1.9	4.7	7.5	0.0	1.57E-03	1.00E-02
03	1	1	1.8	3.4	7.0	2.6	1.8	5.1	8.2	0.0	2.0	2.3	4.5	1.7	2.0	3.5	5.3	0.0	1.9	3.1	6.4	2.4	1.9	4.7	7.5	0.0	1.05E-03	6.69E-03
04	1	0	1.8	3.4	7.0	2.6	0.0	0.0	0.0	0.0	2.0	2.3	4.5	1.7	0.0	0.0	0.0	0.0	1.9	3.1	6.4	2.4	0.0	0.0	0.0	0.0	5.23E-04	3.31E-03
05	0	1	0.0	0.0	0.0	0.0	1.8	5.1	8.2	0.0	0.0	0.0	0.0	0.0	2.0	3.5	5.3	0.0	0.0	0.0	0.0	0.0	1.9	4.7	7.5	0.0	5.23E-04	3.38E-03
06	1	0	1.8	3.4	7.0	2.6	0.0	0.0	0.0	0.0	2.0	2.3	4.5	1.7	0.0	0.0	0.0	0.0	1.9	3.1	6.4	2.4	0.0	0.0	0.0	0.0	5.23E-04	3.31E-03
07	1	2	1.8	3.4	7.0	2.6	3.7	10.2	16.4	0.0	2.0	2.3	4.5	1.7	4.0	6.9	10.5	0.0	1.9	3.1	6.4	2.4	3.8	9.4	14.9	0.0	1.57E-03	1.01E-02
08	1	1	1.8	3.4	7.0	2.6	1.8	5.1	8.2	0.0	2.0	2.3	4.5	1.7	2.0	3.5	5.3	0.0	1.9	3.1	6.4	2.4	1.9	4.7	7.5	0.0	1.05E-03	6.69E-03
09	2	2	3.7	6.8	14.1	5.2	3.7	10.2	16.4	0.0	4.0	4.6	9.1	3.3	4.0	6.9	10.5	0.0	3.8	6.3	12.8	4.7	3.8	9.4	14.9	0.0	2.09E-03	1.34E-02
10	2	2	3.7	6.8	14.1	5.2	3.7	10.2	16.4	0.0	4.0	4.6	9.1	3.3	4.0	6.9	10.5	0.0	3.8	6.3	12.8	4.7	3.8	9.4	14.9	0.0	2.09E-03	1.34E-02
11	2	2	3.7	6.8	14.1	5.2	3.7	10.2	16.4	0.0	4.0	4.6	9.1	3.3	4.0	6.9	10.5	0.0	3.8	6.3	12.8	4.7	3.8	9.4	14.9	0.0	2.09E-03	1.34E-02
12	2	2	3.7	6.8	14.1	5.2	3.7	10.2	16.4	0.0	4.0	4.6	9.1	3.3	4.0	6.9	10.5	0.0	3.8	6.3	12.8	4.7	3.8	9.4	14.9	0.0	2.09E-03	1.34E-02
13	2	2	3.7	6.8	14.1	5.2	3.7	10.2	16.4	0.0	4.0	4.6	9.1	3.3	4.0	6.9	10.5	0.0	3.8	6.3	12.8	4.7	3.8	9.4	14.9	0.0	2.09E-03	1.34E-02
14	2	2	3.7	6.8	14.1	5.2	3.7	10.2	16.4	0.0	4.0	4.6	9.1	3.3	4.0	6.9	10.5	0.0	3.8	6.3	12.8	4.7	3.8	9.4	14.9	0.0	2.09E-03	1.34E-02
15	2	2	3.7	6.8	14.1	5.2	3.7	10.2	16.4	0.0	4.0	4.6	9.1	3.3	4.0	6.9	10.5	0.0	3.8	6.3	12.8	4.7	3.8	9.4	14.9	0.0	2.09E-03	1.34E-02
16	2	2	3.7	6.8	14.1	5.2	3.7	10.2	16.4	0.0	4.0	4.6	9.1	3.3	4.0	6.9	10.5	0.0	3.8	6.3	12.8	4.7	3.8	9.4	14.9	0.0	2.09E-03	1.34E-02
17	2	2	3.7	6.8	14.1	5.2	3.7	10.2	16.4	0.0	4.0	4.6	9.1	3.3	4.0	6.9	10.5	0.0	3.8	6.3	12.8	4.7	3.8	9.4	14.9	0.0	2.09E-03	1.34E-02
18	2	2	3.7	6.8	14.1	5.2	3.7	10.2	16.4	0.0	4.0	4.6	9.1	3.3	4.0	6.9	10.5	0.0	3.8	6.3	12.8	4.7	3.8	9.4	14.9	0.0	2.09E-03	1.34E-02
19	2	2	3.7	6.8	14.1	5.2	3.7	10.2	16.4	0.0	4.0	4.6	9.1	3.3	4.0	6.9	10.5	0.0	3.8	6.3	12.8	4.7	3.8	9.4	14.9	0.0	2.09E-03	1.34E-02
20	2	2	3.7	6.8	14.1	5.2	3.7	10.2	16.4	0.0	4.0	4.6	9.1	3.3	4.0	6.9	10.5	0.0	3.8	6.3	12.8	4.7	3.8	9.4	14.9	0.0	2.09E-03	1.34E-02
21	2	2	3.7	6.8	14.1	5.2	3.7	10.2	16.4	0.0	4.0	4.6	9.1	3.3	4.0	6.9	10.5	0.0	3.8	6.3	12.8	4.7	3.8	9.4	14.9	0.0	2.09E-03	1.34E-02
22	2	2	3.7	6.8	14.1	5.2	3.7	10.2	16.4	0.0	4.0	4.6	9.1	3.3	4.0	6.9	10.5	0.0	3.8	6.3	12.8	4.7	3.8	9.4	14.9	0.0	2.09E-03	1.34E-02
23	2	2	3.7	6.8	14.1	5.2	3.7	10.2	16.4	0.0	4.0	4.6	9.1	3.3	4.0	6.9	10.5	0.0	3.8	6.3	12.8	4.7	3.8	9.4	14.9	0.0	2.09E-03	1.34E-02
24	2	2	3.7	6.8	14.1	5.2	3.7	10.2	16.4	0.0	4.0	4.6	9.1	3.3	4.0	6.9	10.5	0.0	3.8	6.3	12.8	4.7	3.8	9.4	14.9	0.0	2.09E-03	1.34E-02
Daily Emission (g)			76	140	289	107	76	210	335	0	81	94	186	68	81	142	216	0	77	129	263	97	77	193	305	0		
Total Daily Emission (g)			1,233								868								1,142									

Note:

[1] Total Emission = (Main Engine Emission + Auxiliary Engine Emission) x Number of Trip

Emission = Engine Power (kW) x Loading Factor x Time-in-mode (hr) X Emission Factor (g/kWh)

[2] As there is no information on the vessel types used in each trip, the weighted emission from Catamaran Ferry and Monohull Ferry is adopted for assessment. As advised by the operator, the number of vessels for Catamaran Ferry and Monohull Ferry is 6 and 2 vessels respectively.

[3] Emission during Hotelling = total emission of hotelling during arrival and departure

Emission during Navigation = total emission of navigation (Maneuvering + Slow Cruise + Fairway Cruise) during arrival and departure

Daily SO_2 emission (Weekdays)

Hour	Number of Trip		Total Emission (g)[1]																Weighted Average Emission (g)[2]								Weighted Average Emission Rate adopted in the dispersion model (g/s)	
			Catamaran Ferry								Monohull Ferry								Arrival				Departure					
			Arrival				Departure				Arrival				Departure													
	Arrival	Departure	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling[3]	Navigation[3]
01	2	2	2.7	4.9	10.1	3.7	2.7	7.4	11.8	0.0	2.9	3.3	6.5	2.4	2.9	5.0	7.6	0.0	2.8	4.5	9.2	3.4	2.8	6.8	10.7	0.0	1.53E-03	9.62E-03
02	1	1	1.4	2.5	5.1	1.9	1.4	3.7	5.9	0.0	1.4	1.7	3.3	1.2	1.4	2.5	3.8	0.0	1.4	2.3	4.6	1.7	1.4	3.4	5.4	0.0	7.65E-04	4.81E-03
03	1	1	1.4	2.5	5.1	1.9	1.4	3.7	5.9	0.0	1.4	1.7	3.3	1.2	1.4	2.5	3.8	0.0	1.4	2.3	4.6	1.7	1.4	3.4	5.4	0.0	7.65E-04	4.81E-03
04	1	0	1.4	2.5	5.1	1.9	0.0	0.0	0.0	0.0	1.4	1.7	3.3	1.2	0.0	0.0	0.0	0.0	1.4	2.3	4.6	1.7	0.0	0.0	0.0	0.0	3.82E-04	2.38E-03
05	0	1	0.0	0.0	0.0	0.0	1.4	3.7	5.9	0.0	0.0	0.0	0.0	0.0	1.4	2.5	3.8	0.0	0.0	0.0	0.0	0.0	1.4	3.4	5.4	0.0	3.82E-04	2.43E-03
06	1	0	1.4	2.5	5.1	1.9	0.0	0.0	0.0	0.0	1.4	1.7	3.3	1.2	0.0	0.0	0.0	0.0	1.4	2.3	4.6	1.7	0.0	0.0	0.0	0.0	3.82E-04	2.38E-03
07	1	3	1.4	2.5	5.1	1.9	4.1	11.1	17.6	0.0	1.4	1.7	3.3	1.2	4.3	7.5	11.4	0.0	1.4	2.3	4.6	1.7	4.1	10.2	16.1	0.0	1.53E-03	9.67E-03
08	2	4	2.7	4.9	10.1	3.7	5.4	14.7	23.5	0.0	2.9	3.3	6.5	2.4	5.8	10.0	15.2	0.0	2.8	4.5	9.2	3.4	5.5	13.5	21.4	0.0	2.29E-03	1.45E-02
09	3	4	4.1	7.4	15.2	5.6	5.4	14.7	23.5	0.0	4.3	5.0	9.8	3.6	5.8	10.0	15.2	0.0	4.1	6.8	13.8	5.1	5.5	13.5	21.4	0.0	2.68E-03	1.69E-02
10	2	2	2.7	4.9	10.1	3.7	2.7	7.4	11.8	0.0	2.9	3.3	6.5	2.4	2.9	5.0	7.6	0.0	2.8	4.5	9.2	3.4	2.8	6.8	10.7	0.0	1.53E-03	9.62E-03
11	2	2	2.7	4.9	10.1	3.7	2.7	7.4	11.8	0.0	2.9	3.3	6.5	2.4	2.9	5.0	7.6	0.0	2.8	4.5	9.2	3.4	2.8	6.8	10.7	0.0	1.53E-03	9.62E-03
12	2	2	2.7	4.9	10.1	3.7	2.7	7.4	11.8	0.0	2.9	3.3	6.5	2.4	2.9	5.0	7.6	0.0	2.8	4.5	9.2	3.4	2.8	6.8	10.7	0.0	1.53E-03	9.62E-03
13	2	2	2.7	4.9	10.1	3.7	2.7	7.4	11.8	0.0	2.9	3.3	6.5	2.4	2.9	5.0	7.6	0.0	2.8	4.5	9.2	3.4	2.8	6.8	10.7	0.0	1.53E-03	9.62E-03
14	2	2	2.7	4.9	10.1	3.7	2.7	7.4	11.8	0.0	2.9	3.3	6.5	2.4	2.9	5.0	7.6	0.0	2.8	4.5	9.2	3.4	2.8	6.8	10.7	0.0	1.53E-03	9.62E-03
15	2	2	2.7	4.9	10.1	3.7	2.7	7.4	11.8	0.0	2.9	3.3	6.5	2.4	2.9	5.0	7.6	0.0	2.8	4.5	9.2	3.4	2.8	6.8	10.7	0.0	1.53E-03	9.62E-03
16	3	2	4.1	7.4	15.2	5.6	2.7	7.4	11.8	0.0	4.3	5.0	9.8	3.6	2.9	5.0	7.6	0.0	4.1	6.8	13.8	5.1	2.8	6.8	10.7	0.0	1.91E-03	1.20E-02
17	2	2	2.7	4.9	10.1	3.7	2.7	7.4	11.8	0.0	2.9	3.3	6.5	2.4	2.9	5.0	7.6	0.0	2.8	4.5	9.2	3.4	2.8	6.8	10.7	0.0	1.53E-03	9.62E-03
18	2	2	2.7	4.9	10.1	3.7	2.7	7.4	11.8	0.0	2.9	3.3	6.5	2.4	2.9	5.0	7.6	0.0	2.8	4.5	9.2	3.4	2.8	6.8	10.7	0.0	1.53E-03	9.62E-03
19	3	3	4.1	7.4	15.2	5.6	4.1	11.1	17.6	0.0	4.3	5.0	9.8	3.6	4.3	7.5	11.4	0.0	4.1	6.8	13.8	5.1	4.1	10.2	16.1	0.0	2.29E-03	1.44E-02
20	3	2	4.1	7.4	15.2	5.6	2.7	7.4	11.8	0.0	4.3	5.0	9.8	3.6	2.9	5.0	7.6	0.0	4.1	6.8	13.8	5.1	2.8	6.8	10.7	0.0	1.91E-03	1.20E-02
21	2	2	2.7	4.9	10.1	3.7	2.7	7.4	11.8	0.0	2.9	3.3	6.5	2.4	2.9	5.0	7.6	0.0	2.8	4.5	9.2	3.4	2.8	6.8	10.7	0.0	1.53E-03	9.62E-03
22	2	2	2.7	4.9	10.1	3.7	2.7	7.4	11.8	0.0	2.9	3.3	6.5	2.4	2.9	5.0	7.6	0.0	2.8	4.5	9.2	3.4	2.8	6.8	10.7	0.0	1.53E-03	9.62E-03
23	2	2	2.7	4.9	10.1	3.7	2.7	7.4	11.8	0.0	2.9	3.3	6.5	2.4	2.9	5.0	7.6	0.0	2.8	4.5	9.2	3.4	2.8	6.8	10.7	0.0	1.53E-03	9.62E-03
24	2	2	2.7	4.9	10.1	3.7	2.7	7.4	11.8	0.0	2.9	3.3	6.5	2.4	2.9	5.0	7.6	0.0	2.8	4.5	9.2	3.4	2.8	6.8	10.7	0.0	1.53E-03	9.62E-03
Daily Emission (g)			61	111	228	84	64	173	276	0	65	75	147	53	68	117	178	0	62	102	208	77	65	159	252	0		
Total Daily Emission (g)			997								703								923									

Note:

[1] Total Emission = (Main Engine Emission + Auxiliary Engine Emission) x Number of Trip
Emission = Engine Power (kW) x Loading Factor x Time-in-mode (hr) X Emission Factor (g/kWh)

[2] As there is no information on the vessel types used in each trip, the weighted emission from Catamaran Ferry and Monohull Ferry is adopted for assessment. As advised by the operator, the number of vessels for Catamaran Ferry and Monohull Ferry is 6 and 2 vessels respectively.

[3] Emission during Hotelling = total emission of hotelling during arrival and departure
Emission during Navigation = total emission of navigation (Maneuvering + Slow Cruise + Fairway Cruise) during arrival and departure

Daily SO_2 emission (Saturday)

Hour	Number of Trip		Total Emission (g)[1]																Weighted Average Emission (g)[2]								Weighted Average Emission Rate adopted in the dispersion model (g/s)	
			Catamaran Ferry								Monohull Ferry								Arrival				Departure					
			Arrival				Departure				Arrival				Departure													
	Arrival	Departure	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling[3]	Navigation[3]
01	2	3	2.7	4.9	10.1	3.7	4.1	11.1	17.6	0.0	2.9	3.3	6.5	2.4	4.3	7.5	11.4	0.0	2.8	4.5	9.2	3.4	4.1	10.2	16.1	0.0	1.91E-03	1.20E-02
02	2	1	2.7	4.9	10.1	3.7	1.4	3.7	5.9	0.0	2.9	3.3	6.5	2.4	1.4	2.5	3.8	0.0	2.8	4.5	9.2	3.4	1.4	3.4	5.4	0.0	1.15E-03	7.19E-03
03	1	1	1.4	2.5	5.1	1.9	1.4	3.7	5.9	0.0	1.4	1.7	3.3	1.2	1.4	2.5	3.8	0.0	1.4	2.3	4.6	1.7	1.4	3.4	5.4	0.0	7.65E-04	4.81E-03
04	1	0	1.4	2.5	5.1	1.9	0.0	0.0	0.0	0.0	1.4	1.7	3.3	1.2	0.0	0.0	0.0	0.0	1.4	2.3	4.6	1.7	0.0	0.0	0.0	0.0	3.82E-04	2.38E-03
05	0	1	0.0	0.0	0.0	0.0	1.4	3.7	5.9	0.0	0.0	0.0	0.0	0.0	1.4	2.5	3.8	0.0	0.0	0.0	0.0	0.0	1.4	3.4	5.4	0.0	3.82E-04	2.43E-03
06	1	0	1.4	2.5	5.1	1.9	0.0	0.0	0.0	0.0	1.4	1.7	3.3	1.2	0.0	0.0	0.0	0.0	1.4	2.3	4.6	1.7	0.0	0.0	0.0	0.0	3.82E-04	2.38E-03
07	1	2	1.4	2.5	5.1	1.9	2.7	7.4	11.8	0.0	1.4	1.7	3.3	1.2	2.9	5.0	7.6	0.0	1.4	2.3	4.6	1.7	2.8	6.8	10.7	0.0	1.15E-03	7.24E-03
08	2	3	2.7	4.9	10.1	3.7	4.1	11.1	17.6	0.0	2.9	3.3	6.5	2.4	4.3	7.5	11.4	0.0	2.8	4.5	9.2	3.4	4.1	10.2	16.1	0.0	1.91E-03	1.20E-02
09	2	4	2.7	4.9	10.1	3.7	5.4	14.7	23.5	0.0	2.9	3.3	6.5	2.4	5.8	10.0	15.2	0.0	2.8	4.5	9.2	3.4	5.5	13.5	21.4	0.0	2.29E-03	1.45E-02
10	3	2	4.1	7.4	15.2	5.6	2.7	7.4	11.8	0.0	4.3	5.0	9.8	3.6	2.9	5.0	7.6	0.0	4.1	6.8	13.8	5.1	2.8	6.8	10.7	0.0	1.91E-03	1.20E-02
11	2	2	2.7	4.9	10.1	3.7	2.7	7.4	11.8	0.0	2.9	3.3	6.5	2.4	2.9	5.0	7.6	0.0	2.8	4.5	9.2	3.4	2.8	6.8	10.7	0.0	1.53E-03	9.62E-03
12	2	2	2.7	4.9	10.1	3.7	2.7	7.4	11.8	0.0	2.9	3.3	6.5	2.4	2.9	5.0	7.6	0.0	2.8	4.5	9.2	3.4	2.8	6.8	10.7	0.0	1.53E-03	9.62E-03
13	2	2	2.7	4.9	10.1	3.7	2.7	7.4	11.8	0.0	2.9	3.3	6.5	2.4	2.9	5.0	7.6	0.0	2.8	4.5	9.2	3.4	2.8	6.8	10.7	0.0	1.53E-03	9.62E-03
14	2	2	2.7	4.9	10.1	3.7	2.7	7.4	11.8	0.0	2.9	3.3	6.5	2.4	2.9	5.0	7.6	0.0	2.8	4.5	9.2	3.4	2.8	6.8	10.7	0.0	1.53E-03	9.62E-03
15	2	2	2.7	4.9	10.1	3.7	2.7	7.4	11.8	0.0	2.9	3.3	6.5	2.4	2.9	5.0	7.6	0.0	2.8	4.5	9.2	3.4	2.8	6.8	10.7	0.0	1.53E-03	9.62E-03
16	2	2	2.7	4.9	10.1	3.7	2.7	7.4	11.8	0.0	2.9	3.3	6.5	2.4	2.9	5.0	7.6	0.0	2.8	4.5	9.2	3.4	2.8	6.8	10.7	0.0	1.53E-03	9.62E-03
17	2	2	2.7	4.9	10.1	3.7	2.7	7.4	11.8	0.0	2.9	3.3	6.5	2.4	2.9	5.0	7.6	0.0	2.8	4.5	9.2	3.4	2.8	6.8	10.7	0.0	1.53E-03	9.62E-03
18	2	2	2.7	4.9	10.1	3.7	2.7	7.4	11.8	0.0	2.9	3.3	6.5	2.4	2.9	5.0	7.6	0.0	2.8	4.5	9.2	3.4	2.8	6.8	10.7	0.0	1.53E-03	9.62E-03
19	2	2	2.7	4.9	10.1	3.7	2.7	7.4	11.8	0.0	2.9	3.3	6.5	2.4	2.9	5.0	7.6	0.0	2.8	4.5	9.2	3.4	2.8	6.8	10.7	0.0	1.53E-03	9.62E-03
20	2	2	2.7	4.9	10.1	3.7	2.7	7.4	11.8	0.0	2.9	3.3	6.5	2.4	2.9	5.0	7.6	0.0	2.8	4.5	9.2	3.4	2.8	6.8	10.7	0.0	1.53E-03	9.62E-03
21	2	2	2.7	4.9	10.1	3.7	2.7	7.4	11.8	0.0	2.9	3.3	6.5	2.4	2.9	5.0	7.6	0.0	2.8	4.5	9.2	3.4	2.8	6.8	10.7	0.0	1.53E-03	9.62E-03
22	2	2	2.7	4.9	10.1	3.7	2.7	7.4	11.8	0.0	2.9	3.3	6.5	2.4	2.9	5.0	7.6	0.0	2.8	4.5	9.2	3.4	2.8	6.8	10.7	0.0	1.53E-03	9.62E-03
23	2	2	2.7	4.9	10.1	3.7	2.7	7.4	11.8	0.0	2.9	3.3	6.5	2.4	2.9	5.0	7.6	0.0	2.8	4.5	9.2	3.4	2.8	6.8	10.7	0.0	1.53E-03	9.62E-03
24	2	2	2.7	4.9	10.1	3.7	2.7	7.4	11.8	0.0	2.9	3.3	6.5	2.4	2.9	5.0	7.6	0.0	2.8	4.5	9.2	3.4	2.8	6.8	10.7	0.0	1.53E-03	9.62E-03
Daily Emission (g)			58	106	218	81	61	166	265	0	62	71	140	51	65	112	170	0	59	97	198	73	62	152	241	0		
Total Daily Emission (g)			954								672								883									

Note:

[1] Total Emission = (Main Engine Emission + Auxiliary Engine Emission) x Number of Trip

Emission = Engine Power (kW) x Loading Factor x Time-in-mode (hr) X Emission Factor (g/kWh)

[2] As there is no information on the vessel types used in each trip, the weighted emission from Catamaran Ferry and Monohull Ferry is adopted for assessment. As advised by the operator, the number of vessels for Catamaran Ferry and Monohull Ferry is 6 and 2 vessels respectively.

[3] Emission during Hotelling = total emission of hotelling during arrival and departure

Emission during Navigation = total emission of navigation (Maneuvering + Slow Cruise + Fairway Cruise) during arrival and departure

Daily SO_2 emission (Sunday and Public Holidays)

Hour	Number of Trip		Total Emission (g)[1]																Weighted Average Emission (g)[2]								Weighted Average Emission Rate adopted in the dispersion model (g/s)	
			Catamaran Ferry								Monohull Ferry								Arrival				Departure					
			Arrival				Departure				Arrival				Departure													
	Arrival	Departure	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling[3]	Navigation[3]
01	2	3	2.7	4.9	10.1	3.7	4.1	11.1	17.6	0.0	2.9	3.3	6.5	2.4	4.3	7.5	11.4	0.0	2.8	4.5	9.2	3.4	4.1	10.2	16.1	0.0	1.91E-03	1.20E-02
02	2	1	2.7	4.9	10.1	3.7	1.4	3.7	5.9	0.0	2.9	3.3	6.5	2.4	1.4	2.5	3.8	0.0	2.8	4.5	9.2	3.4	1.4	3.4	5.4	0.0	1.15E-03	7.19E-03
03	1	1	1.4	2.5	5.1	1.9	1.4	3.7	5.9	0.0	1.4	1.7	3.3	1.2	1.4	2.5	3.8	0.0	1.4	2.3	4.6	1.7	1.4	3.4	5.4	0.0	7.65E-04	4.81E-03
04	1	0	1.4	2.5	5.1	1.9	0.0	0.0	0.0	0.0	1.4	1.7	3.3	1.2	0.0	0.0	0.0	0.0	1.4	2.3	4.6	1.7	0.0	0.0	0.0	0.0	3.82E-04	2.38E-03
05	0	1	0.0	0.0	0.0	0.0	1.4	3.7	5.9	0.0	0.0	0.0	0.0	0.0	1.4	2.5	3.8	0.0	0.0	0.0	0.0	0.0	1.4	3.4	5.4	0.0	3.82E-04	2.43E-03
06	1	0	1.4	2.5	5.1	1.9	0.0	0.0	0.0	0.0	1.4	1.7	3.3	1.2	0.0	0.0	0.0	0.0	1.4	2.3	4.6	1.7	0.0	0.0	0.0	0.0	3.82E-04	2.38E-03
07	1	2	1.4	2.5	5.1	1.9	2.7	7.4	11.8	0.0	1.4	1.7	3.3	1.2	2.9	5.0	7.6	0.0	1.4	2.3	4.6	1.7	2.8	6.8	10.7	0.0	1.15E-03	7.24E-03
08	1	1	1.4	2.5	5.1	1.9	1.4	3.7	5.9	0.0	1.4	1.7	3.3	1.2	1.4	2.5	3.8	0.0	1.4	2.3	4.6	1.7	1.4	3.4	5.4	0.0	7.65E-04	4.81E-03
09	2	2	2.7	4.9	10.1	3.7	2.7	7.4	11.8	0.0	2.9	3.3	6.5	2.4	2.9	5.0	7.6	0.0	2.8	4.5	9.2	3.4	2.8	6.8	10.7	0.0	1.53E-03	9.62E-03
10	2	2	2.7	4.9	10.1	3.7	2.7	7.4	11.8	0.0	2.9	3.3	6.5	2.4	2.9	5.0	7.6	0.0	2.8	4.5	9.2	3.4	2.8	6.8	10.7	0.0	1.53E-03	9.62E-03
11	2	2	2.7	4.9	10.1	3.7	2.7	7.4	11.8	0.0	2.9	3.3	6.5	2.4	2.9	5.0	7.6	0.0	2.8	4.5	9.2	3.4	2.8	6.8	10.7	0.0	1.53E-03	9.62E-03
12	2	2	2.7	4.9	10.1	3.7	2.7	7.4	11.8	0.0	2.9	3.3	6.5	2.4	2.9	5.0	7.6	0.0	2.8	4.5	9.2	3.4	2.8	6.8	10.7	0.0	1.53E-03	9.62E-03
13	2	2	2.7	4.9	10.1	3.7	2.7	7.4	11.8	0.0	2.9	3.3	6.5	2.4	2.9	5.0	7.6	0.0	2.8	4.5	9.2	3.4	2.8	6.8	10.7	0.0	1.53E-03	9.62E-03
14	2	2	2.7	4.9	10.1	3.7	2.7	7.4	11.8	0.0	2.9	3.3	6.5	2.4	2.9	5.0	7.6	0.0	2.8	4.5	9.2	3.4	2.8	6.8	10.7	0.0	1.53E-03	9.62E-03
15	2	2	2.7	4.9	10.1	3.7	2.7	7.4	11.8	0.0	2.9	3.3	6.5	2.4	2.9	5.0	7.6	0.0	2.8	4.5	9.2	3.4	2.8	6.8	10.7	0.0	1.53E-03	9.62E-03
16	2	2	2.7	4.9	10.1	3.7	2.7	7.4	11.8	0.0	2.9	3.3	6.5	2.4	2.9	5.0	7.6	0.0	2.8	4.5	9.2	3.4	2.8	6.8	10.7	0.0	1.53E-03	9.62E-03
17	2	2	2.7	4.9	10.1	3.7	2.7	7.4	11.8	0.0	2.9	3.3	6.5	2.4	2.9	5.0	7.6	0.0	2.8	4.5	9.2	3.4	2.8	6.8	10.7	0.0	1.53E-03	9.62E-03
18	2	2	2.7	4.9	10.1	3.7	2.7	7.4	11.8	0.0	2.9	3.3	6.5	2.4	2.9	5.0	7.6	0.0	2.8	4.5	9.2	3.4	2.8	6.8	10.7	0.0	1.53E-03	9.62E-03
19	2	2	2.7	4.9	10.1	3.7	2.7	7.4	11.8	0.0	2.9	3.3	6.5	2.4	2.9	5.0	7.6	0.0	2.8	4.5	9.2	3.4	2.8	6.8	10.7	0.0	1.53E-03	9.62E-03
20	2	2	2.7	4.9	10.1	3.7	2.7	7.4	11.8	0.0	2.9	3.3	6.5	2.4	2.9	5.0	7.6	0.0	2.8	4.5	9.2	3.4	2.8	6.8	10.7	0.0	1.53E-03	9.62E-03
21	2	2	2.7	4.9	10.1	3.7	2.7	7.4	11.8	0.0	2.9	3.3	6.5	2.4	2.9	5.0	7.6	0.0	2.8	4.5	9.2	3.4	2.8	6.8	10.7	0.0	1.53E-03	9.62E-03
22	2	2	2.7	4.9	10.1	3.7	2.7	7.4	11.8	0.0	2.9	3.3	6.5	2.4	2.9	5.0	7.6	0.0	2.8	4.5	9.2	3.4	2.8	6.8	10.7	0.0	1.53E-03	9.62E-03
23	2	2	2.7	4.9	10.1	3.7	2.7	7.4	11.8	0.0	2.9	3.3	6.5	2.4	2.9	5.0	7.6	0.0	2.8	4.5	9.2	3.4	2.8	6.8	10.7	0.0	1.53E-03	9.62E-03
24	2	2	2.7	4.9	10.1	3.7	2.7	7.4	11.8	0.0	2.9	3.3	6.5	2.4	2.9	5.0	7.6	0.0	2.8	4.5	9.2	3.4	2.8	6.8	10.7	0.0	1.53E-03	9.62E-03
Daily Emission (g)			55	101	208	77	55	151	241	0	59	68	134	49	59	102	155	0	56	93	189	70	56	139	220	0		
Total Daily Emission (g)			888								626								823									

Note:

[1] Total Emission = (Main Engine Emission + Auxiliary Engine Emission) x Number of Trip

Emission = Engine Power (kW) x Loading Factor x Time-in-mode (hr) X Emission Factor (g/kWh)

[2] As there is no information on the vessel types used in each trip, the weighted emission from Catamaran Ferry and Monohull Ferry is adopted for assessment. As advised by the operator, the number of vessels for Catamaran Ferry and Monohull Ferry is 6 and 2 vessels respectively.

[3] Emission during Hotelling = total emission of hotelling during arrival and departure

Emission during Navigation = total emission of navigation (Maneuvering + Slow Cruise + Fairway Cruise) during arrival and departure

Name	Source ID	Source Type	X	Y	Stack Height / Release Height (m)[3]	Exit Temperature (K)[3]	Exit Velocity (m/s)[4]	Diameter (m)[3]	Emission Rate (g/s)
Hotelling	DCH001	Point	819882	817541	6.2	773	8	0.7	Note [1]
Navigation	DCM001	Point	819901	817546	6.2	773	8	0.7	Note [2]
	DCM002	Point	819920	817551	6.2	773	8	0.7	Note [2]
	DCM003	Point	819937	817562	6.2	773	8	0.7	Note [2]
	DCM004	Point	819951	817576	6.2	773	8	0.7	Note [2]
	DCM005	Point	819965	817591	6.2	773	8	0.7	Note [2]
	DCM006	Point	819979	817605	6.2	773	8	0.7	Note [2]
	DCM007	Point	819993	817619	6.2	773	8	0.7	Note [2]
	DCM008	Point	820007	817634	6.2	773	8	0.7	Note [2]
	DCM009	Point	820021	817648	6.2	773	8	0.7	Note [2]
	DCM010	Point	820034	817663	6.2	773	8	0.7	Note [2]
	DCM011	Point	820048	817677	6.2	773	8	0.7	Note [2]
	DCM012	Point	820062	817692	6.2	773	8	0.7	Note [2]
	DCM013	Point	820076	817706	6.2	773	8	0.7	Note [2]
	DCM014	Point	820091	817719	6.2	773	8	0.7	Note [2]
	DCM015	Point	820108	817729	6.2	773	8	0.7	Note [2]
	DCM016	Point	820125	817740	6.2	773	8	0.7	Note [2]
	DCM017	Point	820142	817751	6.2	773	8	0.7	Note [2]
	DCM018	Point	820159	817761	6.2	773	8	0.7	Note [2]
	DCM019	Point	820176	817772	6.2	773	8	0.7	Note [2]
	DCM020	Point	820194	817782	6.2	773	8	0.7	Note [2]
	DCM021	Point	820211	817792	6.2	773	8	0.7	Note [2]
	DCM022	Point	820229	817800	6.2	773	8	0.7	Note [2]
	DCM023	Point	820248	817807	6.2	773	8	0.7	Note [2]
	DCM024	Point	820266	817814	6.2	773	8	0.7	Note [2]
	DCM025	Point	820285	817821	6.2	773	8	0.7	Note [2]
	DCM026	Point	820304	817828	6.2	773	8	0.7	Note [2]
	DCM027	Point	820323	817834	6.2	773	8	0.7	Note [2]
	DCM028	Point	820342	817839	6.2	773	8	0.7	Note [2]
	DCM029	Point	820361	817845	6.2	773	8	0.7	Note [2]
	DCM030	Point	820381	817851	6.2	773	8	0.7	Note [2]
	DCM031	Point	820400	817857	6.2	773	8	0.7	Note [2]
	DCM032	Point	820419	817862	6.2	773	8	0.7	Note [2]
	DCM033	Point	820438	817868	6.2	773	8	0.7	Note [2]
	DCM034	Point	820458	817872	6.2	773	8	0.7	Note [2]

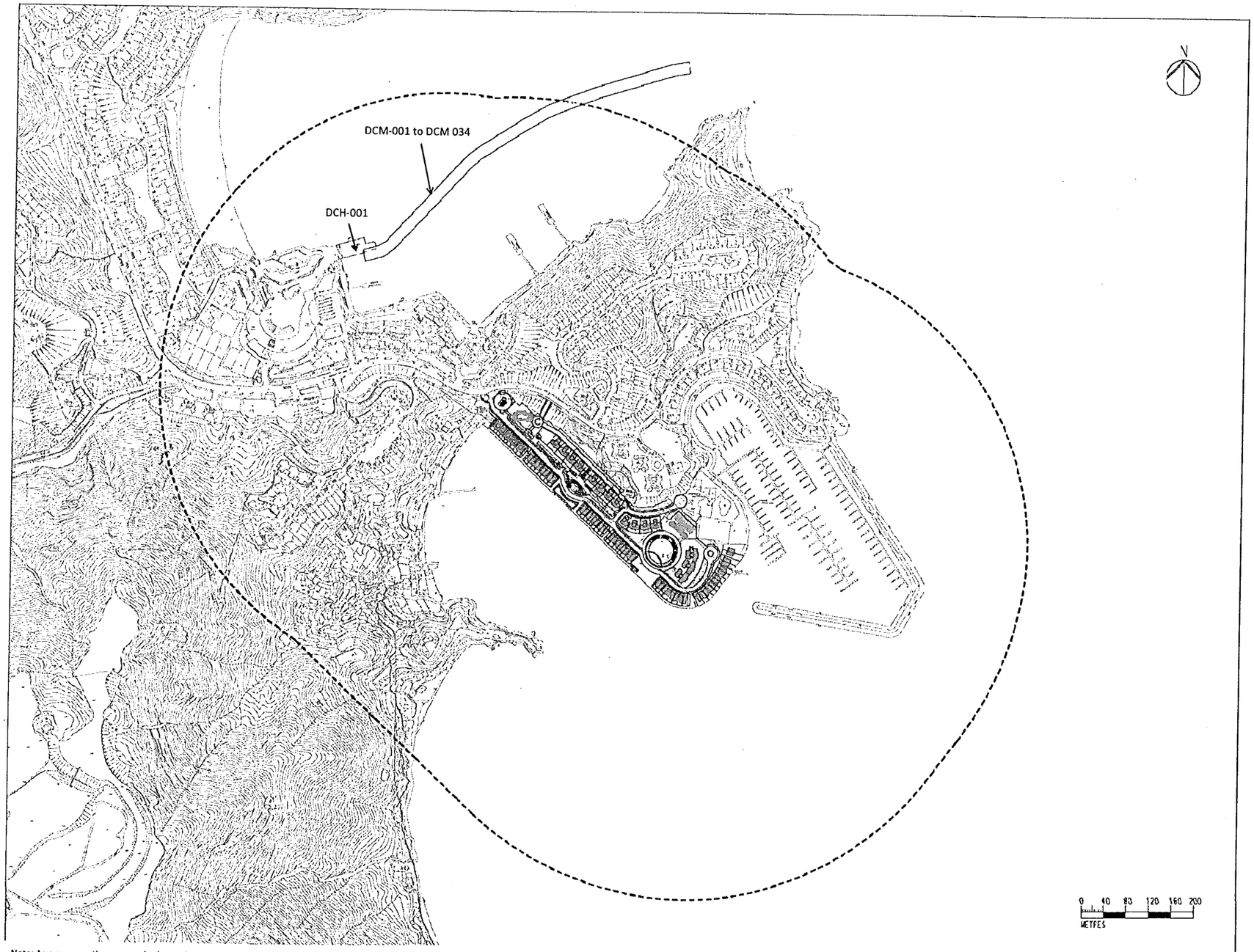
Note:

[1] Hourly Emission Rates (hotelling) are given in Daily NO_x, RSP, FSP and SO_2 Emission Summary in Page 3 to Page 14.

[2] Hourly Emission Rates (navigation) are given in Daily NO_x, RSP, FSP and SO_2 Emission Summary in Page 3 to Page 14.
Higher emission during slow cruise is found compared with that during maneuvering mode.
Due to the uncertainty on the location of navigation route under each mode, the emission during navigation is evenly distributed among the navigation route as a conservative approach.
The emission rate adopted = (Hourly emission rate of navigation (arrival) + Hourly emission rate of navigation (departure))/Number of Navigation Sources (i.e. 34 sources for this ferry route)

[3] No information from the operator is available. Information for release height, exit temperature and chimney diameter for passenger vessels based on information from approved EIA study "Expansion of Heliport Facilities at Macau Ferry Terminal" (AEIAR-095/2006)

[4] No information from the operator is available. Information for exit velocity of passenger ferries based on information from approved EIA study "Organic Waste Treatment Facilities, Phase I" (AEIAR-149/2010)



Note: As a conservative approach, the navigation route outside 500m assessment area is included in the near-field model.

Engine Power and Load Factors under Different Operation Mode of Main Engine

Main Engine Power (kW)	Vessel Speed (Knots)				Load Factor [4]			
	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise
643 [1]	0.00	4.5 [2]	10.0 [2]	12.0 [3]	0.00	0.30	0.45	0.45

Note:

[1] No information from operator is available. The engine power is referenced to the vessel (GRT 0-499) in Table 4-5 of EPD's "Study on Marine Vessels Emission Inventory".

[2] Vessel speeds under maneuvering (1-8 knots) and slow cruise (8-12 knots) are referenced to Table 3-24 of EPD's "Study on Marine Vessels Emission Inventory". The average speed of each mode is adopted for assessment purpose.

[3] Vessel speeds under fairway cruise (>12 knots) are referenced to Table 3-24 of EPD's "Study on Marine Vessels Emission Inventory". 12 knots is adopted for conservative approach that longer TIM will be resulted, hence higher emission.

[4] No information from operator is available. The load factors are referenced to vessel type "all except tug" in Table 4-7 of EPD's "Study on Marine Vessels Emission Inventory".

Engine Power and Load Factors under Different Operation Mode of Auxiliary Engine

Auxiliary Engine Power (kW)	Load Factor			
	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise
66 [1]	0.43 [2]	0.43 [2]	0.43 [2]	0.43 [2]

Note:

[1] No information from operator is available. The engine power is referenced to the vessel (GRT 0-499) in Table 4-6 of EPD's "Study on Marine Vessels Emission Inventory".

[2] No information from operator is available. The load factors are referenced to river trade vessel in Table 4-10 of EPD's "Study on Marine Vessels Emission Inventory".

Time-in-mode

Route		Time-in-mode (minutes)			
		Hotelling	Maneuvering	Slow Cruise	Fairway Cruise
Direct travel between Discovery Bay and Peng Chau	Arrival	5.00 [1]	1.20 [2]	1.20 [2]	0.33 [5]
	Departure	5.00 [1]	1.80 [2]	1.33 [3]	0.00 [3]
Travel between Discovery Bay and Peng Chau via Trappist Haven Monastery	Arrival	5.00 [1]	1.20 [2]	1.20 [2]	0.28 [5]
	Departure	5.00 [1]	1.80 [2]	1.26 [4]	0.00 [4]

Note:

[1] The hotelling time is collected from site survey

[2] TIM of maneuvering and slow cruise is referenced to Table 4.15 of EPD's "Study on Marine Vessels Emission Inventory"

[3] The total length of navigation route adopted in the near-field model is 660m for Peng Chau Kaito. During departure, the ferry will leave the modelled navigation route under slow cruise mode.

Therefore, TIM of slow cruise (departure) = Length of navigation route under slow cruise / vessel speed under slow cruise

Length of navigation route under slow cruise = Total navigation route length adopted in the near-field model - Length of navigation route under maneuvering

Length of navigation route under maneuvering = TIM of maneuvering x vessel speed under maneuvering

[4] The total length of navigation route adopted in the near-field model is 640m for Peng Chau Kaito (via Trappist Haven Monastery). During departure, the ferry will leave the modelled navigation route under slow cruise mode.

Therefore, TIM of slow cruise (departure) = Length of navigation route under slow cruise / vessel speed under slow cruise

Length of navigation route under slow cruise = Total navigation route length adopted in the near-field model - Length of navigation route under maneuvering

Length of navigation route under maneuvering = TIM of maneuvering x vessel speed under maneuvering

[5] TIM of fairway cruise = Length of navigation route under fairway cruise / vessel speed under fairway cruise

Length of navigation route under fairway cruise = Total navigation route length adopted in the near-field model - Length of navigation route under maneuvering - Length of navigation route under slow cruise

Length of navigation route under maneuvering = TIM of maneuvering x vessel speed under maneuvering

Length of navigation route under slow cruise = TIM of slow cruise x vessel speed under slow cruise

Emission Factors of Main Engine and Auxiliary Engine

Engine Type	Emission Factors (g/Kwh)				Brake Specific Fuel Consumption (BSFC) [4]	Fuel Sulphur Content (%) [5]
	NO_x	RSP	FSP	SO_2 [3]		
Main Engine [1]	10.00	0.30	0.29	0.21	213	0.05
Auxiliary Engine [2]	10.00	0.40	0.39	0.21	213	0.05

Note:

[1] The emission factors of main engine(Cat.1) (All RTVs except (a) chemical/gas/oil tankers with GRT ≥ 1,000 and (b) all tugs)) in Table 4-16 of EPD's "Study on Marine Vessels Emission Inventory" are adopted.

[2] The emission factors of auxiliary engine of RTVs in Table 4-16 of EPD's "Study on Marine Vessels Emission Inventory" are adopted.

[3] The emission factors of SO_2 are corrected with the fuel sulphur content according to Section 4.2.31 of EPD's "Study on Marine Vessels Emission Inventory" using the following equation:

SO_2 Emission Factor = BSFC x 2 x 0.9755 x Fuel Sulphur Fraction

[4] BSFC of the vessel is referenced to Section 4.2.27 of EPD's "Study on Marine Vessels Emission Inventory".

[5] With effective of the Air Pollution Control (Marine Light Diesel) Regulation on 1st April, 2014, the fuel sulphur content limit of the MLD is 0.05%.

Project: Discovery Bay: Optimization of Land Use
Title: Calculation of Marine Emission from Kaito Ferry Service between Discovery Bay and Peng Chau

Daily Profile of Passenger Ferry Service between Discovery Bay and Peng Chau (Direct Travel)[1]

Hours	Number of Trip					
	Arrival[2]			Departure[3]		
	Weekday	Saturday	Sunday / Public Holiday	Weekday	Saturday	Sunday / Public Holiday
01	0	0	0	0	0	0
02	0	0	0	0	0	0
03	0	0	0	0	0	0
04	0	0	0	0	0	0
05	0	0	0	0	0	0
06	0	0	0	0	0	0
07	1	1	1	1	1	1
08	1	1	1	1	1	1
09	1	1	1	1	1	0
10	0	0	0	0	0	1
11	0	0	0	0	0	1
12	0	0	0	1	1	0
13	0	0	0	1	1	1
14	1	1	2	1	1	2
15	0	0	0	0	0	0
16	0	0	0	0	0	0
17	0	0	0	1	1	1
18	1	1	1	1	1	1
19	2	2	2	2	2	2
20	1	1	1	1	1	1
21	0	1	1	1	1	1
22	0	0	0	0	0	1
23	1	1	1	1	1	1
24	0	0	0	0	0	0

Note:
[1] The daily schedule is referenced to Transport Department's website. The sailing time is collected from site survey.
[2] The hour of arrival is determined by the departure time at Peng Chau and the sailing time to arrive Discovery Bay.
E.g. If a ferry departs from Peng Chau at 06:30 (Hour 7) and the sailing time is about 10 minutes collected from site survey, it will arrive Discovery Bay at 06:40 (Hour 7). The arrival hour of the ferry is therefore Hour 7.
[3] The hour of departure is the hour that the ferry departs at the Discovery Bay.

Daily Profile of Passenger Ferry Service between Discovery Bay and Peng Chau (via Trappist Haven Monastery)[1]

Hours	Number of Trip					
	Arrival[2]			Departure[3]		
	Weekday	Saturday	Sunday / Public Holiday	Weekday	Saturday	Sunday / Public Holiday
01	0	0	0	0	0	0
02	0	0	0	0	0	0
03	0	0	0	0	0	0
04	0	0	0	0	0	0
05	0	0	0	0	0	0
06	0	0	0	0	0	0
07	0	0	0	0	0	0
08	0	0	0	0	0	0
09	1	1	1	1	1	1
10	1	1	1	1	1	1
11	1	1	1	1	1	0
12	1	1	1	0	0	1
13	1	1	1	0	0	0
14	0	0	0	0	0	0
15	1	1	1	1	1	1
16	0	1	1	0	1	1
17	1	1	1	0	0	0
18	1	1	1	0	0	0
19	0	0	0	0	0	0
20	0	0	0	0	0	0
21	0	0	0	0	0	0
22	0	0	0	0	1	0
23	0	0	0	0	0	0
24	0	0	0	0	0	0

Note:
[1] The daily schedule is referenced to Transport Department's website. The sailing time is collected from site survey.
[2] The hour of arrival is determined by the departure time at Peng Chau and the sailing time to arrive Discovery Bay.
E.g. If a ferry departs from Peng Chau at 10:45 (Hour 11) and the sailing time is about 20 minutes collected from site survey, it will arrive Discovery Bay at 11:05 (Hour 12). The arrival hour of the ferry is therefore Hour 12.
[3] The hour of departure is the hour that the ferry departs at the Discovery Bay.

Daily NOx emission (Weekdays)(Direct Travel between Discovery Bay and Peng Chau)

Hour	Number of Trip		Total Emission (g)[1]								Emission Rate (g/s)	
			Arrival				Departure					
	Arrival	Departure	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling[2]	Navigation[2]
01	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
02	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
03	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
04	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
05	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
06	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
07	1	1	24	44	64	18	24	66	70	0	1.31E-02	7.28E-02
08	1	1	24	44	64	18	24	66	70	0	1.31E-02	7.28E-02
09	1	1	24	44	64	18	24	66	70	0	1.31E-02	7.28E-02
10	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
11	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
12	0	1	0	0	0	0	24	66	70	0	6.57E-03	3.80E-02
13	0	1	0	0	0	0	24	66	70	0	6.57E-03	3.80E-02
14	1	1	24	44	64	18	24	66	70	0	1.31E-02	7.28E-02
15	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
16	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
17	0	1	0	0	0	0	24	66	70	0	6.57E-03	3.80E-02
18	1	1	24	44	64	18	24	66	70	0	1.31E-02	7.28E-02
19	2	2	47	89	127	35	47	133	141	0	2.63E-02	1.46E-01
20	1	1	24	44	64	18	24	66	70	0	1.31E-02	7.28E-02
21	0	1	0	0	0	0	24	66	70	0	6.57E-03	3.80E-02
22	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
23	1	1	24	44	64	18	24	66	70	0	1.31E-02	7.28E-02
24	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
Daily Emission (g)			213	398	572	158	307	863	914	0		
Total Daily Emission (g)			3,426									

Note:

[1] Total Emission = (Main Engine Emission + Auxiliary Engine Emission) x Number of Trip

Emission = Engine Power (kW) x Loading Factor x Time-in-mode (hr) X Emission Factor (g/kWh)

[2] Emission during Hotelling = Emission of hotelling during arrival and departure

Emission during Navigation = Emission of navigation (Maneuvering + Slow Cruise + Fairway Cruise) during arrival and departure

Daily NOx emission (Saturday)(Direct Travel between Discovery Bay and Peng Chau)

Hour	Number of Trip		Total Emission (g)[1]								Emission Rate (g/s)	
			Arrival				Departure					
	Arrival	Departure	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling[2]	Navigation[2]
01	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
02	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
03	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
04	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
05	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
06	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
07	1	1	24	44	64	18	24	66	70	0	1.31E-02	7.28E-02
08	1	1	24	44	64	18	24	66	70	0	1.31E-02	7.28E-02
09	1	1	24	44	64	18	24	66	70	0	1.31E-02	7.28E-02
10	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
11	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
12	0	1	0	0	0	0	24	66	70	0	6.57E-03	3.80E-02
13	0	1	0	0	0	0	24	66	70	0	6.57E-03	3.80E-02
14	1	1	24	44	64	18	24	66	70	0	1.31E-02	7.28E-02
15	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
16	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
17	0	1	0	0	0	0	24	66	70	0	6.57E-03	3.80E-02
18	1	1	24	44	64	18	24	66	70	0	1.31E-02	7.28E-02
19	2	2	47	89	127	35	47	133	141	0	2.63E-02	1.46E-01
20	1	1	24	44	64	18	24	66	70	0	1.31E-02	7.28E-02
21	1	1	24	44	64	18	24	66	70	0	1.31E-02	7.28E-02
22	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
23	1	1	24	44	64	18	24	66	70	0	1.31E-02	7.28E-02
24	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
Daily Emission (g)			237	443	635	176	307	863	914	0		
Total Daily Emission (g)			3,575									

Note:

[1] Total Emission = (Main Engine Emission + Auxiliary Engine Emission) x Number of Trip

Emission = Engine Power (kW) x Loading Factor x Time-in-mode (hr) X Emission Factor (g/kWh)

[2] Emission during Hotelling = Emission of hotelling during arrival and departure

Emission during Navigation = Emission of navigation (Maneuvering + Slow Cruise + Fairway Cruise) during arrival and departure

Daily NOx emission (Sunday / Public Holidays)(Direct Travel between Discovery Bay and Peng Chau)

Hour	Number of Trip		Total Emission (g)[1]								Emission Rate (g/s)	
			Arrival				Departure					
	Arrival	Departure	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling[2]	Navigation[2]
01	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
02	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
03	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
04	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
05	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
06	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
07	1	1	24	44	64	18	24	66	70	0	1.31E-02	7.28E-02
08	1	1	24	44	64	18	24	66	70	0	1.31E-02	7.28E-02
09	1	0	24	44	64	18	0	0	0	0	6.57E-03	3.48E-02
10	0	1	0	0	0	0	24	66	70	0	6.57E-03	3.80E-02
11	0	1	0	0	0	0	24	66	70	0	6.57E-03	3.80E-02
12	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
13	0	1	0	0	0	0	24	66	70	0	6.57E-03	3.80E-02
14	2	2	47	89	127	35	47	133	141	0	2.63E-02	1.46E-01
15	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
16	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
17	0	1	0	0	0	0	24	66	70	0	6.57E-03	3.80E-02
18	1	1	24	44	64	18	24	66	70	0	1.31E-02	7.28E-02
19	2	2	47	89	127	35	47	133	141	0	2.63E-02	1.46E-01
20	1	1	24	44	64	18	24	66	70	0	1.31E-02	7.28E-02
21	1	1	24	44	64	18	24	66	70	0	1.31E-02	7.28E-02
22	0	1	0	0	0	0	24	66	70	0	6.57E-03	3.80E-02
23	1	1	24	44	64	18	24	66	70	0	1.31E-02	7.28E-02
24	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
Daily Emission (g)			260	487	699	193	355	996	1,055	0		
Total Daily Emission (g)			4,045									

Note:

[1] Total Emission = (Main Engine Emission + Auxiliary Engine Emission) x Number of Trip

Emission = Engine Power (kW) x Loading Factor x Time-in-mode (hr) X Emission Factor (g/kWh)

[2] Emission during Hotelling = Emission of hotelling during arrival and departure

Emission during Navigation = Emission of navigation (Maneuvering + Slow Cruise + Fairway Cruise) during arrival and departure

Daily RSP emission (Weekdays)(Direct Travel between Discovery Bay and Peng Chau)

Hour	Number of Trip		Total Emission (g)[1]								Emission Rate (g/s)	
			Arrival				Departure					
	Arrival	Departure	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling[2]	Navigation[2]
01	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
02	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
03	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
04	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
05	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
06	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
07	1	1	0.9	1.4	2.0	0.5	0.9	2.1	2.2	0.0	5.26E-04	2.26E-03
08	1	1	0.9	1.4	2.0	0.5	0.9	2.1	2.2	0.0	5.26E-04	2.26E-03
09	1	1	0.9	1.4	2.0	0.5	0.9	2.1	2.2	0.0	5.26E-04	2.26E-03
10	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
11	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
12	0	1	0.0	0.0	0.0	0.0	0.9	2.1	2.2	0.0	2.63E-04	1.18E-03
13	0	1	0.0	0.0	0.0	0.0	0.9	2.1	2.2	0.0	2.63E-04	1.18E-03
14	1	1	0.9	1.4	2.0	0.5	0.9	2.1	2.2	0.0	5.26E-04	2.26E-03
15	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
16	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
17	0	1	0.0	0.0	0.0	0.0	0.9	2.1	2.2	0.0	2.63E-04	1.18E-03
18	1	1	0.9	1.4	2.0	0.5	0.9	2.1	2.2	0.0	5.26E-04	2.26E-03
19	2	2	1.9	2.8	3.9	1.1	1.9	4.2	4.3	0.0	1.05E-03	4.52E-03
20	1	1	0.9	1.4	2.0	0.5	0.9	2.1	2.2	0.0	5.26E-04	2.26E-03
21	0	1	0.0	0.0	0.0	0.0	0.9	2.1	2.2	0.0	2.63E-04	1.18E-03
22	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
23	1	1	0.9	1.4	2.0	0.5	0.9	2.1	2.2	0.0	5.26E-04	2.26E-03
24	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
Daily Emission (g)			8.5	12.5	17.7	4.9	12.3	27.0	28.3	0.0		
Total Daily Emission (g)			111.1									

Note:

[1] Total Emission = (Main Engine Emission + Auxiliary Engine Emission) x Number of Trip

Emission = Engine Power (kW) x Loading Factor x Time-in-mode (hr) X Emission Factor (g/kWh)

[2] Emission during Hotelling = Emission of hotelling during arrival and departure

Emission during Navigation = Emission of navigation (Maneuvering + Slow Cruise + Fairway Cruise) during arrival and departure

Daily RSP emission (Saturday)(Direct Travel between Discovery Bay and Peng Chau)

Hour	Number of Trip		Total Emission (g)[1]								Emission Rate (g/s)	
			Arrival				Departure					
	Arrival	Departure	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling[2]	Navigation[2]
01	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
02	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
03	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
04	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
05	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
06	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
07	1	1	0.9	1.4	2.0	0.5	0.9	2.1	2.2	0.0	5.26E-04	2.26E-03
08	1	1	0.9	1.4	2.0	0.5	0.9	2.1	2.2	0.0	5.26E-04	2.26E-03
09	1	1	0.9	1.4	2.0	0.5	0.9	2.1	2.2	0.0	5.26E-04	2.26E-03
10	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
11	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
12	0	1	0.0	0.0	0.0	0.0	0.9	2.1	2.2	0.0	2.63E-04	1.18E-03
13	0	1	0.0	0.0	0.0	0.0	0.9	2.1	2.2	0.0	2.63E-04	1.18E-03
14	1	1	0.9	1.4	2.0	0.5	0.9	2.1	2.2	0.0	5.26E-04	2.26E-03
15	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
16	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
17	0	1	0.0	0.0	0.0	0.0	0.9	2.1	2.2	0.0	2.63E-04	1.18E-03
18	1	1	0.9	1.4	2.0	0.5	0.9	2.1	2.2	0.0	5.26E-04	2.26E-03
19	2	2	1.9	2.8	3.9	1.1	1.9	4.2	4.3	0.0	1.05E-03	4.52E-03
20	1	1	0.9	1.4	2.0	0.5	0.9	2.1	2.2	0.0	5.26E-04	2.26E-03
21	1	1	0.9	1.4	2.0	0.5	0.9	2.1	2.2	0.0	5.26E-04	2.26E-03
22	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
23	1	1	0.9	1.4	2.0	0.5	0.9	2.1	2.2	0.0	5.26E-04	2.26E-03
24	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
Daily Emission (g)			9.5	13.8	19.6	5.4	12.3	27.0	28.3	0.0		
Total Daily Emission (g)			115.9									

Note:

[1] Total Emission = (Main Engine Emission + Auxiliary Engine Emission) x Number of Trip

Emission = Engine Power (kW) x Loading Factor x Time-in-mode (hr) X Emission Factor (g/kWh)

[2] Emission during Hotelling = Emission of hotelling during arrival and departure

Emission during Navigation = Emission of navigation (Maneuvering + Slow Cruise + Fairway Cruise) during arrival and departure

Daily RSP emission (Sunday / Public Holidays)(Direct Travel between Discovery Bay and Peng Chau)

Hour	Number of Trip		Total Emission (g)[1]								Emission Rate (g/s)	
			Arrival				Departure					
	Arrival	Departure	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling[2]	Navigation[2]
01	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
02	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
03	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
04	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
05	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
06	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
07	1	1	0.9	1.4	2.0	0.5	0.9	2.1	2.2	0.0	5.26E-04	2.26E-03
08	1	1	0.9	1.4	2.0	0.5	0.9	2.1	2.2	0.0	5.26E-04	2.26E-03
09	1	0	0.9	1.4	2.0	0.5	0.0	0.0	0.0	0.0	2.63E-04	1.08E-03
10	0	1	0.0	0.0	0.0	0.0	0.9	2.1	2.2	0.0	2.63E-04	1.18E-03
11	0	1	0.0	0.0	0.0	0.0	0.9	2.1	2.2	0.0	2.63E-04	1.18E-03
12	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
13	0	1	0.0	0.0	0.0	0.0	0.9	2.1	2.2	0.0	2.63E-04	1.18E-03
14	2	2	1.9	2.8	3.9	1.1	1.9	4.2	4.3	0.0	1.05E-03	4.52E-03
15	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
16	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
17	0	1	0.0	0.0	0.0	0.0	0.9	2.1	2.2	0.0	2.63E-04	1.18E-03
18	1	1	0.9	1.4	2.0	0.5	0.9	2.1	2.2	0.0	5.26E-04	2.26E-03
19	2	2	1.9	2.8	3.9	1.1	1.9	4.2	4.3	0.0	1.05E-03	4.52E-03
20	1	1	0.9	1.4	2.0	0.5	0.9	2.1	2.2	0.0	5.26E-04	2.26E-03
21	1	1	0.9	1.4	2.0	0.5	0.9	2.1	2.2	0.0	5.26E-04	2.26E-03
22	0	1	0.0	0.0	0.0	0.0	0.9	2.1	2.2	0.0	2.63E-04	1.18E-03
23	1	1	0.9	1.4	2.0	0.5	0.9	2.1	2.2	0.0	5.26E-04	2.26E-03
24	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
Daily Emission (g)			10.4	15.2	21.6	6.0	14.2	31.1	32.6	0.0		
Total Daily Emission (g)			131.1									

Note:

[1] Total Emission = (Main Engine Emission + Auxiliary Engine Emission) x Number of Trip

Emission = Engine Power (kW) x Loading Factor x Time-in-mode (hr) X Emission Factor (g/kWh)

[2] Emission during Hotelling = Emission of hotelling during arrival and departure

Emission during Navigation = Emission of navigation (Maneuvering + Slow Cruise + Fairway Cruise) during arrival and departure

Daily FSP emission (Weekdays)(Direct Travel between Discovery Bay and Peng Chau)

Hour	Number of Trip		Total Emission (g)[1]								Emission Rate (g/s)	
			Arrival				Departure					
	Arrival	Departure	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling[2]	Navigation[2]
01	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
02	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
03	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
04	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
05	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
06	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
07	1	1	0.9	1.3	1.9	0.5	0.9	2.0	2.1	0.0	5.12E-04	2.19E-03
08	1	1	0.9	1.3	1.9	0.5	0.9	2.0	2.1	0.0	5.12E-04	2.19E-03
09	1	1	0.9	1.3	1.9	0.5	0.9	2.0	2.1	0.0	5.12E-04	2.19E-03
10	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
11	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
12	0	1	0.0	0.0	0.0	0.0	0.9	2.0	2.1	0.0	2.56E-04	1.15E-03
13	0	1	0.0	0.0	0.0	0.0	0.9	2.0	2.1	0.0	2.56E-04	1.15E-03
14	1	1	0.9	1.3	1.9	0.5	0.9	2.0	2.1	0.0	5.12E-04	2.19E-03
15	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
16	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
17	0	1	0.0	0.0	0.0	0.0	0.9	2.0	2.1	0.0	2.56E-04	1.15E-03
18	1	1	0.9	1.3	1.9	0.5	0.9	2.0	2.1	0.0	5.12E-04	2.19E-03
19	2	2	1.8	2.7	3.8	1.1	1.8	4.0	4.2	0.0	1.02E-03	4.39E-03
20	1	1	0.9	1.3	1.9	0.5	0.9	2.0	2.1	0.0	5.12E-04	2.19E-03
21	0	1	0.0	0.0	0.0	0.0	0.9	2.0	2.1	0.0	2.56E-04	1.15E-03
22	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
23	1	1	0.9	1.3	1.9	0.5	0.9	2.0	2.1	0.0	5.12E-04	2.19E-03
24	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
Daily Emission (g)			8.3	12.1	17.1	4.7	12.0	26.2	27.4	0.0		
Total Daily Emission (g)			107.9									

Note:

[1] Total Emission = (Main Engine Emission + Auxiliary Engine Emission) x Number of Trip

Emission = Engine Power (kW) x Loading Factor x Time-in-mode (hr) X Emission Factor (g/kWh)

[2] Emission during Hotelling = Emission of hotelling during arrival and departure

Emission during Navigation = Emission of navigation (Maneuvering + Slow Cruise + Fairway Cruise) during arrival and departure

Daily FSP emission (Saturday)(Direct Travel between Discovery Bay and Peng Chau)

Hour	Number of Trip		Total Emission (g)[1]								Emission Rate (g/s)	
			Arrival				Departure					
	Arrival	Departure	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling[2]	Navigation[2]
01	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
02	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
03	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
04	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
05	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
06	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
07	1	1	0.9	1.3	1.9	0.5	0.9	2.0	2.1	0.0	5.12E-04	2.19E-03
08	1	1	0.9	1.3	1.9	0.5	0.9	2.0	2.1	0.0	5.12E-04	2.19E-03
09	1	1	0.9	1.3	1.9	0.5	0.9	2.0	2.1	0.0	5.12E-04	2.19E-03
10	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
11	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
12	0	1	0.0	0.0	0.0	0.0	0.9	2.0	2.1	0.0	2.56E-04	1.15E-03
13	0	1	0.0	0.0	0.0	0.0	0.9	2.0	2.1	0.0	2.56E-04	1.15E-03
14	1	1	0.9	1.3	1.9	0.5	0.9	2.0	2.1	0.0	5.12E-04	2.19E-03
15	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
16	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
17	0	1	0.0	0.0	0.0	0.0	0.9	2.0	2.1	0.0	2.56E-04	1.15E-03
18	1	1	0.9	1.3	1.9	0.5	0.9	2.0	2.1	0.0	5.12E-04	2.19E-03
19	2	2	1.8	2.7	3.8	1.1	1.8	4.0	4.2	0.0	1.02E-03	4.39E-03
20	1	1	0.9	1.3	1.9	0.5	0.9	2.0	2.1	0.0	5.12E-04	2.19E-03
21	1	1	0.9	1.3	1.9	0.5	0.9	2.0	2.1	0.0	5.12E-04	2.19E-03
22	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
23	1	1	0.9	1.3	1.9	0.5	0.9	2.0	2.1	0.0	5.12E-04	2.19E-03
24	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
Daily Emission (g)			9.2	13.4	19.1	5.3	12.0	26.2	27.4	0.0		
Total Daily Emission (g)			112.6									

Note:

[1] Total Emission = (Main Engine Emission + Auxiliary Engine Emission) x Number of Trip

Emission = Engine Power (kW) x Loading Factor x Time-in-mode (hr) X Emission Factor (g/kWh)

[2] Emission during Hotelling = Emission of hotelling during arrival and departure

Emission during Navigation = Emission of navigation (Maneuvering + Slow Cruise + Fairway Cruise) during arrival and departure

Daily FSP emission (Sunday / Public Holidays)(Direct Travel between Discovery Bay and Peng Chau)

Hour	Number of Trip		Total Emission (g)[1]								Emission Rate (g/s)	
			Arrival				Departure					
	Arrival	Departure	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling[2]	Navigation[2]
01	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
02	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
03	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
04	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
05	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
06	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
07	1	1	0.9	1.3	1.9	0.5	0.9	2.0	2.1	0.0	5.12E-04	2.19E-03
08	1	1	0.9	1.3	1.9	0.5	0.9	2.0	2.1	0.0	5.12E-04	2.19E-03
09	1	0	0.9	1.3	1.9	0.5	0.0	0.0	0.0	0.0	2.56E-04	1.05E-03
10	0	1	0.0	0.0	0.0	0.0	0.9	2.0	2.1	0.0	2.56E-04	1.15E-03
11	0	1	0.0	0.0	0.0	0.0	0.9	2.0	2.1	0.0	2.56E-04	1.15E-03
12	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
13	0	1	0.0	0.0	0.0	0.0	0.9	2.0	2.1	0.0	2.56E-04	1.15E-03
14	2	2	1.8	2.7	3.8	1.1	1.8	4.0	4.2	0.0	1.02E-03	4.39E-03
15	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
16	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
17	0	1	0.0	0.0	0.0	0.0	0.9	2.0	2.1	0.0	2.56E-04	1.15E-03
18	1	1	0.9	1.3	1.9	0.5	0.9	2.0	2.1	0.0	5.12E-04	2.19E-03
19	2	2	1.8	2.7	3.8	1.1	1.8	4.0	4.2	0.0	1.02E-03	4.39E-03
20	1	1	0.9	1.3	1.9	0.5	0.9	2.0	2.1	0.0	5.12E-04	2.19E-03
21	1	1	0.9	1.3	1.9	0.5	0.9	2.0	2.1	0.0	5.12E-04	2.19E-03
22	0	1	0.0	0.0	0.0	0.0	0.9	2.0	2.1	0.0	2.56E-04	1.15E-03
23	1	1	0.9	1.3	1.9	0.5	0.9	2.0	2.1	0.0	5.12E-04	2.19E-03
24	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
Daily Emission (g)			10.1	14.8	21.0	5.8	13.8	30.2	31.6	0.0		
Total Daily Emission (g)			127.4									

Note:

[1] Total Emission = (Main Engine Emission + Auxiliary Engine Emission) x Number of Trip

Emission = Engine Power (kW) x Loading Factor x Time-in-mode (hr) X Emission Factor (g/kWh)

[2] Emission during Hotelling = Emission of hotelling during arrival and departure

Emission during Navigation = Emission of navigation (Maneuvering + Slow Cruise + Fairway Cruise) during arrival and departure

Daily SO_2 emission (Weekdays)(Direct Travel between Discovery Bay and Peng Chau)

Hour	Number of Trip		Total Emission (g)[1]								Emission Rate (g/s)	
			Arrival				Departure					
	Arrival	Departure	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling[2]	Navigation[2]
01	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
02	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
03	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
04	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
05	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
06	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
07	1	1	0.5	0.9	1.3	0.4	0.5	1.4	1.5	0.0	2.74E-04	1.52E-03
08	1	1	0.5	0.9	1.3	0.4	0.5	1.4	1.5	0.0	2.74E-04	1.52E-03
09	1	1	0.5	0.9	1.3	0.4	0.5	1.4	1.5	0.0	2.74E-04	1.52E-03
10	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
11	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
12	0	1	0.0	0.0	0.0	0.0	0.5	1.4	1.5	0.0	1.37E-04	7.91E-04
13	0	1	0.0	0.0	0.0	0.0	0.5	1.4	1.5	0.0	1.37E-04	7.91E-04
14	1	1	0.5	0.9	1.3	0.4	0.5	1.4	1.5	0.0	2.74E-04	1.52E-03
15	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
16	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
17	0	1	0.0	0.0	0.0	0.0	0.5	1.4	1.5	0.0	1.37E-04	7.91E-04
18	1	1	0.5	0.9	1.3	0.4	0.5	1.4	1.5	0.0	2.74E-04	1.52E-03
19	2	2	1.0	1.8	2.6	0.7	1.0	2.8	2.9	0.0	5.47E-04	3.03E-03
20	1	1	0.5	0.9	1.3	0.4	0.5	1.4	1.5	0.0	2.74E-04	1.52E-03
21	0	1	0.0	0.0	0.0	0.0	0.5	1.4	1.5	0.0	1.37E-04	7.91E-04
22	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
23	1	1	0.5	0.9	1.3	0.4	0.5	1.4	1.5	0.0	2.74E-04	1.52E-03
24	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
Daily Emission (g)			4.4	8.3	11.9	3.3	6.4	18.0	19.0	0.0		
Total Daily Emission (g)			71.3									

Note:

[1] Total Emission = (Main Engine Emission + Auxiliary Engine Emission) x Number of Trip

Emission = Engine Power (kW) x Loading Factor x Time-in-mode (hr) X Emission Factor (g/kWh)

[2] Emission during Hotelling = Emission of hotelling during arrival and departure

Emission during Navigation = Emission of navigation (Maneuvering + Slow Cruise + Fairway Cruise) during arrival and departure

Daily SO_2 emission (Saturday)(Direct Travel between Discovery Bay and Peng Chau)

Hour	Number of Trip		Total Emission (g)[1]								Emission Rate (g/s)	
			Arrival				Departure					
	Arrival	Departure	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling[2]	Navigation[2]
01	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
02	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
03	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
04	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
05	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
06	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
07	1	1	0.5	0.9	1.3	0.4	0.5	1.4	1.5	0.0	2.74E-04	1.52E-03
08	1	1	0.5	0.9	1.3	0.4	0.5	1.4	1.5	0.0	2.74E-04	1.52E-03
09	1	1	0.5	0.9	1.3	0.4	0.5	1.4	1.5	0.0	2.74E-04	1.52E-03
10	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
11	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
12	0	1	0.0	0.0	0.0	0.0	0.5	1.4	1.5	0.0	1.37E-04	7.91E-04
13	0	1	0.0	0.0	0.0	0.0	0.5	1.4	1.5	0.0	1.37E-04	7.91E-04
14	1	1	0.5	0.9	1.3	0.4	0.5	1.4	1.5	0.0	2.74E-04	1.52E-03
15	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
16	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
17	0	1	0.0	0.0	0.0	0.0	0.5	1.4	1.5	0.0	1.37E-04	7.91E-04
18	1	1	0.5	0.9	1.3	0.4	0.5	1.4	1.5	0.0	2.74E-04	1.52E-03
19	2	2	1.0	1.8	2.6	0.7	1.0	2.8	2.9	0.0	5.47E-04	3.03E-03
20	1	1	0.5	0.9	1.3	0.4	0.5	1.4	1.5	0.0	2.74E-04	1.52E-03
21	1	1	0.5	0.9	1.3	0.4	0.5	1.4	1.5	0.0	2.74E-04	1.52E-03
22	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
23	1	1	0.5	0.9	1.3	0.4	0.5	1.4	1.5	0.0	2.74E-04	1.52E-03
24	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
Daily Emission (g)			4.9	9.2	13.2	3.7	6.4	18.0	19.0	0.0		
Total Daily Emission (g)			74.4									

Note:

[1] Total Emission = (Main Engine Emission + Auxiliary Engine Emission) x Number of Trip

Emission = Engine Power (kW) x Loading Factor x Time-in-mode (hr) X Emission Factor (g/kWh)

[2] Emission during Hotelling = Emission of hotelling during arrival and departure

Emission during Navigation = Emission of navigation (Maneuvering + Slow Cruise + Fairway Cruise) during arrival and departure

Daily SO_2 emission (Sunday / Public Holidays)(Direct Travel between Discovery Bay and Peng Chau)

Hour	Number of Trip		Total Emission (g)[1]								Emission Rate (g/s)	
			Arrival				Departure					
	Arrival	Departure	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling[2]	Navigation[2]
01	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
02	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
03	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
04	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
05	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
06	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
07	1	1	0.5	0.9	1.3	0.4	0.5	1.4	1.5	0.0	2.74E-04	1.52E-03
08	1	1	0.5	0.9	1.3	0.4	0.5	1.4	1.5	0.0	2.74E-04	1.52E-03
09	1	0	0.5	0.9	1.3	0.4	0.0	0.0	0.0	0.0	1.37E-04	7.25E-04
10	0	1	0.0	0.0	0.0	0.0	0.5	1.4	1.5	0.0	1.37E-04	7.91E-04
11	0	1	0.0	0.0	0.0	0.0	0.5	1.4	1.5	0.0	1.37E-04	7.91E-04
12	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
13	0	1	0.0	0.0	0.0	0.0	0.5	1.4	1.5	0.0	1.37E-04	7.91E-04
14	2	2	1.0	1.8	2.6	0.7	1.0	2.8	2.9	0.0	5.47E-04	3.03E-03
15	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
16	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
17	0	1	0.0	0.0	0.0	0.0	0.5	1.4	1.5	0.0	1.37E-04	7.91E-04
18	1	1	0.5	0.9	1.3	0.4	0.5	1.4	1.5	0.0	2.74E-04	1.52E-03
19	2	2	1.0	1.8	2.6	0.7	1.0	2.8	2.9	0.0	5.47E-04	3.03E-03
20	1	1	0.5	0.9	1.3	0.4	0.5	1.4	1.5	0.0	2.74E-04	1.52E-03
21	1	1	0.5	0.9	1.3	0.4	0.5	1.4	1.5	0.0	2.74E-04	1.52E-03
22	0	1	0.0	0.0	0.0	0.0	0.5	1.4	1.5	0.0	1.37E-04	7.91E-04
23	1	1	0.5	0.9	1.3	0.4	0.5	1.4	1.5	0.0	2.74E-04	1.52E-03
24	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
Daily Emission (g)			5.4	10.1	14.6	4.0	7.4	20.7	22.0	0.0		
Total Daily Emission (g)			84.2									

Note:

[1] Total Emission = (Main Engine Emission + Auxiliary Engine Emission) x Number of Trip

Emission = Engine Power (kW) x Loading Factor x Time-in-mode (hr) X Emission Factor (g/kWh)

[2] Emission during Hotelling = Emission of hotelling during arrival and departure

Emission during Navigation = Emission of navigation (Maneuvering + Slow Cruise + Fairway Cruise) during arrival and departure

Daily NOx emission (Weekdays)(Travel between Discovery Bay and Peng Chau via Trappist Haven Monastery)

Hour	Number of Trip		Total Emission (g)[1]								Emission Rate (g/s)	
			Arrival				Departure					
	Arrival	Departure	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling[2]	Navigation[2]
01	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
02	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
03	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
04	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
05	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
06	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
07	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
08	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
09	1	1	24	44	64	15	24	66	67	0	1.31E-02	7.11E-02
10	1	1	24	44	64	15	24	66	67	0	1.31E-02	7.11E-02
11	1	1	24	44	64	15	24	66	67	0	1.31E-02	7.11E-02
12	1	0	24	44	64	15	0	0	0	0	6.57E-03	3.40E-02
13	1	0	24	44	64	15	0	0	0	0	6.57E-03	3.40E-02
14	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
15	1	1	24	44	64	15	24	66	67	0	1.31E-02	7.11E-02
16	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
17	1	0	24	44	64	15	0	0	0	0	6.57E-03	3.40E-02
18	1	0	24	44	64	15	0	0	0	0	6.57E-03	3.40E-02
19	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
20	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
21	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
22	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
23	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
24	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
Daily Emission (g)			189	354	508	118	95	266	268	0		
Total Daily Emission (g)			1,797									

Note:

[1] Total Emission = (Main Engine Emission + Auxiliary Engine Emission) x Number of Trip

Emission = Engine Power (kW) x Loading Factor x Time-in-mode (hr) X Emission Factor (g/kWh)

[2] Emission during Hotelling = Emission of hotelling during arrival and departure

Emission during Navigation = Emission of navigation (Maneuvering + Slow Cruise + Fairway Cruise) during arrival and departure

Daily NOx emission (Saturday)(Travel between Discovery Bay and Peng Chau via Trappist Haven Monastery)

Hour	Number of Trip		Total Emission (g)[1]								Emission Rate (g/s)	
			Arrival				Departure					
	Arrival	Departure	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling[2]	Navigation[2]
01	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
02	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
03	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
04	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
05	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
06	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
07	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
08	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
09	1	1	24	44	64	15	24	66	67	0	1.31E-02	7.11E-02
10	1	1	24	44	64	15	24	66	67	0	1.31E-02	7.11E-02
11	1	1	24	44	64	15	24	66	67	0	1.31E-02	7.11E-02
12	1	0	24	44	64	15	0	0	0	0	6.57E-03	3.40E-02
13	1	0	24	44	64	15	0	0	0	0	6.57E-03	3.40E-02
14	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
15	1	1	24	44	64	15	24	66	67	0	1.31E-02	7.11E-02
16	1	1	24	44	64	15	24	66	67	0	1.31E-02	7.11E-02
17	1	0	24	44	64	15	0	0	0	0	6.57E-03	3.40E-02
18	1	0	24	44	64	15	0	0	0	0	6.57E-03	3.40E-02
19	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
20	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
21	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
22	0	1	0	0	0	0	24	66	67	0	6.57E-03	3.70E-02
23	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
24	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
Daily Emission (g)			213	398	572	132	142	398	401	0		
Total Daily Emission (g)			2,257									

Note:

[1] Total Emission = (Main Engine Emission + Auxiliary Engine Emission) x Number of Trip

Emission = Engine Power (kW) x Loading Factor x Time-in-mode (hr) X Emission Factor (g/kWh)

[2] Emission during Hotelling = Emission of hotelling during arrival and departure

Emission during Navigation = Emission of navigation (Maneuvering + Slow Cruise + Fairway Cruise) during arrival and departure

Daily NOx emission (Sunday / Public Holidays)(Travel between Discovery Bay and Peng Chau via Trappist Haven Monastery)

Hour	Number of Trip		Total Emission (g)[1]								Emission Rate (g/s)	
			Arrival				Departure					
	Arrival	Departure	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling[2]	Navigation[2]
01	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
02	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
03	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
04	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
05	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
06	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
07	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
08	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
09	1	1	24	44	64	15	24	66	67	0	1.31E-02	7.11E-02
10	1	1	24	44	64	15	24	66	67	0	1.31E-02	7.11E-02
11	1	0	24	44	64	15	0	0	0	0	6.57E-03	3.40E-02
12	1	1	24	44	64	15	24	66	67	0	1.31E-02	7.11E-02
13	1	0	24	44	64	15	0	0	0	0	6.57E-03	3.40E-02
14	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
15	1	1	24	44	64	15	24	66	67	0	1.31E-02	7.11E-02
16	1	1	24	44	64	15	24	66	67	0	1.31E-02	7.11E-02
17	1	0	24	44	64	15	0	0	0	0	6.57E-03	3.40E-02
18	1	0	24	44	64	15	0	0	0	0	6.57E-03	3.40E-02
19	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
20	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
21	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
22	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
23	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
24	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
Daily Emission (g)			213	398	572	132	118	332	335	0		
Total Daily Emission (g)			2,100									

Note:

[1] Total Emission = (Main Engine Emission + Auxiliary Engine Emission) x Number of Trip

Emission = Engine Power (kW) x Loading Factor x Time-in-mode (hr) X Emission Factor (g/kWh)

[2] Emission during Hotelling = Emission of hotelling during arrival and departure

Emission during Navigation = Emission of navigation (Maneuvering + Slow Cruise + Fairway Cruise) during arrival and departure

Daily RSP emission (Weekdays)(Travel between Discovery Bay and Peng Chau via Trappist Haven Monastery)

Hour	Number of Trip		Total Emission (g)[1]								Emission Rate (g/s)	
			Arrival				Departure					
	Arrival	Departure	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling[2]	Navigation[2]
01	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
02	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
03	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
04	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
05	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
06	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
07	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
08	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
09	1	1	0.9	1.4	2.0	0.5	0.9	2.1	2.1	0.0	5.26E-04	2.21E-03
10	1	1	0.9	1.4	2.0	0.5	0.9	2.1	2.1	0.0	5.26E-04	2.21E-03
11	1	1	0.9	1.4	2.0	0.5	0.9	2.1	2.1	0.0	5.26E-04	2.21E-03
12	1	0	0.9	1.4	2.0	0.5	0.0	0.0	0.0	0.0	2.63E-04	1.06E-03
13	1	0	0.9	1.4	2.0	0.5	0.0	0.0	0.0	0.0	2.63E-04	1.06E-03
14	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
15	1	1	0.9	1.4	2.0	0.5	0.9	2.1	2.1	0.0	5.26E-04	2.21E-03
16	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
17	1	0	0.9	1.4	2.0	0.5	0.0	0.0	0.0	0.0	2.63E-04	1.06E-03
18	1	0	0.9	1.4	2.0	0.5	0.0	0.0	0.0	0.0	2.63E-04	1.06E-03
19	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
20	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
21	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
22	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
23	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
24	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
Daily Emission (g)			7.6	11.1	15.7	3.6	3.8	8.3	8.3	0.0		
Total Daily Emission (g)			58.3									

Note:

[1] Total Emission = (Main Engine Emission + Auxiliary Engine Emission) x Number of Trip

Emission = Engine Power (kW) x Loading Factor x Time-in-mode (hr) X Emission Factor (g/kWh)

[2] Emission during Hotelling = Emission of hotelling during arrival and departure

Emission during Navigation = Emission of navigation (Maneuvering + Slow Cruise + Fairway Cruise) during arrival and departure

Daily RSP emission (Saturday)(Travel between Discovery Bay and Peng Chau via Trappist Haven Monastery)

Hour	Number of Trip		Total Emission (g)[1]								Emission Rate (g/s)	
			Arrival				Departure					
	Arrival	Departure	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling[2]	Navigation[2]
01	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
02	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
03	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
04	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
05	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
06	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
07	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
08	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
09	1	1	0.9	1.4	2.0	0.5	0.9	2.1	2.1	0.0	5.26E-04	2.21E-03
10	1	1	0.9	1.4	2.0	0.5	0.9	2.1	2.1	0.0	5.26E-04	2.21E-03
11	1	1	0.9	1.4	2.0	0.5	0.9	2.1	2.1	0.0	5.26E-04	2.21E-03
12	1	0	0.9	1.4	2.0	0.5	0.0	0.0	0.0	0.0	2.63E-04	1.06E-03
13	1	0	0.9	1.4	2.0	0.5	0.0	0.0	0.0	0.0	2.63E-04	1.06E-03
14	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
15	1	1	0.9	1.4	2.0	0.5	0.9	2.1	2.1	0.0	5.26E-04	2.21E-03
16	1	1	0.9	1.4	2.0	0.5	0.9	2.1	2.1	0.0	5.26E-04	2.21E-03
17	1	0	0.9	1.4	2.0	0.5	0.0	0.0	0.0	0.0	2.63E-04	1.06E-03
18	1	0	0.9	1.4	2.0	0.5	0.0	0.0	0.0	0.0	2.63E-04	1.06E-03
19	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
20	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
21	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
22	0	1	0.0	0.0	0.0	0.0	0.9	2.1	2.1	0.0	2.63E-04	1.15E-03
23	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
24	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
Daily Emission (g)			8.5	12.5	17.7	4.1	5.7	12.5	12.4	0.0		
Total Daily Emission (g)			73.3									

Note:

[1] Total Emission = (Main Engine Emission + Auxiliary Engine Emission) x Number of Trip

Emission = Engine Power (kW) x Loading Factor x Time-in-mode (hr) X Emission Factor (g/kWh)

[2] Emission during Hotelling = Emission of hotelling during arrival and departure

Emission during Navigation = Emission of navigation (Maneuvering + Slow Cruise + Fairway Cruise) during arrival and departure

Daily RSP emission (Sunday / Public Holidays)(Travel between Discovery Bay and Peng Chau via Trappist Haven Monastery)

Hour	Number of Trip		Total Emission (g)[1]								Emission Rate (g/s)	
			Arrival				Departure					
	Arrival	Departure	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling[2]	Navigation[2]
01	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
02	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
03	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
04	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
05	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
06	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
07	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
08	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
09	1	1	0.9	1.4	2.0	0.5	0.9	2.1	2.1	0.0	5.26E-04	2.21E-03
10	1	1	0.9	1.4	2.0	0.5	0.9	2.1	2.1	0.0	5.26E-04	2.21E-03
11	1	0	0.9	1.4	2.0	0.5	0.0	0.0	0.0	0.0	2.63E-04	1.06E-03
12	1	1	0.9	1.4	2.0	0.5	0.9	2.1	2.1	0.0	5.26E-04	2.21E-03
13	1	0	0.9	1.4	2.0	0.5	0.0	0.0	0.0	0.0	2.63E-04	1.06E-03
14	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
15	1	1	0.9	1.4	2.0	0.5	0.9	2.1	2.1	0.0	5.26E-04	2.21E-03
16	1	1	0.9	1.4	2.0	0.5	0.9	2.1	2.1	0.0	5.26E-04	2.21E-03
17	1	0	0.9	1.4	2.0	0.5	0.0	0.0	0.0	0.0	2.63E-04	1.06E-03
18	1	0	0.9	1.4	2.0	0.5	0.0	0.0	0.0	0.0	2.63E-04	1.06E-03
19	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
20	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
21	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
22	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
23	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
24	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
Daily Emission (g)			8.5	12.5	17.7	4.1	4.7	10.4	10.3	0.0		
Total Daily Emission (g)			68.2									

Note:

[1] Total Emission = (Main Engine Emission + Auxiliary Engine Emission) x Number of Trip

Emission = Engine Power (kW) x Loading Factor x Time-in-mode (hr) X Emission Factor (g/kWh)

[2] Emission during Hotelling = Emission of hotelling during arrival and departure

Emission during Navigation = Emission of navigation (Maneuvering + Slow Cruise + Fairway Cruise) during arrival and departure

Daily FSP emission (Weekdays)(Travel between Discovery Bay and Peng Chau via Trappist Haven Monastery)

Hour	Number of Trip		Total Emission (g)[1]								Emission Rate (g/s)	
			Arrival				Departure					
	Arrival	Departure	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling[2]	Navigation[2]
01	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
02	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
03	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
04	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
05	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
06	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
07	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
08	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
09	1	1	0.9	1.3	1.9	0.4	0.9	2.0	2.0	0.0	5.12E-04	2.14E-03
10	1	1	0.9	1.3	1.9	0.4	0.9	2.0	2.0	0.0	5.12E-04	2.14E-03
11	1	1	0.9	1.3	1.9	0.4	0.9	2.0	2.0	0.0	5.12E-04	2.14E-03
12	1	0	0.9	1.3	1.9	0.4	0.0	0.0	0.0	0.0	2.56E-04	1.03E-03
13	1	0	0.9	1.3	1.9	0.4	0.0	0.0	0.0	0.0	2.56E-04	1.03E-03
14	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
15	1	1	0.9	1.3	1.9	0.4	0.9	2.0	2.0	0.0	5.12E-04	2.14E-03
16	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
17	1	0	0.9	1.3	1.9	0.4	0.0	0.0	0.0	0.0	2.56E-04	1.03E-03
18	1	0	0.9	1.3	1.9	0.4	0.0	0.0	0.0	0.0	2.56E-04	1.03E-03
19	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
20	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
21	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
22	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
23	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
24	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
Daily Emission (g)			7.4	10.8	15.2	3.5	3.7	8.1	8.0	0.0		
Total Daily Emission (g)			56.7									

Note:

[1] Total Emission = (Main Engine Emission + Auxiliary Engine Emission) x Number of Trip

Emission = Engine Power (kW) x Loading Factor x Time-in-mode (hr) X Emission Factor (g/kWh)

[2] Emission during Hotelling = Emission of hotelling during arrival and departure

Emission during Navigation = Emission of navigation (Maneuvering + Slow Cruise + Fairway Cruise) during arrival and departure

Project: Discovery Bay: Optimization of Land Use
Title: Calculation of Marine Emission from Kaito Ferry Service between Discovery Bay and Peng Chau

Daily FSP emission (Saturday)(Travel between Discovery Bay and Peng Chau via Trappist Haven Monastery)

Hour	Number of Trip		Total Emission (g)[1]								Emission Rate (g/s)	
			Arrival				Departure					
	Arrival	Departure	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling[2]	Navigation[2]
01	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
02	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
03	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
04	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
05	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
06	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
07	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
08	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
09	1	1	0.9	1.3	1.9	0.4	0.9	2.0	2.0	0.0	5.12E-04	2.14E-03
10	1	1	0.9	1.3	1.9	0.4	0.9	2.0	2.0	0.0	5.12E-04	2.14E-03
11	1	1	0.9	1.3	1.9	0.4	0.9	2.0	2.0	0.0	5.12E-04	2.14E-03
12	1	0	0.9	1.3	1.9	0.4	0.0	0.0	0.0	0.0	2.56E-04	1.03E-03
13	1	0	0.9	1.3	1.9	0.4	0.0	0.0	0.0	0.0	2.56E-04	1.03E-03
14	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
15	1	1	0.9	1.3	1.9	0.4	0.9	2.0	2.0	0.0	5.12E-04	2.14E-03
16	1	1	0.9	1.3	1.9	0.4	0.9	2.0	2.0	0.0	5.12E-04	2.14E-03
17	1	0	0.9	1.3	1.9	0.4	0.0	0.0	0.0	0.0	2.56E-04	1.03E-03
18	1	0	0.9	1.3	1.9	0.4	0.0	0.0	0.0	0.0	2.56E-04	1.03E-03
19	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
20	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
21	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
22	0	1	0.0	0.0	0.0	0.0	0.9	2.0	2.0	0.0	2.56E-04	1.12E-03
23	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
24	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
Daily Emission (g)			8.3	12.1	17.1	4.0	5.5	12.1	12.0	0.0		
Total Daily Emission (g)			71.2									

Note:

[1] Total Emission = (Main Engine Emission + Auxiliary Engine Emission) x Number of Trip

Emission = Engine Power (kW) x Loading Factor x Time-in-mode (hr) X Emission Factor (g/kWh)

[2] Emission during Hotelling = Emission of hotelling during arrival and departure

Emission during Navigation = Emission of navigation (Maneuvering + Slow Cruise + Fairway Cruise) during arrival and departure

Daily FSP emission (Sunday / Public Holidays)(Travel between Discovery Bay and Peng Chau via Trappist Haven Monastery)

Hour	Number of Trip		Total Emission (g)[1]								Emission Rate (g/s)	
			Arrival				Departure					
	Arrival	Departure	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling[2]	Navigation[2]
01	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
02	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
03	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
04	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
05	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
06	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
07	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
08	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
09	1	1	0.9	1.3	1.9	0.4	0.9	2.0	2.0	0.0	5.12E-04	2.14E-03
10	1	1	0.9	1.3	1.9	0.4	0.9	2.0	2.0	0.0	5.12E-04	2.14E-03
11	1	0	0.9	1.3	1.9	0.4	0.0	0.0	0.0	0.0	2.56E-04	1.03E-03
12	1	1	0.9	1.3	1.9	0.4	0.9	2.0	2.0	0.0	5.12E-04	2.14E-03
13	1	0	0.9	1.3	1.9	0.4	0.0	0.0	0.0	0.0	2.56E-04	1.03E-03
14	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
15	1	1	0.9	1.3	1.9	0.4	0.9	2.0	2.0	0.0	5.12E-04	2.14E-03
16	1	1	0.9	1.3	1.9	0.4	0.9	2.0	2.0	0.0	5.12E-04	2.14E-03
17	1	0	0.9	1.3	1.9	0.4	0.0	0.0	0.0	0.0	2.56E-04	1.03E-03
18	1	0	0.9	1.3	1.9	0.4	0.0	0.0	0.0	0.0	2.56E-04	1.03E-03
19	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
20	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
21	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
22	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
23	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
24	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
Daily Emission (g)			8.3	12.1	17.1	4.0	4.6	10.1	10.0	0.0		
Total Daily Emission (g)			66.2									

Note:

[1] Total Emission = (Main Engine Emission + Auxiliary Engine Emission) x Number of Trip

Emission = Engine Power (kW) x Loading Factor x Time-in-mode (hr) X Emission Factor (g/kWh)

[2] Emission during Hotelling = Emission of hotelling during arrival and departure

Emission during Navigation = Emission of navigation (Maneuvering + Slow Cruise + Fairway Cruise) during arrival and departure

Project: Discovery Bay: Optimization of Land Use
Title: Calculation of Marine Emission from Kaito Ferry Service between Discovery Bay and Peng Chau

Daily SO2 emission (Weekdays)(Travel between Discovery Bay and Peng Chau via Trappist Haven Monastery)

Hour	Number of Trip		Total Emission (g)[1]								Emission Rate (g/s)	
			Arrival				Departure					
	Arrival	Departure	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling[2]	Navigation[2]
01	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
02	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
03	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
04	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
05	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
06	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
07	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
08	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
09	1	1	0.5	0.9	1.3	0.3	0.5	1.4	1.4	0.0	2.74E-04	1.48E-03
10	1	1	0.5	0.9	1.3	0.3	0.5	1.4	1.4	0.0	2.74E-04	1.48E-03
11	1	1	0.5	0.9	1.3	0.3	0.5	1.4	1.4	0.0	2.74E-04	1.48E-03
12	1	0	0.5	0.9	1.3	0.3	0.0	0.0	0.0	0.0	1.37E-04	7.09E-04
13	1	0	0.5	0.9	1.3	0.3	0.0	0.0	0.0	0.0	1.37E-04	7.09E-04
14	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
15	1	1	0.5	0.9	1.3	0.3	0.5	1.4	1.4	0.0	2.74E-04	1.48E-03
16	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
17	1	0	0.5	0.9	1.3	0.3	0.0	0.0	0.0	0.0	1.37E-04	7.09E-04
18	1	0	0.5	0.9	1.3	0.3	0.0	0.0	0.0	0.0	1.37E-04	7.09E-04
19	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
20	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
21	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
22	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
23	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
24	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
Daily Emission (g)			3.9	7.4	10.6	2.5	2.0	5.5	5.6	0.0		
Total Daily Emission (g)			37.4									

Note:

[1] Total Emission = (Main Engine Emission + Auxiliary Engine Emission) x Number of Trip

Emission = Engine Power (kW) x Loading Factor x Time-in-mode (hr) X Emission Factor (g/kWh)

[2] Emission during Hotelling = Emission of hotelling during arrival and departure

Emission during Navigation = Emission of navigation (Maneuvering + Slow Cruise + Fairway Cruise) during arrival and departure

Daily SO2 emission (Saturday)(Travel between Discovery Bay and Peng Chau via Trappist Haven Monastery)

Hour	Number of Trip		Total Emission (g)[1]								Emission Rate (g/s)	
			Arrival				Departure					
	Arrival	Departure	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling[2]	Navigation[2]
01	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
02	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
03	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
04	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
05	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
06	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
07	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
08	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
09	1	1	0.5	0.9	1.3	0.3	0.5	1.4	1.4	0.0	2.74E-04	1.48E-03
10	1	1	0.5	0.9	1.3	0.3	0.5	1.4	1.4	0.0	2.74E-04	1.48E-03
11	1	1	0.5	0.9	1.3	0.3	0.5	1.4	1.4	0.0	2.74E-04	1.48E-03
12	1	0	0.5	0.9	1.3	0.3	0.0	0.0	0.0	0.0	1.37E-04	7.09E-04
13	1	0	0.5	0.9	1.3	0.3	0.0	0.0	0.0	0.0	1.37E-04	7.09E-04
14	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
15	1	1	0.5	0.9	1.3	0.3	0.5	1.4	1.4	0.0	2.74E-04	1.48E-03
16	1	1	0.5	0.9	1.3	0.3	0.5	1.4	1.4	0.0	2.74E-04	1.48E-03
17	1	0	0.5	0.9	1.3	0.3	0.0	0.0	0.0	0.0	1.37E-04	7.09E-04
18	1	0	0.5	0.9	1.3	0.3	0.0	0.0	0.0	0.0	1.37E-04	7.09E-04
19	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
20	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
21	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
22	0	1	0.0	0.0	0.0	0.0	0.5	1.4	1.4	0.0	1.37E-04	7.71E-04
23	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
24	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
Daily Emission (g)			4.4	8.3	11.9	2.8	3.0	8.3	8.4	0.0		
Total Daily Emission (g)			47.0									

Note:

[1] Total Emission = (Main Engine Emission + Auxiliary Engine Emission) x Number of Trip

Emission = Engine Power (kW) x Loading Factor x Time-in-mode (hr) X Emission Factor (g/kWh)

[2] Emission during Hotelling = Emission of hotelling during arrival and departure

Emission during Navigation = Emission of navigation (Maneuvering + Slow Cruise + Fairway Cruise) during arrival and departure

Daily SO2 emission (Sunday / Public Holidays)(Travel between Discovery Bay and Peng Chau via Trappist Haven Monastery)

Hour	Number of Trip		Total Emission (g)[1]								Emission Rate (g/s)	
			Arrival				Departure					
	Arrival	Departure	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling[2]	Navigation[2]
01	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
02	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
03	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
04	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
05	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
06	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
07	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
08	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
09	1	1	0.5	0.9	1.3	0.3	0.5	1.4	1.4	0.0	2.74E-04	1.48E-03
10	1	1	0.5	0.9	1.3	0.3	0.5	1.4	1.4	0.0	2.74E-04	1.48E-03
11	1	0	0.5	0.9	1.3	0.3	0.0	0.0	0.0	0.0	1.37E-04	7.09E-04
12	1	1	0.5	0.9	1.3	0.3	0.5	1.4	1.4	0.0	2.74E-04	1.48E-03
13	1	0	0.5	0.9	1.3	0.3	0.0	0.0	0.0	0.0	1.37E-04	7.09E-04
14	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
15	1	1	0.5	0.9	1.3	0.3	0.5	1.4	1.4	0.0	2.74E-04	1.48E-03
16	1	1	0.5	0.9	1.3	0.3	0.5	1.4	1.4	0.0	2.74E-04	1.48E-03
17	1	0	0.5	0.9	1.3	0.3	0.0	0.0	0.0	0.0	1.37E-04	7.09E-04
18	1	0	0.5	0.9	1.3	0.3	0.0	0.0	0.0	0.0	1.37E-04	7.09E-04
19	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
20	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
21	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
22	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
23	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
24	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
Daily Emission (g)			4.4	8.3	11.9	2.8	2.5	6.9	7.0	0.0		
Total Daily Emission (g)			43.7									

Note:

[1] Total Emission = (Main Engine Emission + Auxiliary Engine Emission) x Number of Trip

Emission = Engine Power (kW) x Loading Factor x Time-in-mode (hr) X Emission Factor (g/kWh)

[2] Emission during Hotelling = Emission of hotelling during arrival and departure

Emission during Navigation = Emission of navigation (Maneuvering + Slow Cruise + Fairway Cruise) during arrival and departure

Project: Discovery Bay: Optimization of Land Use
Title: Model Input Parameter for Passenger Ferry Service between Discovery Bay and Peng Chau

Name	Source ID	Source Type	X	Y	Stack Height / Release Height (m)[3]	Exit Temperature (K)[3]	Exit Velocity (m/s)[4]	Diameter (m)[3]	Emission Rate (g/s)
Hotelling (Direct Travel)	DPH001	Point	820373	817006	6.2	773	8	0.7	Note [1]
Navigation (Direct Travel)	DPM001	Point	820370	816986	6.2	773	8	0.7	Note [2]
	DPM002	Point	820367	816966	6.2	773	8	0.7	Note [2]
	DPM003	Point	820370	816946	6.2	773	8	0.7	Note [2]
	DPM004	Point	820384	816933	6.2	773	8	0.7	Note [2]
	DPM005	Point	820399	816919	6.2	773	8	0.7	Note [2]
	DPM006	Point	820413	816905	6.2	773	8	0.7	Note [2]
	DPM007	Point	820427	816891	6.2	773	8	0.7	Note [2]
	DPM008	Point	820441	816876	6.2	773	8	0.7	Note [2]
	DPM009	Point	820456	816862	6.2	773	8	0.7	Note [2]
	DPM010	Point	820470	816848	6.2	773	8	0.7	Note [2]
	DPM011	Point	820485	816836	6.2	773	8	0.7	Note [2]
	DPM012	Point	820501	816823	6.2	773	8	0.7	Note [2]
	DPM013	Point	820517	816811	6.2	773	8	0.7	Note [2]
	DPM014	Point	820532	816798	6.2	773	8	0.7	Note [2]
	DPM015	Point	820548	816786	6.2	773	8	0.7	Note [2]
	DPM016	Point	820564	816773	6.2	773	8	0.7	Note [2]
	DPM017	Point	820579	816761	6.2	773	8	0.7	Note [2]
	DPM018	Point	820595	816748	6.2	773	8	0.7	Note [2]
	DPM019	Point	820610	816736	6.2	773	8	0.7	Note [2]
	DPM020	Point	820626	816723	6.2	773	8	0.7	Note [2]
	DPM021	Point	820642	816711	6.2	773	8	0.7	Note [2]
	DPM022	Point	820657	816698	6.2	773	8	0.7	Note [2]
	DPM023	Point	820673	816686	6.2	773	8	0.7	Note [2]
	DPM024	Point	820688	816673	6.2	773	8	0.7	Note [2]
	DPM025	Point	820704	816661	6.2	773	8	0.7	Note [2]
	DPM026	Point	820720	816648	6.2	773	8	0.7	Note [2]
	DPM027	Point	820735	816636	6.2	773	8	0.7	Note [2]
	DPM028	Point	820751	816623	6.2	773	8	0.7	Note [2]
	DPM029	Point	820767	816611	6.2	773	8	0.7	Note [2]
	DPM030	Point	820782	816598	6.2	773	8	0.7	Note [2]
	DPM031	Point	820798	816586	6.2	773	8	0.7	Note [2]
	DPM032	Point	820813	816573	6.2	773	8	0.7	Note [2]
	DPM033	Point	820829	816561	6.2	773	8	0.7	Note [2]

Note:

[1] The emission rate adopted = Hourly emission of hotelling (arrival) + Hourly emission of hotelling (departure) (Hourly Emission Rates (hotelling) are given in Daily NOx, RSP, FSP and SO_2 Emission Summary in Page 19 to Page 42)

[2] The emission rate adopted = (Hourly emission rate of navigation (arrival) + Hourly emission rate of navigation (departure))/Number of Navigation Sources (i.e. 33 sources for this ferry route) (Hourly Emission Rates (navigation) are given in Daily NOx, RSP, FSP and SO_2 Emission Summary in Page 19 to Page 42)
Higher emission during slow cruise is found compared to those during fairway cruise and maneuvering modes.
Due to the uncertainty on the location of navigation route under each mode, the emission during navigation is evenly distributed among the navigation route as a conservative approach.

[3] No information from the operator is available. Information for release height, exit temperature and chimney diameter for passenger vessels based on information from approved EIA study "Expansion of Heliport Facilities at Macau Ferry Terminal"(AEIAR-095/2006)

[4] No information from the operator is available. Information for exit velocity of passenger ferries based on information from approved EIA study "Organic Waste Treatment Facilities, Phase I" (AEIAR-149/2010)

Name	Source ID	Source Type	X	Y	Stack Height / Release Height (m)[3]	Exit Temperature (K)[3]	Exit Velocity (m/s)[4]	Diameter (m)[3]	Emission Rate (g/s)
Hotelling (via Trappist Haven Monastery)	DTH001	Point	820373	817006	6.2	773	8	0.7	Note [1]
Navigation (via Trappist Haven Monastery)	DTM001	Point	820369	816986	6.2	773	8	0.7	Note [2]
	DTM002	Point	820366	816966	6.2	773	8	0.7	Note [2]
	DTM003	Point	820368	816947	6.2	773	8	0.7	Note [2]
	DTM004	Point	820382	816932	6.2	773	8	0.7	Note [2]
	DTM005	Point	820397	816918	6.2	773	8	0.7	Note [2]
	DTM006	Point	820411	816904	6.2	773	8	0.7	Note [2]
	DTM007	Point	820425	816890	6.2	773	8	0.7	Note [2]
	DTM008	Point	820439	816876	6.2	773	8	0.7	Note [2]
	DTM009	Point	820453	816862	6.2	773	8	0.7	Note [2]
	DTM010	Point	820467	816848	6.2	773	8	0.7	Note [2]
	DTM011	Point	820481	816834	6.2	773	8	0.7	Note [2]
	DTM012	Point	820494	816818	6.2	773	8	0.7	Note [2]
	DTM013	Point	820507	816802	6.2	773	8	0.7	Note [2]
	DTM014	Point	820519	816787	6.2	773	8	0.7	Note [2]
	DTM015	Point	820530	816770	6.2	773	8	0.7	Note [2]
	DTM016	Point	820535	816750	6.2	773	8	0.7	Note [2]
	DTM017	Point	820540	816731	6.2	773	8	0.7	Note [2]
	DTM018	Point	820545	816712	6.2	773	8	0.7	Note [2]
	DTM019	Point	820550	816692	6.2	773	8	0.7	Note [2]
	DTM020	Point	820555	816673	6.2	773	8	0.7	Note [2]
	DTM021	Point	820560	816654	6.2	773	8	0.7	Note [2]
	DTM022	Point	820565	816634	6.2	773	8	0.7	Note [2]
	DTM023	Point	820570	816615	6.2	773	8	0.7	Note [2]
	DTM024	Point	820575	816596	6.2	773	8	0.7	Note [2]
	DTM025	Point	820580	816576	6.2	773	8	0.7	Note [2]
	DTM026	Point	820585	816557	6.2	773	8	0.7	Note [2]
	DTM027	Point	820590	816538	6.2	773	8	0.7	Note [2]
	DTM028	Point	820596	816518	6.2	773	8	0.7	Note [2]
	DTM029	Point	820601	816499	6.2	773	8	0.7	Note [2]
	DTM030	Point	820606	816480	6.2	773	8	0.7	Note [2]
	DTM031	Point	820611	816460	6.2	773	8	0.7	Note [2]
	DTM032	Point	820616	816441	6.2	773	8	0.7	Note [2]

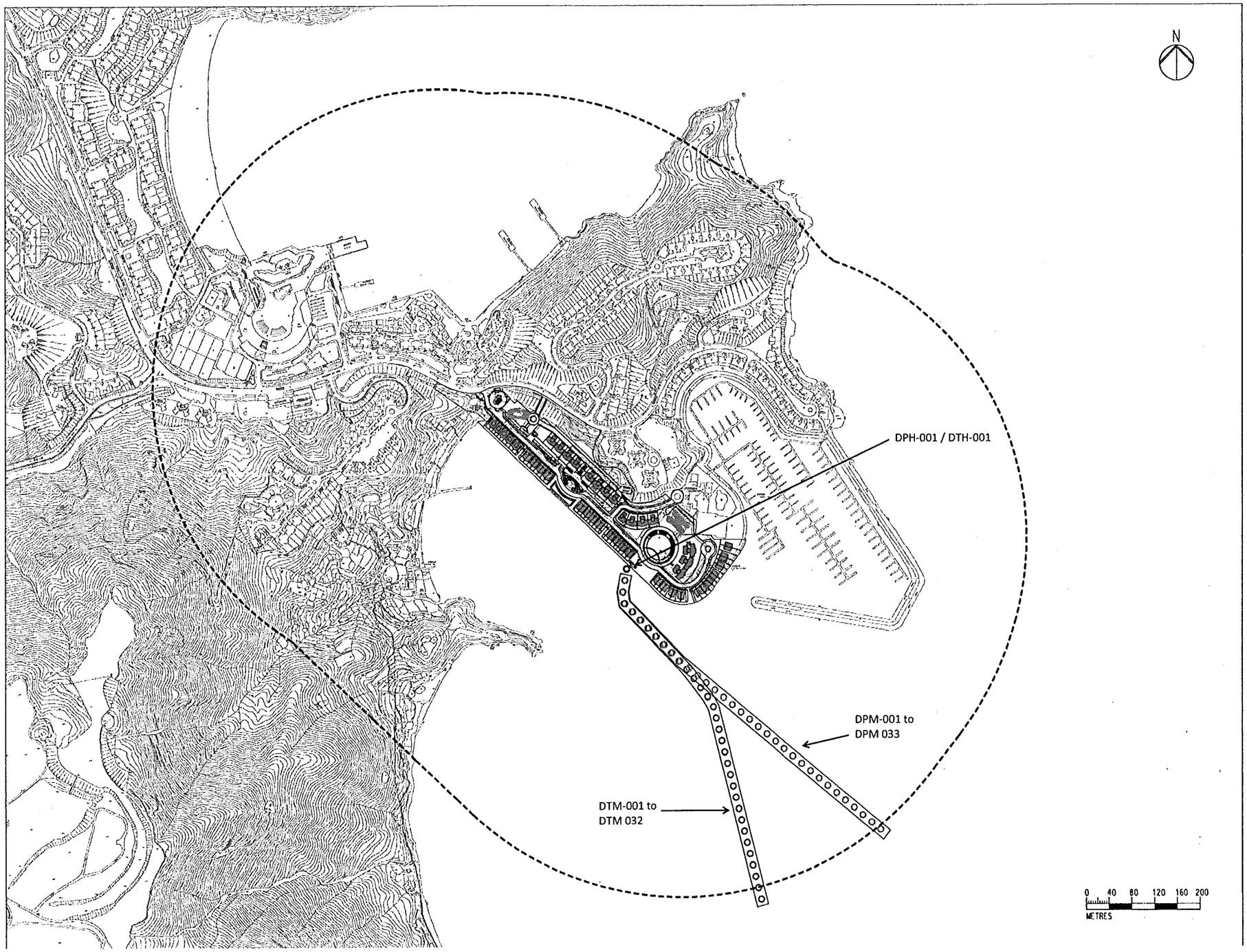
Note:

[1] The emission rate adopted = Hourly emission of hotelling (arrival) + Hourly emission of hotelling (departure) (Hourly Emission Rates (hotelling) are given in Daily NOx, RSP, FSP and SO_2 Emission Summary in Page 19 to Page 42)

[2] The emission rate adopted = (Hourly emission rate of navigation (arrival) + Hourly emission rate of navigation (departure))/Number of Navigation Sources (i.e. 32 sources for this ferry route) (Hourly Emission Rates (navigation) are given in Daily NOx, RSP, FSP and SO2 Emission Summary in Page 19 to Page 42)
Higher emission of slow cruise is found compared with fairway cruise and maneuvering mode.
Due to the uncertainty on the location of navigation route under each mode, the emission during navigation is evenly distributed among the navigation route as a conservative approach.

[3] No information from the operator is available. Information for release height, exit temperature and chimney diameter for passenger vessels based on information from approved EIA study "Expansion of Heliport Facilities at Macau Ferry Terminal"(AEIAR-095/2006)

[4] No information from the operator is available. Information for exit velocity of passenger ferries based on information from approved EIA study "Organic Waste Treatment Facilities, Phase I" (AEIAR-149/2010)



Note: As a conservative approach, the navigation route outside 500m assessment area is included in the near-field model.

Engine Power and Load Factors under Different Operation Mode of Main Engine

Main Engine Power (kW)	Vessel Speed (Knots)				Load Factor [4]			
	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise
643 [1]	0.00	4.5 [2]	10.0 [2]	12.0 [3]	0.00	0.30	0.45	0.45

Note:

[1] No information from operator is available. The engine power is referenced to the vessel (GRT 0-499) in Table 4-5 of EPD's "Study on Marine Vessels Emission Inventory".

[2] Vessel speeds under maneuvering (1-8 knots) and slow cruise (8-12 knots) are referenced to Table 3-24 of EPD's "Study on Marine Vessels Emission Inventory". The average speed of each mode is adopted for assessment purpose.

[3] Vessel speeds under fairway cruise (>12 knots) are referenced to Table 3-24 of EPD's "Study on Marine Vessels Emission Inventory". 12 knots is adopted for conservative approach that longer TIM will be resulted, hence higher emission.

[4] No information from operator is available. The load factors are referenced to vessel type "all except tug" in Table 4-7 of EPD's "Study on Marine Vessels Emission Inventory".

Engine Power and Load Factors under Different Operation Mode of Auxiliary Engine

Auxiliary Engine Power (kW)	Load Factor [2]			
	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise
66 [1]	0.43 [2]	0.43 [2]	0.43 [2]	0.43 [2]

Note:

[1] No information from operator is available. The engine power is referenced to the vessel (GRT 0-499) in Table 4-6 of EPD's "Study on Marine Vessels Emission Inventory".

[2] No information from operator is available. The load factors are referenced to river trade vessel in Table 4-10 of EPD's "Study on Marine Vessels Emission Inventory".

Time-in-mode

	Time-in-mode (minutes)			
	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise
Arrival	5.00 [1]	1.20 [2]	1.20 [2]	0.28 [4]
Departure	5.00 [1]	1.80 [2]	1.26 [3]	0.00 [4]

Note:

[1] The hotelling time is collected from site survey

[2] TIM of maneuvering and slow cruise (except departure) is referenced to Table 4.15 of EPD's "Study on Marine Vessels Emission Inventory"

[3] The Total length of navigation route adopted in the near-field model is 640m for Mui Wo Kaito. During departure, the ferry will leave the modelled navigation route under slow cruise mode.

Therefore, TIM of slow cruise (departure) = Length of navigation route under slow cruise / vessel speed under slow cruise

Length of navigation route under slow cruise = Total navigation route length adopted in the near-field model - Length of navigation route under maneuvering

Length of navigation route under maneuvering = TIM of maneuvering x vessel speed under maneuvering

[4] TIM of fairway cruise = Length of navigation route under fairway cruise / vessel speed under fairway cruise

Length of navigation route under fairway cruise = Total navigation route length adopted in the near-field model (640m) - Length of navigation route under maneuvering - Length of navigation route under slow cruise

Length of navigation route under maneuvering = TIM of maneuvering x vessel speed under maneuvering

Length of navigation route under slow cruise = TIM of slow cruise x vessel speed under slow cruise

Emission Factors of Main Engine and Auxiliary Engine

Engine Type	Emission Factors (g/Kwh)				Brake Specific Fuel Consumption (BSFC) [4]	Fuel Sulphur Content (%) [5]
	NO_x	RSP	FSP	SO_2 [3]		
Main Engine [1]	10.00	0.30	0.29	0.21	213	0.05
Auxiliary Engine [2]	10.00	0.40	0.39	0.21	213	0.05

Note:

[1] The emission factors of main engine(Cat.1) (All RTVs except (a) chemical/gas/oil tankers with GRT ≥ 1,000 and (b) all tugs)) in Table 4-16 of EPD's "Study on Marine Vessels Emission Inventory" are adopted.

[2] The emission factors of auxiliary engine of RTVs in Table 4-16 of EPD's "Study on Marine Vessels Emission Inventory" are adopted.

[3] The emission factors of SO_2 are corrected with the fuel sulphur content according to Section 4.2.31 of EPD's "Study on Marine Vessels Emission Inventory" using the following equation:

SO_2 Emission Factor = BSFC x 2 x 0.9755 x Fuel Sulphur Fraction

[4] BSFC of the vessel is referenced to Section 4.2.27 of EPD's "Study on Marine Vessels Emission Inventory".

[5] With effective of the Air Pollution Control (Marine Light Diesel) Regulation on 1st April, 2014, the fuel sulphur content limit of the MLD is 0.05%.

Daily Profile of Passenger Ferry Service between Discovery Bay and Mui Wo [1]

Hours	Number of Trip					
	Arrival[2]			Departure[3]		
	Weekday	Saturday	Sunday / Public Holiday	Weekday	Saturday	Sunday / Public Holiday
01	0	0	0	0	0	0
02	0	0	0	0	0	0
03	0	0	0	0	0	0
04	0	0	0	0	0	0
05	0	0	0	0	0	0
06	0	0	0	0	0	0
07	0	0	0	0	0	0
08	1	0	0	0	1	0
09	0	1	0	0	0	1
10	0	0	1	0	0	0
11	0	0	0	0	1	1
12	0	1	1	0	0	1
13	0	0	1	0	0	0
14	0	0	0	0	1	1
15	0	1	1	0	0	0
16	0	0	1	1	0	1
17	0	0	0	0	1	1
18	0	1	1	0	0	0
19	0	0	0	0	1	1
20	0	1	1	0	0	0
21	0	1	1	0	1	1
22	0	0	0	0	0	0
23	0	0	0	0	0	0
24	0	0	0	0	0	0

Note:

[1] The daily schedule and sailing time of the ferry service is referenced to Transport Department's website.

[2] The hour of arrival is determined by the departure time at Mui Wo and the sailing time to arrive Discovery Bay.

E.g. If a ferry departs from Mui Wo at 07:45 (Hour 8) and the sailing time is 20 minutes from Transport Department's website, it will arrive Discovery Bay at 08:05 (Hour 9).

The arrival hour of the ferry is therefore Hour 9.

[3] The hour of departure is the hour that the ferry departs at the Discovery Bay.

Daily NOx emission (Weekdays)

Hour	Number of Trip		Total Emission (g)[1]								Emission Rate (g/s)	
			Arrival				Departure					
	Arrival	Departure	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling[2]	Navigation[2]
01	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
02	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
03	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
04	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
05	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
06	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
07	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
08	1	0	24	44	64	15	0	0	0	0	6.57E-03	3.40E-02
09	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
10	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
11	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
12	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
13	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
14	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
15	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
16	0	1	0	0	0	0	24	66	67	0	6.57E-03	3.70E-02
17	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
18	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
19	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
20	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
21	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
22	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
23	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
24	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
Daily Emission (g)			24	44	64	15	24	66	67	0		
Total Daily Emission (g)			303									

Note:

[1] Total Emission = (Main Engine Emission + Auxiliary Engine Emission) x Number of Trip
Emission = Engine Power (kW) x Loading Factor x Time-in-mode (hr) X Emission Factor (g/kWh)

[2] Emission during Hotelling = Emission of hotelling during arrival and departure
Emission during Navigation = Emission of navigation (Maneuvering + Slow Cruise + Fairway Cruise) during arrival and departure

Daily NOx emission (Saturday)

Hour	Number of Trip		Total Emission (g)[1]								Emission Rate (g/s)	
			Arrival				Departure					
	Arrival	Departure	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling[2]	Navigation[2]
01	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
02	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
03	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
04	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
05	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
06	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
07	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
08	0	1	0	0	0	0	24	66	67	0	6.57E-03	3.70E-02
09	1	0	24	44	64	15	0	0	0	0	6.57E-03	3.40E-02
10	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
11	0	1	0	0	0	0	24	66	67	0	6.57E-03	3.70E-02
12	1	0	24	44	64	15	0	0	0	0	6.57E-03	3.40E-02
13	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
14	0	1	0	0	0	0	24	66	67	0	6.57E-03	3.70E-02
15	1	0	24	44	64	15	0	0	0	0	6.57E-03	3.40E-02
16	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
17	0	1	0	0	0	0	24	66	67	0	6.57E-03	3.70E-02
18	1	0	24	44	64	15	0	0	0	0	6.57E-03	3.40E-02
19	0	1	0	0	0	0	24	66	67	0	6.57E-03	3.70E-02
20	1	0	24	44	64	15	0	0	0	0	6.57E-03	3.40E-02
21	1	1	24	44	64	15	24	66	67	0	1.31E-02	7.11E-02
22	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
23	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
24	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
Daily Emission (g)			142	266	381	88	142	398	401	0		
Total Daily Emission (g)			1,819									

Note:

[1] Total Emission = (Main Engine Emission + Auxiliary Engine Emission) x Number of Trip
Emission = Engine Power (kW) x Loading Factor x Time-in-mode (hr) X Emission Factor (g/kWh)

[2] Emission during Hotelling = Emission of hotelling during arrival and departure
Emission during Navigation = Emission of navigation (Maneuvering + Slow Cruise + Fairway Cruise) during arrival and departure

y NOx emission (Sunday / Public Holidays)

Hour	Number of Trip		Total Emission (g)[1]								Emission Rate (g/s)	
			Arrival				Departure					
	Arrival	Departure	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling[2]	Navigation[2]
01	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
02	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
03	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
04	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
05	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
06	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
07	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
08	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
09	0	1	0	0	0	0	24	66	67	0	6.57E-03	3.70E-02
10	1	0	24	44	64	15	0	0	0	0	6.57E-03	3.40E-02
11	0	1	0	0	0	0	24	66	67	0	6.57E-03	3.70E-02
12	1	1	24	44	64	15	24	66	67	0	1.31E-02	7.11E-02
13	1	0	24	44	64	15	0	0	0	0	6.57E-03	3.40E-02
14	0	1	0	0	0	0	24	66	67	0	6.57E-03	3.70E-02
15	1	0	24	44	64	15	0	0	0	0	6.57E-03	3.40E-02
16	1	1	24	44	64	15	24	66	67	0	1.31E-02	7.11E-02
17	0	1	0	0	0	0	24	66	67	0	6.57E-03	3.70E-02
18	1	0	24	44	64	15	0	0	0	0	6.57E-03	3.40E-02
19	0	1	0	0	0	0	24	66	67	0	6.57E-03	3.70E-02
20	1	0	24	44	64	15	0	0	0	0	6.57E-03	3.40E-02
21	1	1	24	44	64	15	24	66	67	0	1.31E-02	7.11E-02
22	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
23	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
24	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
Daily Emission (g)			189	354	508	118	189	531	535	0		
Total Daily Emission (g)			2,425									

e:

otal Emission = (Main Engine Emission + Auxiliary Engine Emission) x Number of Trip

mission = Engine Power (kW) x Loading Factor x Time-in-mode (hr) X Emission Factor (g/kWh)

mission during Hotelling = Emission of hotelling during arrival and departure

mission during Navigation = Emission of navigation (Maneuvering + Slow Cruise + Fairway Cruise) during arrival and departure

Daily RSP emission (Weekdays)

Hour	Number of Trip		Total Emission (g)[1]								Emission Rate (g/s)	
			Arrival				Departure					
	Arrival	Departure	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling[2]	Navigation[2]
01	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
02	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
03	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
04	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
05	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
06	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
07	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
08	1	0	0.9	1.4	2.0	0.5	0.0	0.0	0.0	0.0	2.63E-04	1.06E-03
09	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
10	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
11	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
12	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
13	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
14	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
15	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
16	0	1	0.0	0.0	0.0	0.0	0.9	2.1	2.1	0.0	2.63E-04	1.15E-03
17	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
18	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
19	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
20	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
21	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
22	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
23	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
24	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
Daily Emission (g)			0.9	1.4	2.0	0.5	0.9	2.1	2.1	0.0		
Total Daily Emission (g)			9.8									

Note:

[1] Total Emission = (Main Engine Emission + Auxiliary Engine Emission) x Number of Trip

Emission = *Engine Power* (kW) x *Loading Factor* x *Time-in-mode* (hr) X *Emission Factor* (g/kWh)

[2] Emission during Hotelling = Emission of hotelling during arrival and departure

Emission during Navigation = Emission of navigation (Maneuvering + Slow Cruise + Fairway Cruise) during arrival and departure

Daily RSP emission (Saturday)

Hour	Number of Trip		Total Emission (g)[1]								Emission Rate (g/s)	
			Arrival				Departure					
	Arrival	Departure	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling[2]	Navigation[2]
01	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
02	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
03	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
04	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
05	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
06	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
07	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
08	0	1	0.0	0.0	0.0	0.0	0.9	2.1	2.1	0.0	2.63E-04	1.15E-03
09	1	0	0.9	1.4	2.0	0.5	0.0	0.0	0.0	0.0	2.63E-04	1.06E-03
10	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
11	0	1	0.0	0.0	0.0	0.0	0.9	2.1	2.1	0.0	2.63E-04	1.15E-03
12	1	0	0.9	1.4	2.0	0.5	0.0	0.0	0.0	0.0	2.63E-04	1.06E-03
13	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
14	0	1	0.0	0.0	0.0	0.0	0.9	2.1	2.1	0.0	2.63E-04	1.15E-03
15	1	0	0.9	1.4	2.0	0.5	0.0	0.0	0.0	0.0	2.63E-04	1.06E-03
16	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
17	0	1	0.0	0.0	0.0	0.0	0.9	2.1	2.1	0.0	2.63E-04	1.15E-03
18	1	0	0.9	1.4	2.0	0.5	0.0	0.0	0.0	0.0	2.63E-04	1.06E-03
19	0	1	0.0	0.0	0.0	0.0	0.9	2.1	2.1	0.0	2.63E-04	1.15E-03
20	1	0	0.9	1.4	2.0	0.5	0.0	0.0	0.0	0.0	2.63E-04	1.06E-03
21	1	1	0.9	1.4	2.0	0.5	0.9	2.1	2.1	0.0	5.26E-04	2.21E-03
22	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
23	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
24	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
Daily Emission (g)			5.7	8.3	11.8	2.7	5.7	12.5	12.4	0.0		
Total Daily Emission (g)			59.0									

Note:

[1] Total Emission = (Main Engine Emission + Auxiliary Engine Emission) x Number of Trip

Emission = Engine Power (kW) x Loading Factor x Time-in-mode (hr) X Emission Factor (g/kWh)

[2] Emission during Hotelling = Emission of hotelling during arrival and departure

Emission during Navigation = Emission of navigation (Maneuvering + Slow Cruise + Fairway Cruise) during arrival and departure

Daily RSP emission (Sunday / Public Holidays)

Hour	Number of Trip		Total Emission (g)[1]								Emission Rate (g/s)	
			Arrival				Departure					
	Arrival	Departure	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling[2]	Navigation[2]
01	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
02	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
03	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
04	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
05	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
06	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
07	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
08	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
09	0	1	0.0	0.0	0.0	0.0	0.9	2.1	2.1	0.0	2.63E-04	1.15E-03
10	1	0	0.9	1.4	2.0	0.5	0.0	0.0	0.0	0.0	2.63E-04	1.06E-03
11	0	1	0.0	0.0	0.0	0.0	0.9	2.1	2.1	0.0	2.63E-04	1.15E-03
12	1	1	0.9	1.4	2.0	0.5	0.9	2.1	2.1	0.0	5.26E-04	2.21E-03
13	1	0	0.9	1.4	2.0	0.5	0.0	0.0	0.0	0.0	2.63E-04	1.06E-03
14	0	1	0.0	0.0	0.0	0.0	0.9	2.1	2.1	0.0	2.63E-04	1.15E-03
15	1	0	0.9	1.4	2.0	0.5	0.0	0.0	0.0	0.0	2.63E-04	1.06E-03
16	1	1	0.9	1.4	2.0	0.5	0.9	2.1	2.1	0.0	5.26E-04	2.21E-03
17	0	1	0.0	0.0	0.0	0.0	0.9	2.1	2.1	0.0	2.63E-04	1.15E-03
18	1	0	0.9	1.4	2.0	0.5	0.0	0.0	0.0	0.0	2.63E-04	1.06E-03
19	0	1	0.0	0.0	0.0	0.0	0.9	2.1	2.1	0.0	2.63E-04	1.15E-03
20	1	0	0.9	1.4	2.0	0.5	0.0	0.0	0.0	0.0	2.63E-04	1.06E-03
21	1	1	0.9	1.4	2.0	0.5	0.9	2.1	2.1	0.0	5.26E-04	2.21E-03
22	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
23	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
24	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
Daily Emission (g)			7.6	11.1	15.7	3.6	7.6	16.6	16.5	0.0		
Total Daily Emission (g)			78.7									

Note:

[1] Total Emission = (Main Engine Emission + Auxiliary Engine Emission) x Number of Trip

Emission = Engine Power (kW) x Loading Factor x Time-in-mode (hr) X Emission Factor (g/kWh)

[2] Emission during Hotelling = Emission of hotelling during arrival and departure

Emission during Navigation = Emission of navigation (Maneuvering + Slow Cruise + Fairway Cruise) during arrival and departure

Daily FSP emission (Weekdays)

Hour	Number of Trip		Total Emission (g)[1]								Emission Rate (g/s)	
			Arrival				Departure					
	Arrival	Departure	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling[2]	Navigation[2]
01	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
02	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
03	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
04	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
05	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
06	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
07	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
08	1	0	0.9	1.3	1.9	0.4	0.0	0.0	0.0	0.0	2.56E-04	1.03E-03
09	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
10	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
11	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
12	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
13	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
14	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
15	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
16	0	1	0.0	0.0	0.0	0.0	0.9	2.0	2.0	0.0	2.56E-04	1.12E-03
17	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
18	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
19	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
20	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
21	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
22	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
23	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
24	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
Daily Emission (g)			0.9	1.3	1.9	0.4	0.9	2.0	2.0	0.0		
Total Daily Emission (g)			9.6									

Note:

[1] Total Emission = (Main Engine Emission + Auxiliary Engine Emission) x Number of Trip

Emission = Engine Power (kW) x Loading Factor x Time-in-mode (hr) X Emission Factor (g/kWh)

[2] Emission during Hotelling = Emission of hotelling during arrival and departure

Emission during Navigation = Emission of navigation (Maneuvering + Slow Cruise + Fairway Cruise) during arrival and departure

Daily FSP emission (Saturday)

Hour	Number of Trip		Total Emission (g)[1]								Emission Rate (g/s)	
			Arrival				Departure					
	Arrival	Departure	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling[2]	Navigation[2]
01	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
02	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
03	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
04	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
05	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
06	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
07	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
08	0	1	0.0	0.0	0.0	0.0	0.9	2.0	2.0	0.0	2.56E-04	1.12E-03
09	1	0	0.9	1.3	1.9	0.4	0.0	0.0	0.0	0.0	2.56E-04	1.03E-03
10	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
11	0	1	0.0	0.0	0.0	0.0	0.9	2.0	2.0	0.0	2.56E-04	1.12E-03
12	1	0	0.9	1.3	1.9	0.4	0.0	0.0	0.0	0.0	2.56E-04	1.03E-03
13	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
14	0	1	0.0	0.0	0.0	0.0	0.9	2.0	2.0	0.0	2.56E-04	1.12E-03
15	1	0	0.9	1.3	1.9	0.4	0.0	0.0	0.0	0.0	2.56E-04	1.03E-03
16	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
17	0	1	0.0	0.0	0.0	0.0	0.9	2.0	2.0	0.0	2.56E-04	1.12E-03
18	1	0	0.9	1.3	1.9	0.4	0.0	0.0	0.0	0.0	2.56E-04	1.03E-03
19	0	1	0.0	0.0	0.0	0.0	0.9	2.0	2.0	0.0	2.56E-04	1.12E-03
20	1	0	0.9	1.3	1.9	0.4	0.0	0.0	0.0	0.0	2.56E-04	1.03E-03
21	1	1	0.9	1.3	1.9	0.4	0.9	2.0	2.0	0.0	5.12E-04	2.14E-03
22	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
23	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
24	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
Daily Emission (g)			5.5	8.1	11.4	2.6	5.5	12.1	12.0	0.0		
Total Daily Emission (g)			57.3									

Note:

[1] Total Emission = (Main Engine Emission + Auxiliary Engine Emission) x Number of Trip

Emission = Engine Power (kW) x Loading Factor x Time-in-mode (hr) X Emission Factor (g/kWh)

[2] Emission during Hotelling = Emission of hotelling during arrival and departure

Emission during Navigation = Emission of navigation (Maneuvering + Slow Cruise + Fairway Cruise) during arrival and departure

Daily FSP emission (Sunday / Public Holidays)

Hour	Number of Trip		Total Emission (g)[1]								Emission Rate (g/s)	
			Arrival				Departure					
	Arrival	Departure	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling[2]	Navigation[2]
01	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
02	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
03	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
04	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
05	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
06	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
07	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
08	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
09	0	1	0.0	0.0	0.0	0.0	0.9	2.0	2.0	0.0	2.56E-04	1.12E-03
10	1	0	0.9	1.3	1.9	0.4	0.0	0.0	0.0	0.0	2.56E-04	1.03E-03
11	0	1	0.0	0.0	0.0	0.0	0.9	2.0	2.0	0.0	2.56E-04	1.12E-03
12	1	1	0.9	1.3	1.9	0.4	0.9	2.0	2.0	0.0	5.12E-04	2.14E-03
13	1	0	0.9	1.3	1.9	0.4	0.0	0.0	0.0	0.0	2.56E-04	1.03E-03
14	0	1	0.0	0.0	0.0	0.0	0.9	2.0	2.0	0.0	2.56E-04	1.12E-03
15	1	0	0.9	1.3	1.9	0.4	0.0	0.0	0.0	0.0	2.56E-04	1.03E-03
16	1	1	0.9	1.3	1.9	0.4	0.9	2.0	2.0	0.0	5.12E-04	2.14E-03
17	0	1	0.0	0.0	0.0	0.0	0.9	2.0	2.0	0.0	2.56E-04	1.12E-03
18	1	0	0.9	1.3	1.9	0.4	0.0	0.0	0.0	0.0	2.56E-04	1.03E-03
19	0	1	0.0	0.0	0.0	0.0	0.9	2.0	2.0	0.0	2.56E-04	1.12E-03
20	1	0	0.9	1.3	1.9	0.4	0.0	0.0	0.0	0.0	2.56E-04	1.03E-03
21	1	1	0.9	1.3	1.9	0.4	0.9	2.0	2.0	0.0	5.12E-04	2.14E-03
22	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
23	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
24	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
Daily Emission (g)			7.4	10.8	15.2	3.5	7.4	16.1	16.1	0.0		
Total Daily Emission (g)			76.5									

Note:

[1] Total Emission = (Main Engine Emission + Auxiliary Engine Emission) x Number of Trip

Emission = Engine Power (kW) x Loading Factor x Time-in-mode (hr) X Emission Factor (g/kWh)

[2] Emission during Hotelling = Emission of hotelling during arrival and departure

Emission during Navigation = Emission of navigation (Maneuvering + Slow Cruise + Fairway Cruise) during arrival and departure

Daily SO_2 emission (Weekdays)

Hour	Number of Trip		Total Emission (g)[1]								Emission Rate (g/s)	
			Arrival				Departure					
	Arrival	Departure	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling[2]	Navigation[2]
01	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
02	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
03	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
04	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
05	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
06	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
07	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
08	1	0	0.5	0.9	1.3	0.3	0.0	0.0	0.0	0.0	1.37E-04	7.09E-04
09	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
10	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
11	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
12	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
13	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
14	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
15	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
16	0	1	0.0	0.0	0.0	0.0	0.5	1.4	1.4	0.0	1.37E-04	7.71E-04
17	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
18	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
19	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
20	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
21	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
22	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
23	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
24	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
Daily Emission (g)			0.5	0.9	1.3	0.3	0.5	1.4	1.4	0.0		
Total Daily Emission (g)			6.3									

Note:

[1] Total Emission = (Main Engine Emission + Auxiliary Engine Emission) x Number of Trip

Emission = Engine Power (kW) x Loading Factor x Time-in-mode (hr) X Emission Factor (g/kWh)

[2] Emission during Hotelling = Emission of hotelling during arrival and departure

Emission during Navigation = Emission of navigation (Maneuvering + Slow Cruise + Fairway Cruise) during arrival and departure

Daily SO_2 emission (Saturday)

Hour	Number of Trip		Total Emission (g)[1]								Emission Rate (g/s)	
			Arrival				Departure					
	Arrival	Departure	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling[2]	Navigation[2]
01	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
02	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
03	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
04	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
05	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
06	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
07	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
08	0	1	0.0	0.0	0.0	0.0	0.5	1.4	1.4	0.0	1.37E-04	7.71E-04
09	1	0	0.5	0.9	1.3	0.3	0.0	0.0	0.0	0.0	1.37E-04	7.09E-04
10	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
11	0	1	0.0	0.0	0.0	0.0	0.5	1.4	1.4	0.0	1.37E-04	7.71E-04
12	1	0	0.5	0.9	1.3	0.3	0.0	0.0	0.0	0.0	1.37E-04	7.09E-04
13	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
14	0	1	0.0	0.0	0.0	0.0	0.5	1.4	1.4	0.0	1.37E-04	7.71E-04
15	1	0	0.5	0.9	1.3	0.3	0.0	0.0	0.0	0.0	1.37E-04	7.09E-04
16	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
17	0	1	0.0	0.0	0.0	0.0	0.5	1.4	1.4	0.0	1.37E-04	7.71E-04
18	1	0	0.5	0.9	1.3	0.3	0.0	0.0	0.0	0.0	1.37E-04	7.09E-04
19	0	1	0.0	0.0	0.0	0.0	0.5	1.4	1.4	0.0	1.37E-04	7.71E-04
20	1	0	0.5	0.9	1.3	0.3	0.0	0.0	0.0	0.0	1.37E-04	7.09E-04
21	1	1	0.5	0.9	1.3	0.3	0.5	1.4	1.4	0.0	2.74E-04	1.48E-03
22	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
23	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
24	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
Daily Emission (g)			3.0	5.5	7.9	1.8	3.0	8.3	8.4	0.0		
Total Daily Emission (g)			37.9									

Note:

[1] Total Emission = (Main Engine Emission + Auxiliary Engine Emission) x Number of Trip

Emission = Engine Power (kW) x Loading Factor x Time-in-mode (hr) X Emission Factor (g/kWh)

[2] Emission during Hotelling = Emission of hotelling during arrival and departure

Emission during Navigation = Emission of navigation (Maneuvering + Slow Cruise + Fairway Cruise) during arrival and departure

Daily SO_2 emission (Sunday / Public Holidays)

Hour	Number of Trip		Total Emission (g)[1]								Emission Rate (g/s)	
			Arrival				Departure					
	Arrival	Departure	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling[2]	Navigation[2]
01	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
02	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
03	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
04	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
05	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
06	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
07	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
08	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
09	0	1	0.0	0.0	0.0	0.0	0.5	1.4	1.4	0.0	1.37E-04	7.71E-04
10	1	0	0.5	0.9	1.3	0.3	0.0	0.0	0.0	0.0	1.37E-04	7.09E-04
11	0	1	0.0	0.0	0.0	0.0	0.5	1.4	1.4	0.0	1.37E-04	7.71E-04
12	1	1	0.5	0.9	1.3	0.3	0.5	1.4	1.4	0.0	2.74E-04	1.48E-03
13	1	0	0.5	0.9	1.3	0.3	0.0	0.0	0.0	0.0	1.37E-04	7.09E-04
14	0	1	0.0	0.0	0.0	0.0	0.5	1.4	1.4	0.0	1.37E-04	7.71E-04
15	1	0	0.5	0.9	1.3	0.3	0.0	0.0	0.0	0.0	1.37E-04	7.09E-04
16	1	1	0.5	0.9	1.3	0.3	0.5	1.4	1.4	0.0	2.74E-04	1.48E-03
17	0	1	0.0	0.0	0.0	0.0	0.5	1.4	1.4	0.0	1.37E-04	7.71E-04
18	1	0	0.5	0.9	1.3	0.3	0.0	0.0	0.0	0.0	1.37E-04	7.09E-04
19	0	1	0.0	0.0	0.0	0.0	0.5	1.4	1.4	0.0	1.37E-04	7.71E-04
20	1	0	0.5	0.9	1.3	0.3	0.0	0.0	0.0	0.0	1.37E-04	7.09E-04
21	1	1	0.5	0.9	1.3	0.3	0.5	1.4	1.4	0.0	2.74E-04	1.48E-03
22	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
23	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
24	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
Daily Emission (g)			3.9	7.4	10.6	2.5	3.9	11.1	11.1	0.0		
Total Daily Emission (g)			50.5									

Note:

[1] Total Emission = (Main Engine Emission + Auxiliary Engine Emission) x Number of Trip

Emission = Engine Power (kW) x Loading Factor x Time-in-mode (hr) X Emission Factor (g/kWh)

[2] Emission during Hotelling = Emission of hotelling during arrival and departure

Emission during Navigation = Emission of navigation (Maneuvering + Slow Cruise + Fairway Cruise) during arrival and departure

Name	Source ID	Source Type	X	Y	Stack Height / Release Height (m)[3]	Exit Temperature (K)[3]	Exit Velocity (m/s)[4]	Diameter (m)[3]	Emission Rate (g/s)
Hotelling	DMH001	Point	820373	817006	6.2	773	8	0.7	Note [1]
Navigation	DMM001	Point	820369	816986	6.2	773	8	0.7	Note [2]
	DMM002	Point	820366	816966	6.2	773	8	0.7	Note [2]
	DMM003	Point	820368	816947	6.2	773	8	0.7	Note [2]
	DMM004	Point	820382	816932	6.2	773	8	0.7	Note [2]
	DMM005	Point	820397	816918	6.2	773	8	0.7	Note [2]
	DMM006	Point	820411	816904	6.2	773	8	0.7	Note [2]
	DMM007	Point	820425	816890	6.2	773	8	0.7	Note [2]
	DMM008	Point	820439	816876	6.2	773	8	0.7	Note [2]
	DMM009	Point	820453	816862	6.2	773	8	0.7	Note [2]
	DMM010	Point	820467	816848	6.2	773	8	0.7	Note [2]
	DMM011	Point	820481	816834	6.2	773	8	0.7	Note [2]
	DMM012	Point	820494	816818	6.2	773	8	0.7	Note [2]
	DMM013	Point	820507	816802	6.2	773	8	0.7	Note [2]
	DMM014	Point	820519	816787	6.2	773	8	0.7	Note [2]
	DMM015	Point	820530	816770	6.2	773	8	0.7	Note [2]
	DMM016	Point	820535	816750	6.2	773	8	0.7	Note [2]
	DMM017	Point	820540	816731	6.2	773	8	0.7	Note [2]
	DMM018	Point	820545	816712	6.2	773	8	0.7	Note [2]
	DMM019	Point	820550	816692	6.2	773	8	0.7	Note [2]
	DMM020	Point	820555	816673	6.2	773	8	0.7	Note [2]
	DMM021	Point	820560	816654	6.2	773	8	0.7	Note [2]
	DMM022	Point	820565	816634	6.2	773	8	0.7	Note [2]
	DMM023	Point	820570	816615	6.2	773	8	0.7	Note [2]
	DMM024	Point	820575	816596	6.2	773	8	0.7	Note [2]
	DMM025	Point	820580	816576	6.2	773	8	0.7	Note [2]
	DMM026	Point	820585	816557	6.2	773	8	0.7	Note [2]
	DMM027	Point	820590	816538	6.2	773	8	0.7	Note [2]
	DMM028	Point	820596	816518	6.2	773	8	0.7	Note [2]
	DMM029	Point	820601	816499	6.2	773	8	0.7	Note [2]
	DMM030	Point	820606	816480	6.2	773	8	0.7	Note [2]
	DMM031	Point	820611	816460	6.2	773	8	0.7	Note [2]
	DMM032	Point	820616	816441	6.2	773	8	0.7	Note [2]

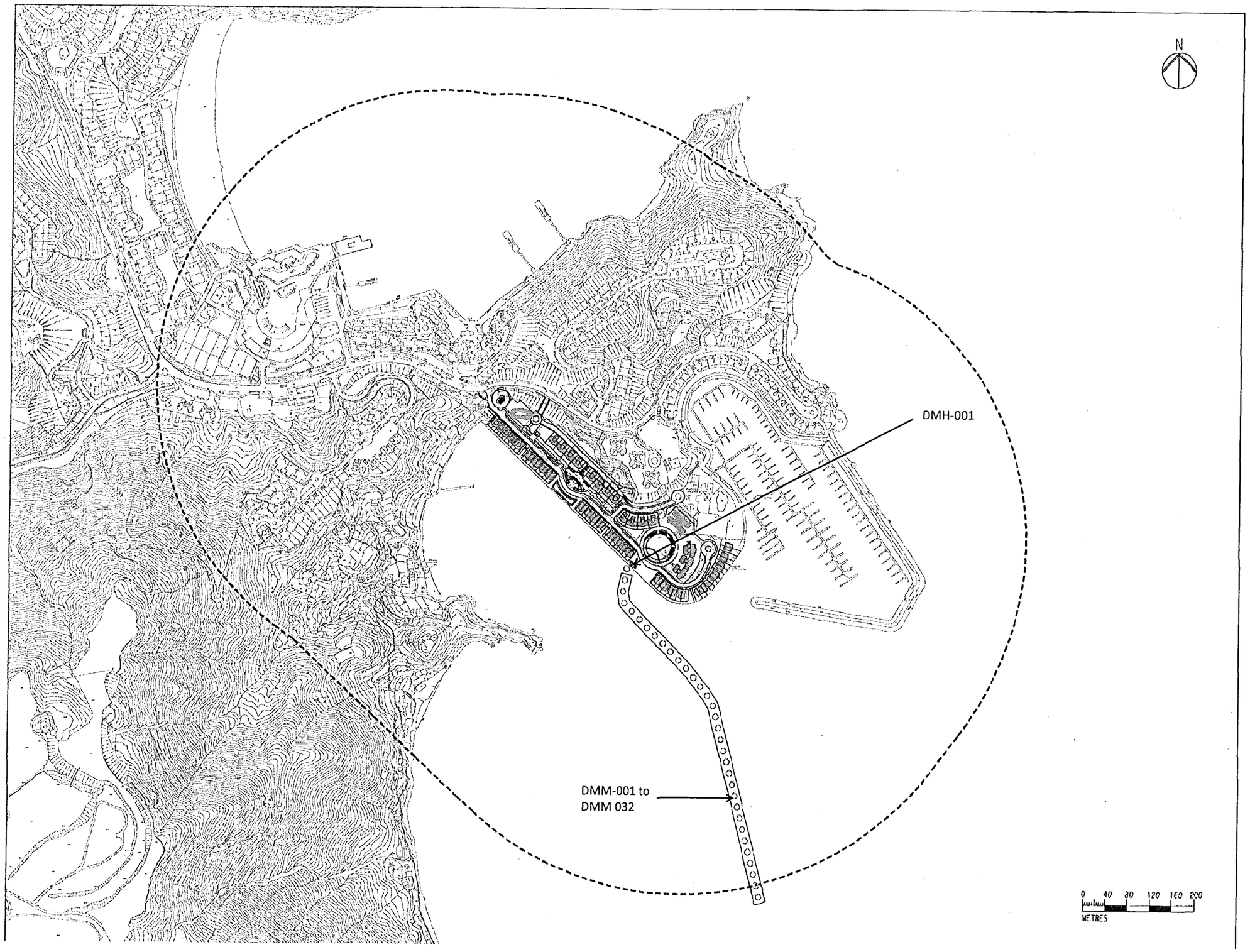
Note:

[1] The emission rate adopted = Hourly emission of hotelling (arrival) + Hourly emission of hotelling (departure) (Hourly Emission Rates (hotelling) are given in Daily NOx, RSP, FSP and SO_2 Emission Summary in Page 48 to Page 59)

[2] The emission rate adopted = (Hourly emission rate of navigation (arrival) + Hourly emission rate of navigation (departure))/Number of Navigation Sources (i.e. 32 sources for this ferry route) (Hourly Emission Rates (navigation) are given in Daily NOx, RSP, FSP and SO_2 Emission Summary in Page 48 to Page 59)
Higher emission of slow cruise is found compared with fairway cruise and maneuvering mode.
Due to the uncertainty on the location of navigation route under each mode, the emission during navigation is evenly distributed among the navigation route as a conservative approach.

[3] No information from the operator is available. Information for release height, exit temperature and chimney diameter for passenger vessels based on information from approved EIA study "Expansion of Heliport Facilities at Macau Ferry Terminal"(AEIAR-095/2006)

[4] No information from the operator is available. Information for exit velocity of passenger ferries based on information from approved EIA study "Organic Waste Treatment Facilities, Phase I" (AEIAR-149/2010)



Note: As a conservative approach, the navigation route outside 500m assessment area is included in the near-field model.

Engine Power and Load Factors under Different Operation Mode of Main Engine

Main Engine Power (kW)	Maximum Design Speed of the Vessel (Knots)	Vessel Speed (Knots)				Load Factor			
		Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise
637.83[1]	6.5[2]	0.0	3.0[2]	N/A[3]	N/A[3]	0.00	0.50[2]	N/A[3]	N/A[3]

Note:

[1] Information provided by the operator. Only the tug boast is installed with main engine.

[2] *Information provided by the operator.*

[3] As advised by operator, the navigation speed of tug boat/barge is 3 knots and it is defined as maneuvering mode (1-8 knots) according to Table 3-24 of EPD's "Study on Marine Vessels Emission Inventory".
Therefore, there is no slow cruise (8-12 knots) and fairway cruise (>12knots) mode for tug boat/barge.

Engine Power and Load Factors under Different Operation Mode of Auxiliary Engine

Total Engine Power (kW)	Load Factor			
	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise
96.77[1]	0.43[2]	0.43	N/A[2]	N/A[2]

Note:

[1] Information provided by the operator. The engine power is the total power of tug boat and barge.

[2] No available information from operator. The load factors are referenced to river trade vessels in Table 4-10 of EPD's "Study on Marine Vessels Emission Inventory"
As advised by operator, the maximum design speed of tug boat/barge is 6.5 knots, there is no slow cruise and fairway cruise mode for tug boat/barge

Time-in-mode

	Time-in-mode (minutes)			
	Hotelling[1]	Maneuvering[2]	Slow Cruise[3]	Fairway Cruise[4]
Arrival	60.00	10.80	NA	NA
Departure		10.80	NA	NA

Note:

[1] A continuous operation of the auxiliary engine is assumed from 7:00 am to 7:00pm during weekdays as a very conservative assumption.
The 60 minutes showed in the table means the engine is operating continuously in a hour for the purpose of calcualting the hourly emission.

[2] Maneuvering: TIM = Length of the navigation path adopted in the near-field model (1,000m) / navigation speed under maneuvering mode

[3] Slow Cruise: No slow cruise mode for tug boat and barge

[4] Fairway Cruise: No fairway cruise mode for tug boat and barge

Emission Factors of Main Engine and Auxiliary Engine

Engine Type	Emission Factors (g/Kwh)				Brake Specific Fuel Consumption (BSFC)[4]	Fuel Sulphur Content (%)[5]
	NO_x	RSP	FSP	SO_2[3]		
Main Engine[1]	13.20	0.72	0.70	0.21	213	0.05
Auxiliary Engine[2]	10.00	0.40	0.39	0.21	213	0.05

Note:

[1] Emission factors of Main Engine(Cat.2) (Chemical/gas/oil tankers with GRT ≥ 1,000 and all tugs boats) in Table 4-16 of EPD's "Study on Marine Vessels Emission Inventory" are adopted.

[2] Emission factors of auxiliary engine of RTVs in Table 4-16 of EPD's "Study on Marine Vessels Emission Inventory" are adopted.

[3] The emission factors of SO_2 are corrected with the fuel sulphur content according to Section 4.2.31 of EPD's "Study on Marine Vessels Emission Inventory" using the following equation:
SO_2 Emission Factor = BSFC x 2 x 0.9755 x Fuel Sulphur Fraction

[4] *BSFC of the vessel is referenced to Section 4.2.27 of EPD's "Study on Marine Vessels Emission Inventory".*

[5] With effective of the Air Pollution Control (Marine Light Diesel) Regulation on 1st April, 2014, the fuel sulphur content limit of the MLD is 0.05%.

Daily NO_x emission (Weekdays only)

Hour	Number of Trip		Total Emission (g) [1]			Emission Rate (g/s)	
			Hotelling	Arrival	Departure	Hotelling[2]	Navigation[2]
	Arrival	Departure		Maneuvering	Maneuvering		
01	0	0	0	0	0	0.00E+00	0.00E+00
02	0	0	0	0	0	0.00E+00	0.00E+00
03	0	0	0	0	0	0.00E+00	0.00E+00
04	0	0	0	0	0	0.00E+00	0.00E+00
05	0	0	0	0	0	0.00E+00	0.00E+00
06	0	0	0	0	0	0.00E+00	0.00E+00
07	0	0	0	0	0	0.00E+00	0.00E+00
08	1	1	416	833	833	1.16E-01	4.63E-01
09	1	1	416	833	833	1.16E-01	4.63E-01
10	1	1	416	833	833	1.16E-01	4.63E-01
11	1	1	416	833	833	1.16E-01	4.63E-01
12	1	1	416	833	833	1.16E-01	4.63E-01
13	1	1	416	833	833	1.16E-01	4.63E-01
14	1	1	416	833	833	1.16E-01	4.63E-01
15	1	1	416	833	833	1.16E-01	4.63E-01
16	1	1	416	833	833	1.16E-01	4.63E-01
17	1	1	416	833	833	1.16E-01	4.63E-01
18	1	1	416	833	833	1.16E-01	4.63E-01
19	1	1	416	833	833	1.16E-01	4.63E-01
20	0	0	0	0	0	0.00E+00	0.00E+00
21	0	0	0	0	0	0.00E+00	0.00E+00
22	0	0	0	0	0	0.00E+00	0.00E+00
23	0	0	0	0	0	0.00E+00	0.00E+00
24	0	0	0	0	0	0.00E+00	0.00E+00
Daily Emission (g)			4,993	9,992	9,992		
Total Daily Emission (g)			24,977				

Note:

[1] Total Emission = Main Engine Emission + Auxiliary Engine Emission

Emission = Engine Power (kW) x Loading Factor x Time-in-mode (hr) X Emission Factor (g/kWh)

[2] Emission during Hotelling = Emission of hotelling during arrival and departure

Emission during Navigation = Emission of maneuvering during arrival and departure

Daily RSP emission (Weekdays only)

Hour	Number of Trip		Total Emission (g) [1]			Emission Rate (g/s)	
			Hotelling	Arrival	Departure	Hotelling[2]	Navigation[2]
	Arrival	Departure		Maneuvering	Maneuvering		
01	0	0	0.0	0.0	0.0	0.00E+00	0.00E+00
02	0	0	0.0	0.0	0.0	0.00E+00	0.00E+00
03	0	0	0.0	0.0	0.0	0.00E+00	0.00E+00
04	0	0	0.0	0.0	0.0	0.00E+00	0.00E+00
05	0	0	0.0	0.0	0.0	0.00E+00	0.00E+00
06	0	0	0.0	0.0	0.0	0.00E+00	0.00E+00
07	0	0	0.0	0.0	0.0	0.00E+00	0.00E+00
08	1	1	16.6	44.3	44.3	4.62E-03	2.46E-02
09	1	1	16.6	44.3	44.3	4.62E-03	2.46E-02
10	1	1	16.6	44.3	44.3	4.62E-03	2.46E-02
11	1	1	16.6	44.3	44.3	4.62E-03	2.46E-02
12	1	1	16.6	44.3	44.3	4.62E-03	2.46E-02
13	1	1	16.6	44.3	44.3	4.62E-03	2.46E-02
14	1	1	16.6	44.3	44.3	4.62E-03	2.46E-02
15	1	1	16.6	44.3	44.3	4.62E-03	2.46E-02
16	1	1	16.6	44.3	44.3	4.62E-03	2.46E-02
17	1	1	16.6	44.3	44.3	4.62E-03	2.46E-02
18	1	1	16.6	44.3	44.3	4.62E-03	2.46E-02
19	1	1	16.6	44.3	44.3	4.62E-03	2.46E-02
20	0	0	0.0	0.0	0.0	0.00E+00	0.00E+00
21	0	0	0.0	0.0	0.0	0.00E+00	0.00E+00
22	0	0	0.0	0.0	0.0	0.00E+00	0.00E+00
23	0	0	0.0	0.0	0.0	0.00E+00	0.00E+00
24	0	0	0.0	0.0	0.0	0.00E+00	0.00E+00
Daily Emission (g)			199.7	531.9	531.9		
Total Daily Emission (g)			1,263.6				

Note:

1] Total Emission = Main Engine Emission + Auxiliary Engine Emission

Emission = Engine Power (kW) x Loading Factor x Time-in-mode (hr) X Emission Factor (g/kWh)

2] Emission during Hotelling = Emission of hotelling during arrival and departure

Emission during Navigation = Emission of maneuvering during arrival and departure

Daily FSP emission (Weekdays only)

Hour	Number of Trip		Total Emission (g) [1]			Emission Rate (g/s)	
	Arrival	Departure	Hotelling	Arrival Maneuvering	Departure Maneuvering	Hotelling[2]	Navigation[2]
01	0	0	0.0	0.0	0.0	0.00E+00	0.00E+00
02	0	0	0.0	0.0	0.0	0.00E+00	0.00E+00
03	0	0	0.0	0.0	0.0	0.00E+00	0.00E+00
04	0	0	0.0	0.0	0.0	0.00E+00	0.00E+00
05	0	0	0.0	0.0	0.0	0.00E+00	0.00E+00
06	0	0	0.0	0.0	0.0	0.00E+00	0.00E+00
07	0	0	0.0	0.0	0.0	0.00E+00	0.00E+00
08	1	1	16.1	43.0	43.0	4.48E-03	2.39E-02
09	1	1	16.1	43.0	43.0	4.48E-03	2.39E-02
10	1	1	16.1	43.0	43.0	4.48E-03	2.39E-02
11	1	1	16.1	43.0	43.0	4.48E-03	2.39E-02
12	1	1	16.1	43.0	43.0	4.48E-03	2.39E-02
13	1	1	16.1	43.0	43.0	4.48E-03	2.39E-02
14	1	1	16.1	43.0	43.0	4.48E-03	2.39E-02
15	1	1	16.1	43.0	43.0	4.48E-03	2.39E-02
16	1	1	16.1	43.0	43.0	4.48E-03	2.39E-02
17	1	1	16.1	43.0	43.0	4.48E-03	2.39E-02
18	1	1	16.1	43.0	43.0	4.48E-03	2.39E-02
19	1	1	16.1	43.0	43.0	4.48E-03	2.39E-02
20	0	0	0.0	0.0	0.0	0.00E+00	0.00E+00
21	0	0	0.0	0.0	0.0	0.00E+00	0.00E+00
22	0	0	0.0	0.0	0.0	0.00E+00	0.00E+00
23	0	0	0.0	0.0	0.0	0.00E+00	0.00E+00
24	0	0	0.0	0.0	0.0	0.00E+00	0.00E+00
Daily Emission (g)			193.7	516.0	516.0		
Total Daily Emission (g)			1,225.7				

Note:

[1] Total Emission = Main Engine Emission + Auxiliary Engine Emission

Emission = Engine Power (kW) x Loading Factor x Time-in-mode (hr) X Emission Factor (g/kWh)

[2] Emission during Hotelling = Emission of hotelling during arrival and departure

Emission during Navigation = Emission of maneuvering during arrival and departure

Daily SO_2 emission (Weekdays only)

Hour	Number of Trip		Total Emission (g) [1]			Emission Rate (g/s)	
			Hotelling	Arrival	Departure	Hotelling[2]	Navigation[2]
	Arrival	Departure		Maneuvering	Maneuvering		
01	0	0	0.0	0.0	0.0	0.00E+00	0.00E+00
02	0	0	0.0	0.0	0.0	0.00E+00	0.00E+00
03	0	0	0.0	0.0	0.0	0.00E+00	0.00E+00
04	0	0	0.0	0.0	0.0	0.00E+00	0.00E+00
05	0	0	0.0	0.0	0.0	0.00E+00	0.00E+00
06	0	0	0.0	0.0	0.0	0.00E+00	0.00E+00
07	0	0	0.0	0.0	0.0	0.00E+00	0.00E+00
08	1	1	8.7	13.5	13.5	2.41E-03	7.51E-03
09	1	1	8.7	13.5	13.5	2.41E-03	7.51E-03
10	1	1	8.7	13.5	13.5	2.41E-03	7.51E-03
11	1	1	8.7	13.5	13.5	2.41E-03	7.51E-03
12	1	1	8.7	13.5	13.5	2.41E-03	7.51E-03
13	1	1	8.7	13.5	13.5	2.41E-03	7.51E-03
14	1	1	8.7	13.5	13.5	2.41E-03	7.51E-03
15	1	1	8.7	13.5	13.5	2.41E-03	7.51E-03
16	1	1	8.7	13.5	13.5	2.41E-03	7.51E-03
17	1	1	8.7	13.5	13.5	2.41E-03	7.51E-03
18	1	1	8.7	13.5	13.5	2.41E-03	7.51E-03
19	1	1	8.7	13.5	13.5	2.41E-03	7.51E-03
20	0	0	0.0	0.0	0.0	0.00E+00	0.00E+00
21	0	0	0.0	0.0	0.0	0.00E+00	0.00E+00
22	0	0	0.0	0.0	0.0	0.00E+00	0.00E+00
23	0	0	0.0	0.0	0.0	0.00E+00	0.00E+00
24	0	0	0.0	0.0	0.0	0.00E+00	0.00E+00
Daily Emission (g)			104	162	162		
Total Daily Emission (g)			428				

Note:

[1] Total Emission = Main Engine Emission + Auxiliary Engine Emission

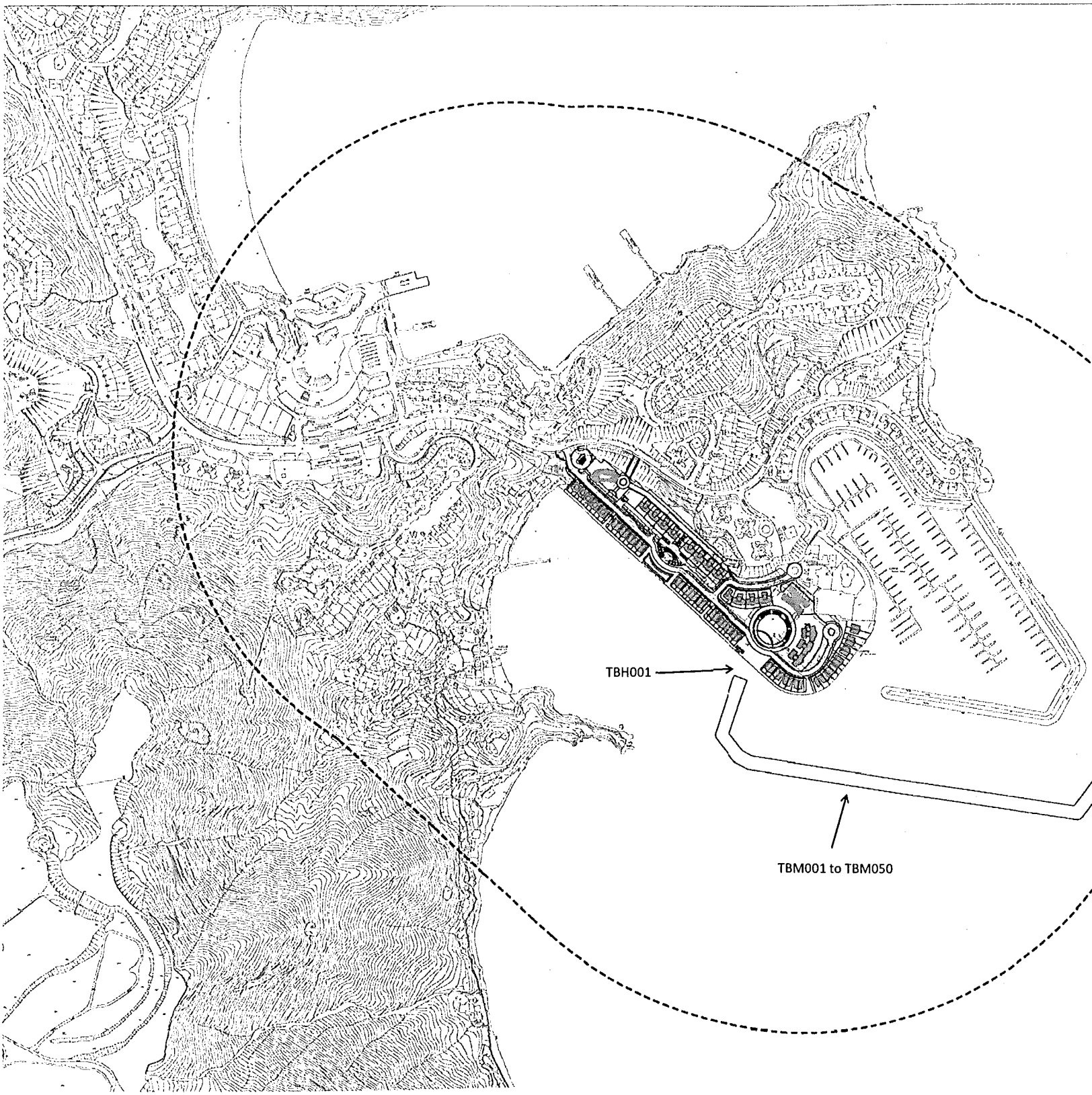
Emission = Engine Power (kW) x Loading Factor x Time-in-mode (hr) X Emission Factor (g/kWh)

[2] Emission during Hotelling = Emission of hotelling during arrival and departure

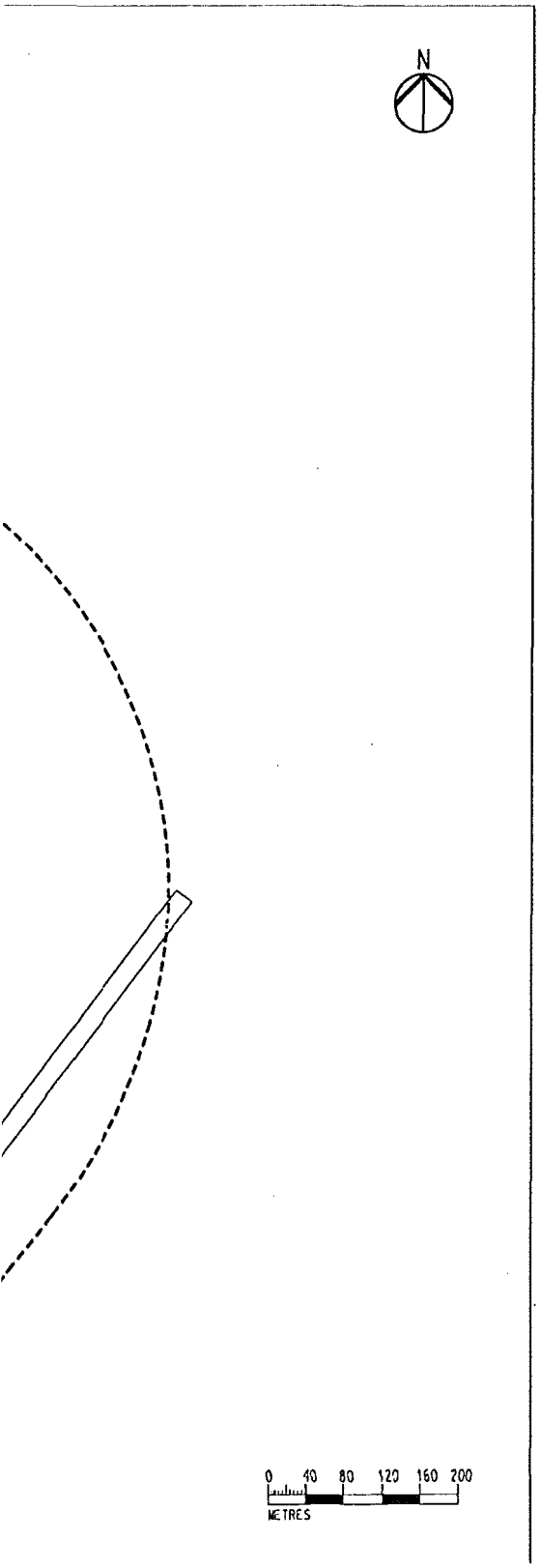
Emission during Navigation = Emission of maneuvering during arrival and departure

Name	Source ID	Source Type	X	Y	Stack Height / Release Height (m)[3]	Exit Temperature (K)[3]	Exit Velocity (m/s)[3]	Diameter (m)[3]	Emission Rate (g/s) during daytime of weekdays (Hour 8 - Hour 19)[1][2]			
									NO_x	RSP	FSP	SO_2
Hotelling	TBH001	Point	820389	816980	11	588	8	0.2	1.16E-01	4.62E-03	4.48E-03	2.41E-03
Navigation	TBM001	Point	820382	816961	11	588	8	0.2	9.25E-03	4.93E-04	4.78E-04	1.50E-04
	TBM002	Point	820376	816942	11	588	8	0.2	9.25E-03	4.93E-04	4.78E-04	1.50E-04
	TBM003	Point	820370	816923	11	588	8	0.2	9.25E-03	4.93E-04	4.78E-04	1.50E-04
	TBM004	Point	820364	816904	11	588	8	0.2	9.25E-03	4.93E-04	4.78E-04	1.50E-04
	TBM005	Point	820357	816885	11	588	8	0.2	9.25E-03	4.93E-04	4.78E-04	1.50E-04
	TBM006	Point	820370	816870	11	588	8	0.2	9.25E-03	4.93E-04	4.78E-04	1.50E-04
	TBM007	Point	820382	816854	11	588	8	0.2	9.25E-03	4.93E-04	4.78E-04	1.50E-04
	TBM008	Point	820400	816844	11	588	8	0.2	9.25E-03	4.93E-04	4.78E-04	1.50E-04
	TBM009	Point	820419	816841	11	588	8	0.2	9.25E-03	4.93E-04	4.78E-04	1.50E-04
	TBM010	Point	820439	816838	11	588	8	0.2	9.25E-03	4.93E-04	4.78E-04	1.50E-04
	TBM011	Point	820459	816835	11	588	8	0.2	9.25E-03	4.93E-04	4.78E-04	1.50E-04
	TBM012	Point	820479	816832	11	588	8	0.2	9.25E-03	4.93E-04	4.78E-04	1.50E-04
	TBM013	Point	820498	816830	11	588	8	0.2	9.25E-03	4.93E-04	4.78E-04	1.50E-04
	TBM014	Point	820518	816827	11	588	8	0.2	9.25E-03	4.93E-04	4.78E-04	1.50E-04
	TBM015	Point	820538	816824	11	588	8	0.2	9.25E-03	4.93E-04	4.78E-04	1.50E-04
	TBM016	Point	820558	816821	11	588	8	0.2	9.25E-03	4.93E-04	4.78E-04	1.50E-04
	TBM017	Point	820578	816818	11	588	8	0.2	9.25E-03	4.93E-04	4.78E-04	1.50E-04
	TBM018	Point	820597	816815	11	588	8	0.2	9.25E-03	4.93E-04	4.78E-04	1.50E-04
	TBM019	Point	820617	816812	11	588	8	0.2	9.25E-03	4.93E-04	4.78E-04	1.50E-04
	TBM020	Point	820637	816809	11	588	8	0.2	9.25E-03	4.93E-04	4.78E-04	1.50E-04
	TBM021	Point	820657	816806	11	588	8	0.2	9.25E-03	4.93E-04	4.78E-04	1.50E-04
	TBM022	Point	820676	816803	11	588	8	0.2	9.25E-03	4.93E-04	4.78E-04	1.50E-04
	TBM023	Point	820696	816800	11	588	8	0.2	9.25E-03	4.93E-04	4.78E-04	1.50E-04
	TBM024	Point	820716	816797	11	588	8	0.2	9.25E-03	4.93E-04	4.78E-04	1.50E-04
	TBM025	Point	820736	816794	11	588	8	0.2	9.25E-03	4.93E-04	4.78E-04	1.50E-04
	TBM026	Point	820756	816791	11	588	8	0.2	9.25E-03	4.93E-04	4.78E-04	1.50E-04
	TBM027	Point	820775	816788	11	588	8	0.2	9.25E-03	4.93E-04	4.78E-04	1.50E-04
	TBM028	Point	820795	816785	11	588	8	0.2	9.25E-03	4.93E-04	4.78E-04	1.50E-04
	TBM029	Point	820815	816782	11	588	8	0.2	9.25E-03	4.93E-04	4.78E-04	1.50E-04
	TBM030	Point	820835	816779	11	588	8	0.2	9.25E-03	4.93E-04	4.78E-04	1.50E-04
	TBM031	Point	820855	816776	11	588	8	0.2	9.25E-03	4.93E-04	4.78E-04	1.50E-04
	TBM032	Point	820874	816773	11	588	8	0.2	9.25E-03	4.93E-04	4.78E-04	1.50E-04
	TBM033	Point	820894	816770	11	588	8	0.2	9.25E-03	4.93E-04	4.78E-04	1.50E-04
	TBM034	Point	820906	816786	11	588	8	0.2	9.25E-03	4.93E-04	4.78E-04	1.50E-04
	TBM035	Point	820918	816802	11	588	8	0.2	9.25E-03	4.93E-04	4.78E-04	1.50E-04
	TBM036	Point	820930	816818	11	588	8	0.2	9.25E-03	4.93E-04	4.78E-04	1.50E-04
	TBM037	Point	820942	816834	11	588	8	0.2	9.25E-03	4.93E-04	4.78E-04	1.50E-04
	TBM038	Point	820954	816850	11	588	8	0.2	9.25E-03	4.93E-04	4.78E-04	1.50E-04
	TBM039	Point	820966	816866	11	588	8	0.2	9.25E-03	4.93E-04	4.78E-04	1.50E-04
	TBM040	Point	820978	816882	11	588	8	0.2	9.25E-03	4.93E-04	4.78E-04	1.50E-04
	TBM041	Point	820990	816898	11	588	8	0.2	9.25E-03	4.93E-04	4.78E-04	1.50E-04
	TBM042	Point	821002	816914	11	588	8	0.2	9.25E-03	4.93E-04	4.78E-04	1.50E-04
	TBM043	Point	821014	816930	11	588	8	0.2	9.25E-03	4.93E-04	4.78E-04	1.50E-04
	TBM044	Point	821026	816946	11	588	8	0.2	9.25E-03	4.93E-04	4.78E-04	1.50E-04
	TBM045	Point	821038	816962	11	588	8	0.2	9.25E-03	4.93E-04	4.78E-04	1.50E-04
	TBM046	Point	821050	816978	11	588	8	0.2	9.25E-03	4.93E-04	4.78E-04	1.50E-04
	TBM047	Point	821062	816994	11	588	8	0.2	9.25E-03	4.93E-04	4.78E-04	1.50E-04
	TBM048	Point	821074	817010	11	588	8	0.2	9.25E-03	4.93E-04	4.78E-04	1.50E-04
	TBM049	Point	821086	817026	11	588	8	0.2	9.25E-03	4.93E-04	4.78E-04	1.50E-04
	TBM050	Point	821098	817042	11	588	8	0.2	9.25E-03	4.93E-04	4.78E-04	1.50E-04

Note:
[1] The value shown in the summary is the emission rate during daytime (07:00-19:00). For night-time (19:00-07:00), there is no emission from vessel and the emission rate is 0 g/s.
[2] The emission rate adopted for navigation = (Hourly emission rate of navigation (arrival) + Hourly emission rate of navigation (departure))/Number of Navigation Sources (i.e. 50 sources for this route)
[3] No information from the operator is available. Information of exit temperature, exit velocity and diameter are based on information from approved EIA study "Organic Waste Treatment Facilities, Phase I" (AEIAR-149/2010). The stack height is observed from site survey.



Note: As a conservative approach, the navigation route outside 500m assessment area is included in the near-field model.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Appendix A4.2-2

Calculation of Fireworks Displays Emissions

According to Section 3.5.30 of approved EIA Study "*Construction of an International Theme Park in Penny's Bay of North Lantau together with its Essential Associated Infrastructures – Environmental Impact Assessment* " (AEIAR-032/2000) , it is assumed that 2.6 kg and 14.7 kg RSP will be emitted for one low-level show and one mid-level show respectively.
As all the shows are modeled at the same hour as a worst case scenario, the adopted RSP emission rates:

RSP emission rate for low-level show (per show)	=	2.6	kg/hr
		7.22E-01	g/s
RSP emission rate for mid-level show (per show)	=	14.7	kg/hr
		4.08E+00	g/s

As there is no FSP emission rate available from the approved EIA study, RSP emission rates are adopted as FSP emission as a worst case scenario. Therefore, the FSP emission rates:

FSP emission rate for low-level show (per show)	=	7.22E-01	g/s
FSP emission rate for mid-level show (per show)	=	4.08E+00	g/s

Model Input Parameters for Fireworks Works Displays

Source	Source ID	Type	X	Y	Release Height [1]	Lateral Dim. (Sy)	Vertical Dim. (Sz)	Hourly RSP/FSP Emission Rate (g/s)[2]	
			(m)	(m)	(m)	(m)	(m)	Hour 21	Other Hours
Low-level show 1	LL01	Volume	822274	819292	120	4.65	4.65	7.22E-01	0.00E+00
Low-level show 2	LL02	Volume	822274	819292	120	4.65	4.65	7.22E-01	0.00E+00
Low-level show 3	LL03	Volume	822274	819292	120	4.65	4.65	7.22E-01	0.00E+00
Mid-level show 1	ML01	Volume	822274	819292	150	6.98	6.98	4.08E+00	0.00E+00
Mid-level show 2	ML02	Volume	822274	819292	150	6.98	6.98	4.08E+00	0.00E+00

Note:

[1] The release heights are observed by site survey.

[2] The fireworks displays shows are started at 20:00 (Hour 21) and last for about 15 minutes based on site survey. Therefore, there is no emission during all hours except Hour 21.

Appendix 4.3

Results Summary

Result Summary of Cumulative NO_2 Concentration for all ASRs at Various Heights above Ground

Area	ASR	19th highest 1-hour NO_2 Concentration ($\mu g/m^3$) (AQO = 200 $\mu g/m^3$)										Annual NO_2 Concentration ($\mu g/m^3$) (AQO = 40 $\mu g/m^3$)									
		1.5m	5m	10m	20m	30m	40m	50m	60m	70m	80m	1.5m	5m	10m	20m	30m	40m	50m	60m	70m	80m
Area 10b	A10b-01	127	127	128	129	129	130	129	127	127	127	30	30	29	29	29	29	29	29	29	29
	A10b-02	127	127	128	129	129	130	130	128	127	127	30	30	30	29	29	29	29	29	29	29
	A10b-03	127	127	128	129	129	131	130	129	127	127	30	30	30	29	29	29	29	29	29	29
	A10b-04	127	128	128	129	129	132	130	129	127	127	30	30	30	29	29	29	29	29	29	29
	A10b-05	128	128	128	129	130	131	130	129	127	127	30	30	30	30	29	29	29	29	29	29
	A10b-06	128	128	129	129	129	130	130	129	127	127	31	31	31	30	29	29	29	29	29	29
	A10b-07	128	128	129	129	129	130	129	129	127	127	31	32	32	30	29	29	29	29	29	29
	A10b-08	129	147	143	129	129	129	129	129	127	127	35	39	36	30	29	29	29	29	29	29
	A10b-09	129	129	134	132	129	129	129	129	127	127	31	31	31	30	29	29	29	29	29	29
	A10b-10	128	134	136	130	129	129	129	129	128	127	31	31	31	30	29	29	29	29	29	29
	A10b-11	129	129	130	130	130	129	129	129	128	127	31	31	31	30	29	29	29	29	29	29
	A10b-12	128	128	129	129	129	129	129	129	128	127	30	30	30	30	29	29	29	29	29	29
	A10b-13	128	128	128	129	129	129	129	129	128	127	30	30	30	30	29	29	29	29	29	29
	A10b-14	129	129	129	130	129	129	129	129	128	127	30	30	30	30	29	29	29	29	29	29
	A10b-15	128	128	129	129	129	129	129	129	128	127	30	30	30	30	29	29	29	29	29	29
	A10b-16	129	129	130	130	129	129	129	129	128	127	32	32	31	30	29	29	29	29	29	29
	A10b-17	128	128	128	129	129	129	129	129	128	127	32	32	32	30	30	29	29	29	29	29
	A10b-18	129	129	129	129	130	130	129	129	128	127	31	31	31	30	30	29	29	29	29	29
	A10b-19	129	129	129	129	131	131	129	129	128	127	30	30	30	30	30	29	29	29	29	29
	A10b-20	129	129	129	130	133	133	129	129	128	127	30	30	30	30	30	29	29	29	29	29
	A10b-21	128	129	129	130	132	134	131	129	128	127	30	30	30	30	30	29	29	29	29	29

Note: [1] The Annual NO2 background of Area 10b (Grid 18_26) = 28.5 $\mu g/m^3$

Result Summary of Cumulative RSP Concentration for all ASRs at Various Heights above Ground

Area	ASR	10^{th} highest 24-hour RSP Concentration ($\mu g/m^3$) (AQO = 100 $\mu g/m^3$)										Annual RSP Concentration ($\mu g/m^3$) (AQO = 50 $\mu g/m^3$)									
		1.5m	5m	10m	20m	30m	40m	50m	60m	70m	80m	1.5m	5m	10m	20m	30m	40m	50m	60m	70m	80m
Area 10b	A10b-01	75	75	75	75	75	75	75	75	75	75	40	40	40	40	40	40	40	40	40	40
	A10b-02	75	75	75	75	75	75	75	75	75	75	40	40	40	40	40	40	40	40	40	40
	A10b-03	75	75	75	75	75	75	75	75	75	75	40	40	40	40	40	40	40	40	40	40
	A10b-04	75	75	75	75	75	75	75	75	75	75	40	40	40	40	40	40	40	40	40	40
	A10b-05	75	75	75	75	75	75	75	75	75	75	40	40	40	40	40	40	40	40	40	40
	A10b-06	75	75	75	75	75	75	75	75	75	75	40	40	40	40	40	40	40	40	40	40
	A10b-07	75	75	75	75	75	75	75	75	75	75	40	40	40	40	40	40	40	40	40	40
	A10b-08	75	76	76	75	75	75	75	75	75	75	40	40	40	40	40	40	40	40	40	40
	A10b-09	75	75	75	75	75	75	75	75	75	75	40	40	40	40	40	40	40	40	40	40
	A10b-10	75	76	76	75	75	75	75	75	75	75	40	40	40	40	40	40	40	40	40	40
	A10b-11	75	76	76	75	75	75	75	75	75	75	40	40	40	40	40	40	40	40	40	40
	A10b-12	75	75	75	75	75	75	75	75	75	75	40	40	40	40	40	40	40	40	40	40
	A10b-13	75	75	75	75	75	75	75	75	75	75	40	40	40	40	40	40	40	40	40	40
	A10b-14	75	75	75	75	75	75	75	75	75	75	40	40	40	40	40	40	40	40	40	40
	A10b-15	75	75	75	75	75	75	75	75	75	75	40	40	40	40	40	40	40	40	40	40
	A10b-16	75	75	75	75	75	75	75	75	75	75	40	40	40	40	40	40	40	40	40	40
	A10b-17	75	75	75	75	75	75	75	75	75	75	40	40	40	40	40	40	40	40	40	40
	A10b-18	75	75	75	75	75	75	75	75	75	75	40	40	40	40	40	40	40	40	40	40
	A10b-19	75	75	75	75	75	75	75	75	75	75	40	40	40	40	40	40	40	40	40	40
	A10b-20	75	75	75	75	75	75	75	75	75	75	40	40	40	40	40	40	40	40	40	40
	A10b-21	75	75	75	75	75	75	75	75	75	75	40	40	40	40	40	40	40	40	40	40

Note: [1] The Annual RSP background of Area 10b (Grid 18_26) = 39.9 $\mu g/m^3$

Result Summary of Cumulative FSP Concentration for all ASRs at Various Heights above Ground

Area	ASR	10th highest 24-hour FSP Concentration (µg/m³) (AQO = 75 µg/m³)										Annual FSP Concentration (µg/m³) (AQO = 35 µg/m³)									
		1.5m	5m	10m	20m	30m	40m	50m	60m	70m	80m	1.5m	5m	10m	20m	30m	40m	50m	60m	70m	80m
Area 10b	A10b-01	56	56	56	56	56	56	56	56	56	56	28	28	28	28	28	28	28	28	28	28
	A10b-02	56	56	56	56	56	56	56	56	56	56	28	28	28	28	28	28	28	28	28	28
	A10b-03	56	56	56	56	56	56	56	56	56	56	28	28	28	28	28	28	28	28	28	28
	A10b-04	56	56	56	56	56	56	56	56	56	56	28	28	28	28	28	28	28	28	28	28
	A10b-05	56	56	56	56	56	56	56	56	56	56	28	28	28	28	28	28	28	28	28	28
	A10b-06	56	56	56	56	56	56	56	56	56	56	28	28	28	28	28	28	28	28	28	28
	A10b-07	56	56	56	56	56	56	56	56	56	56	28	28	28	28	28	28	28	28	28	28
	A10b-08	56	57	57	56	56	56	56	56	56	56	29	29	29	28	28	28	28	28	28	28
	A10b-09	56	56	57	57	56	56	56	56	56	56	28	28	28	28	28	28	28	28	28	28
	A10b-10	57	57	57	56	56	56	56	56	56	56	28	28	28	28	28	28	28	28	28	28
	A10b-11	57	57	57	56	56	56	56	56	56	56	28	28	28	28	28	28	28	28	28	28
	A10b-12	56	56	56	56	56	56	56	56	56	56	28	28	28	28	28	28	28	28	28	28
	A10b-13	56	56	56	56	56	56	56	56	56	56	28	28	28	28	28	28	28	28	28	28
	A10b-14	56	56	56	56	56	56	56	56	56	56	28	28	28	28	28	28	28	28	28	28
	A10b-15	56	56	56	56	56	56	56	56	56	56	28	28	28	28	28	28	28	28	28	28
	A10b-16	56	56	56	56	56	56	56	56	56	56	28	28	28	28	28	28	28	28	28	28
	A10b-17	56	56	56	56	56	56	56	56	56	56	28	28	28	28	28	28	28	28	28	28
	A10b-18	56	56	56	56	56	56	56	56	56	56	28	28	28	28	28	28	28	28	28	28
	A10b-19	56	56	56	56	56	56	56	56	56	56	28	28	28	28	28	28	28	28	28	28
	A10b-20	56	56	56	56	56	56	56	56	56	56	28	28	28	28	28	28	28	28	28	28
	A10b-21	56	56	56	56	56	56	56	56	56	56	28	28	28	28	28	28	28	28	28	28

Note: [1] The Annual FSP background of Area 10b (Grid 18_26) = 28.3 µg/m³

Result Summary of Cumulative SO_2 Concentration for all ASRs at Various Heights above Ground

Area	ASR	Max 10-minute SO_2 Concentration ($\mu g/m^3$) (AQO = 500 $\mu g/m^3$)										4th highest 24-hour SO_2 Concentration ($\mu g/m^3$) (AQO = 125 $\mu g/m^3$)									
		1.5m	5m	10m	20m	30m	40m	50m	60m	70m	80m	1.5m	5m	10m	20m	30m	40m	50m	60m	70m	80m
Area 10b	A10b-01	138	138	138	138	138	138	138	138	138	138	30	30	30	30	30	30	30	30	30	30
	A10b-02	138	138	138	138	138	138	138	138	138	138	30	30	30	30	30	30	30	30	30	30
	A10b-03	138	138	138	138	138	138	138	138	138	138	30	30	30	30	30	30	30	30	30	30
	A10b-04	138	138	138	138	138	139	138	138	138	138	30	30	30	30	30	30	30	30	30	30
	A10b-05	138	138	138	138	139	139	139	138	138	138	30	30	30	30	30	30	30	30	30	30
	A10b-06	138	138	138	138	139	139	139	138	138	138	30	30	30	30	30	30	30	30	30	30
	A10b-07	138	138	138	138	139	139	139	138	138	138	30	30	30	30	30	30	30	30	30	30
	A10b-08	138	138	138	138	138	139	138	138	138	138	30	30	30	30	30	30	30	30	30	30
	A10b-09	138	138	138	138	138	139	138	138	138	138	30	30	30	30	30	30	30	30	30	30
	A10b-10	138	138	138	138	138	139	138	138	138	138	30	30	30	30	30	30	30	30	30	30
	A10b-11	138	138	138	138	138	138	138	138	138	138	30	30	30	30	30	30	30	30	30	30
	A10b-12	138	138	138	138	138	138	138	138	138	138	30	30	30	30	30	30	30	30	30	30
	A10b-13	138	138	138	138	138	138	138	138	138	138	30	30	30	30	30	30	30	30	30	30
	A10b-14	138	138	138	138	138	138	138	138	138	138	30	30	30	30	30	30	30	30	30	30
	A10b-15	138	138	138	138	138	138	138	138	138	138	30	30	30	30	30	30	30	30	30	30
	A10b-16	138	138	138	138	138	138	138	138	138	138	30	30	30	30	30	30	30	30	30	30
	A10b-17	138	138	138	138	138	138	138	138	138	138	30	30	30	30	30	30	30	30	30	30
	A10b-18	138	138	138	138	139	139	138	138	138	138	30	30	30	30	30	30	30	30	30	30
	A10b-19	138	138	138	138	139	139	139	138	138	138	30	30	30	30	30	30	30	30	30	30
	A10b-20	138	138	138	138	139	139	139	138	138	138	30	30	30	30	30	30	30	30	30	30
	A10b-21	138	138	138	138	139	139	139	138	138	138	30	30	30	30	30	30	30	30	30	30

Result Summary of Aluminum Concentration for all ASRs at Various Heights above Ground

Area	ASR	Max 1-hour Aluminum Concentration (μg/m³) (No Criteria)										Max 8-hour Aluminum Concentration (μg/m³) (No Criteria)										Annual Aluminum Concentration (μg/m³) (Criteria = 100 μg/m³)									
		1.5m	5m	10m	20m	30m	40m	50m	60m	70m	80m	1.5m	5m	10m	20m	30m	40m	50m	60m	70m	80m	1.5m	5m	10m	20m	30m	40m	50m	60m	70m	80m
Area 10b	A10b-01	0.213	0.214	0.218	0.233	0.261	0.305	0.369	0.456	0.567	0.734	0.192	0.192	0.193	0.194	0.198	0.203	0.211	0.222	0.236	0.257	0.189	0.189	0.189	0.189	0.189	0.189	0.189	0.189	0.189	0.189
	A10b-02	0.213	0.214	0.217	0.232	0.259	0.302	0.365	0.450	0.559	0.689	0.192	0.192	0.193	0.194	0.198	0.203	0.211	0.222	0.235	0.251	0.189	0.189	0.189	0.189	0.189	0.189	0.189	0.189	0.189	0.189
	A10b-03	0.210	0.210	0.213	0.226	0.250	0.288	0.342	0.417	0.512	0.626	0.192	0.192	0.192	0.194	0.197	0.201	0.208	0.217	0.229	0.244	0.189	0.189	0.189	0.189	0.189	0.189	0.189	0.189	0.189	0.189
	A10b-04	0.205	0.206	0.208	0.218	0.236	0.265	0.308	0.366	0.440	0.528	0.191	0.191	0.191	0.193	0.195	0.199	0.204	0.211	0.220	0.231	0.189	0.189	0.189	0.189	0.189	0.189	0.189	0.189	0.189	0.189
	A10b-05	0.216	0.216	0.217	0.219	0.230	0.254	0.291	0.340	0.403	0.479	0.192	0.192	0.192	0.193	0.194	0.197	0.202	0.208	0.216	0.225	0.189	0.189	0.189	0.189	0.189	0.189	0.189	0.189	0.189	0.189
	A10b-06	0.224	0.225	0.225	0.228	0.233	0.256	0.293	0.343	0.407	0.484	0.193	0.193	0.194	0.194	0.194	0.197	0.202	0.208	0.216	0.226	0.189	0.189	0.189	0.189	0.189	0.189	0.189	0.189	0.189	0.189
	A10b-07	0.231	0.231	0.232	0.235	0.240	0.253	0.288	0.336	0.397	0.470	0.194	0.194	0.194	0.195	0.195	0.197	0.201	0.207	0.215	0.224	0.189	0.189	0.189	0.189	0.189	0.189	0.189	0.189	0.189	0.189
	A10b-08	0.239	0.239	0.240	0.244	0.251	0.259	0.272	0.313	0.364	0.426	0.195	0.195	0.195	0.196	0.197	0.198	0.199	0.204	0.211	0.219	0.189	0.189	0.189	0.189	0.189	0.189	0.189	0.189	0.189	0.189
	A10b-09	0.246	0.247	0.248	0.252	0.259	0.269	0.280	0.292	0.311	0.363	0.196	0.196	0.196	0.197	0.198	0.199	0.200	0.202	0.204	0.211	0.189	0.189	0.189	0.189	0.189	0.189	0.189	0.189	0.189	0.189
	A10b-10	0.248	0.249	0.250	0.254	0.262	0.272	0.283	0.295	0.313	0.417	0.196	0.196	0.197	0.197	0.198	0.199	0.201	0.202	0.204	0.218	0.189	0.189	0.189	0.189	0.189	0.189	0.189	0.189	0.189	0.189
	A10b-11	0.247	0.248	0.249	0.254	0.261	0.271	0.282	0.295	0.320	0.427	0.196	0.196	0.196	0.197	0.198	0.199	0.201	0.202	0.205	0.219	0.189	0.189	0.189	0.189	0.189	0.189	0.189	0.189	0.189	0.189
	A10b-12	0.246	0.247	0.248	0.253	0.260	0.270	0.282	0.295	0.331	0.425	0.196	0.196	0.196	0.197	0.198	0.199	0.201	0.202	0.207	0.219	0.189	0.189	0.189	0.189	0.189	0.189	0.189	0.189	0.189	0.189
	A10b-13	0.246	0.247	0.248	0.253	0.261	0.272	0.284	0.298	0.322	0.428	0.196	0.196	0.196	0.197	0.198	0.199	0.201	0.203	0.206	0.219	0.189	0.189	0.189	0.189	0.189	0.189	0.189	0.189	0.189	0.189
	A10b-14	0.246	0.247	0.248	0.253	0.261	0.271	0.284	0.297	0.311	0.387	0.196	0.196	0.196	0.197	0.198	0.199	0.201	0.203	0.204	0.214	0.189	0.189	0.189	0.189	0.189	0.189	0.189	0.189	0.189	0.189
	A10b-15	0.244	0.245	0.246	0.251	0.259	0.269	0.281	0.295	0.318	0.366	0.196	0.196	0.196	0.197	0.198	0.199	0.201	0.202	0.205	0.211	0.189	0.189	0.189	0.189	0.189	0.189	0.189	0.189	0.189	0.189
	A10b-16	0.236	0.236	0.237	0.241	0.248	0.256	0.277	0.321	0.378	0.447	0.195	0.195	0.195	0.196	0.196	0.197	0.200	0.206	0.213	0.221	0.189	0.189	0.189	0.189	0.189	0.189	0.189	0.189	0.189	0.189
	A10b-17	0.228	0.228	0.229	0.232	0.237	0.253	0.290	0.340	0.404	0.481	0.194	0.194	0.194	0.194	0.195	0.197	0.202	0.208	0.216	0.226	0.189	0.189	0.189	0.189	0.189	0.189	0.189	0.189	0.189	0.189
	A10b-18	0.220	0.220	0.221	0.229	0.252	0.288	0.337	0.401	0.479	0.566	0.193	0.193	0.193	0.194	0.197	0.201	0.208	0.216	0.225	0.236	0.189	0.189	0.189	0.189	0.189	0.189	0.189	0.189	0.189	0.189
	A10b-19	0.211	0.212	0.215	0.228	0.250	0.284	0.331	0.393	0.468	0.553	0.192	0.192	0.192	0.194	0.197	0.201	0.207	0.215	0.224	0.234	0.189	0.189	0.189	0.189	0.189	0.189	0.189	0.189	0.189	0.189
	A10b-20	0.223	0.225	0.229	0.248	0.282	0.334	0.406	0.500	0.614	0.742	0.193	0.193	0.194	0.196	0.201	0.207	0.216	0.228	0.242	0.258	0.189	0.189	0.189	0.189	0.189	0.189	0.189	0.189	0.189	0.189
	A10b-21	0.224	0.226	0.230	0.251	0.287	0.344	0.423	0.528	0.657	0.875	0.193	0.194	0.194	0.197	0.201	0.208	0.218	0.231	0.248	0.275	0.189	0.189	0.189	0.189	0.189	0.189	0.189	0.189	0.189	0.189

esult Summary of Antimony Concentration for all ASRs at Various Heights above Ground

Area	ASR	Max 1-hour Antimony Concentration (µg/m³) (No Criteria)										Max 8-hour Antimony Concentration (µg/m³) (No Criteria)										Annual Antimony Concentration (µg/m³) (Criteria = 5 µg/m³)									
		1.5m	5m	10m	20m	30m	40m	50m	60m	70m	80m	1.5m	5m	10m	20m	30m	40m	50m	60m	70m	80m	1.5m	5m	10m	20m	30m	40m	50m	60m	70m	80m
	A10b-01	0.011	0.011	0.013	0.019	0.031	0.051	0.079	0.117	0.165	0.238	0.001	0.001	0.002	0.002	0.004	0.006	0.010	0.015	0.021	0.030	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	A10b-02	0.010	0.011	0.012	0.019	0.031	0.049	0.077	0.114	0.162	0.218	0.001	0.001	0.002	0.002	0.004	0.006	0.010	0.014	0.020	0.027	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	A10b-03	0.009	0.009	0.011	0.016	0.027	0.043	0.067	0.100	0.141	0.191	0.001	0.001	0.001	0.002	0.003	0.005	0.008	0.012	0.018	0.024	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	A10b-04	0.007	0.007	0.008	0.013	0.021	0.033	0.052	0.077	0.109	0.148	<0.001	<0.001	0.001	0.002	0.003	0.004	0.006	0.010	0.014	0.019	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	A10b-05	0.012	0.012	0.012	0.013	0.018	0.029	0.044	0.066	0.094	0.127	0.001	0.001	0.002	0.002	0.002	0.004	0.006	0.008	0.012	0.016	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	A10b-06	0.016	0.016	0.016	0.017	0.019	0.029	0.045	0.067	0.095	0.129	0.002	0.002	0.002	0.002	0.002	0.004	0.006	0.008	0.012	0.016	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	A10b-07	0.018	0.018	0.019	0.020	0.022	0.028	0.043	0.064	0.091	0.123	0.002	0.002	0.002	0.003	0.003	0.003	0.005	0.008	0.011	0.015	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	A10b-08	0.022	0.022	0.022	0.024	0.027	0.031	0.036	0.054	0.077	0.103	0.003	0.003	0.003	0.003	0.003	0.004	0.005	0.007	0.010	0.013	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	A10b-09	0.025	0.025	0.026	0.028	0.031	0.035	0.040	0.045	0.053	0.076	0.003	0.003	0.003	0.003	0.004	0.004	0.005	0.006	0.007	0.010	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	A10b-10	0.026	0.026	0.027	0.029	0.032	0.036	0.041	0.047	0.054	0.100	0.003	0.003	0.003	0.004	0.004	0.005	0.005	0.006	0.007	0.012	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Area 10b	A10b-11	0.026	0.026	0.026	0.028	0.031	0.036	0.041	0.046	0.057	0.104	0.003	0.003	0.003	0.004	0.004	0.004	0.005	0.006	0.007	0.013	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	A10b-12	0.025	0.025	0.026	0.028	0.031	0.036	0.041	0.046	0.062	0.103	0.003	0.003	0.003	0.003	0.004	0.004	0.005	0.006	0.008	0.013	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	A10b-13	0.025	0.025	0.026	0.028	0.031	0.036	0.042	0.048	0.058	0.105	0.003	0.003	0.003	0.003	0.004	0.005	0.005	0.006	0.007	0.013	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	A10b-14	0.025	0.025	0.026	0.028	0.031	0.036	0.041	0.047	0.053	0.087	0.003	0.003	0.003	0.003	0.004	0.004	0.005	0.006	0.007	0.011	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	A10b-15	0.024	0.024	0.025	0.027	0.030	0.035	0.040	0.046	0.057	0.077	0.003	0.003	0.003	0.003	0.004	0.004	0.005	0.006	0.007	0.010	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	A10b-16	0.020	0.021	0.021	0.023	0.026	0.029	0.038	0.058	0.083	0.113	0.003	0.003	0.003	0.003	0.003	0.004	0.005	0.007	0.010	0.014	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	A10b-17	0.017	0.017	0.017	0.019	0.021	0.028	0.044	0.066	0.094	0.128	0.002	0.002	0.002	0.002	0.003	0.004	0.006	0.008	0.012	0.016	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	A10b-18	0.014	0.014	0.014	0.018	0.028	0.043	0.065	0.093	0.127	0.165	0.002	0.002	0.002	0.002	0.003	0.005	0.008	0.012	0.016	0.021	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	A10b-19	0.010	0.010	0.011	0.017	0.027	0.041	0.062	0.089	0.122	0.159	0.001	0.001	0.001	0.002	0.003	0.005	0.008	0.011	0.015	0.020	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	A10b-20	0.015	0.016	0.018	0.026	0.041	0.063	0.095	0.136	0.186	0.242	0.002	0.002	0.002	0.003	0.005	0.008	0.012	0.017	0.023	0.030	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	A10b-21	0.015	0.016	0.018	0.027	0.043	0.068	0.102	0.148	0.205	0.300	0.002	0.002	0.002	0.003	0.005	0.008	0.013	0.019	0.026	0.037	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001

Result Summary of Barium Concentration for all ASRs at Various Heights above Ground

Area	ASR	Max 1-hour Barium Concentration (μg/m³) (No Criteria)										Max 8-hour Barium Concentration (μg/m³) (Criteria = 500 μg/m³)										Annual Barium Concentration (μg/m³) (Criteria = 5 μg/m³)									
		1.5m	5m	10m	20m	30m	40m	50m	60m	70m	80m	1.5m	5m	10m	20m	30m	40m	50m	60m	70m	80m	1.5m	5m	10m	20m	30m	40m	50m	60m	70m	80m
Area 10b	A10b-01	0.039	0.040	0.044	0.060	0.089	0.135	0.202	0.293	0.409	0.583	0.017	0.017	0.018	0.020	0.023	0.029	0.037	0.049	0.063	0.085	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014
	A10b-02	0.039	0.040	0.043	0.059	0.087	0.132	0.198	0.287	0.400	0.536	0.017	0.017	0.018	0.020	0.023	0.029	0.037	0.048	0.062	0.079	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014
	A10b-03	0.035	0.036	0.040	0.053	0.078	0.117	0.174	0.252	0.351	0.470	0.017	0.017	0.017	0.019	0.022	0.027	0.034	0.044	0.056	0.071	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014
	A10b-04	0.031	0.031	0.034	0.044	0.063	0.094	0.138	0.199	0.276	0.368	0.016	0.016	0.016	0.018	0.020	0.024	0.030	0.037	0.047	0.058	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014
	A10b-05	0.042	0.042	0.043	0.045	0.056	0.082	0.120	0.172	0.238	0.316	0.018	0.018	0.018	0.018	0.019	0.023	0.027	0.034	0.042	0.052	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014
	A10b-06	0.051	0.051	0.052	0.055	0.060	0.084	0.122	0.175	0.242	0.322	0.019	0.019	0.019	0.019	0.020	0.023	0.028	0.034	0.043	0.053	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014
	A10b-07	0.058	0.058	0.059	0.062	0.068	0.080	0.117	0.167	0.231	0.307	0.019	0.019	0.020	0.020	0.021	0.022	0.027	0.033	0.041	0.051	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014
	A10b-08	0.066	0.067	0.068	0.072	0.078	0.087	0.101	0.143	0.197	0.261	0.021	0.021	0.021	0.021	0.022	0.023	0.025	0.030	0.037	0.045	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014
	A10b-09	0.074	0.074	0.075	0.080	0.087	0.097	0.109	0.121	0.141	0.196	0.021	0.022	0.022	0.022	0.023	0.024	0.026	0.027	0.030	0.037	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014
	A10b-10	0.076	0.076	0.078	0.082	0.090	0.100	0.112	0.125	0.143	0.252	0.022	0.022	0.022	0.023	0.024	0.025	0.026	0.028	0.030	0.044	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014
	A10b-11	0.075	0.075	0.077	0.081	0.089	0.099	0.111	0.124	0.151	0.263	0.022	0.022	0.022	0.022	0.023	0.025	0.026	0.028	0.031	0.045	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014
	A10b-12	0.074	0.074	0.075	0.080	0.088	0.099	0.111	0.125	0.163	0.261	0.021	0.022	0.022	0.022	0.023	0.025	0.026	0.028	0.033	0.045	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014
	A10b-13	0.074	0.074	0.075	0.081	0.089	0.100	0.114	0.128	0.153	0.264	0.021	0.022	0.022	0.022	0.023	0.025	0.026	0.028	0.031	0.045	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014
	A10b-14	0.074	0.074	0.075	0.081	0.089	0.100	0.113	0.127	0.142	0.221	0.021	0.022	0.022	0.022	0.023	0.025	0.026	0.028	0.030	0.040	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014
	A10b-15	0.072	0.072	0.074	0.079	0.087	0.098	0.110	0.124	0.149	0.199	0.021	0.021	0.021	0.022	0.023	0.024	0.026	0.028	0.031	0.037	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014
	A10b-16	0.063	0.063	0.064	0.069	0.075	0.084	0.106	0.152	0.211	0.283	0.020	0.020	0.020	0.021	0.022	0.023	0.025	0.031	0.039	0.048	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014
	A10b-17	0.054	0.055	0.055	0.059	0.064	0.081	0.119	0.172	0.239	0.319	0.019	0.019	0.019	0.020	0.020	0.022	0.027	0.034	0.042	0.052	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014
	A10b-18	0.046	0.047	0.047	0.056	0.080	0.117	0.169	0.236	0.317	0.408	0.018	0.018	0.018	0.019	0.022	0.027	0.033	0.042	0.052	0.063	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014
	A10b-19	0.037	0.038	0.041	0.054	0.078	0.113	0.163	0.227	0.306	0.394	0.017	0.017	0.017	0.019	0.022	0.026	0.033	0.041	0.050	0.061	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014
	A10b-20	0.050	0.051	0.056	0.076	0.111	0.165	0.241	0.339	0.458	0.592	0.018	0.019	0.019	0.022	0.026	0.033	0.042	0.055	0.070	0.086	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014
	A10b-21	0.051	0.052	0.057	0.078	0.117	0.175	0.259	0.368	0.503	0.731	0.019	0.019	0.019	0.022	0.027	0.034	0.045	0.058	0.075	0.104	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014

Result Summary of Strontium Concentration for all ASRs at Various Heights above Ground

Area	ASR	Max 1-hour Strontium Concentration (μg/m³) (No Criteria)										Max 8-hour Strontium Concentration (μg/m³) (No Criteria)										Annual Strontium Concentration (μg/m³) (No Criteria)									
		1.5m	5m	10m	20m	30m	40m	50m	60m	70m	80m	1.5m	5m	10m	20m	30m	40m	50m	60m	70m	80m	1.5m	5m	10m	20m	30m	40m	50m	60m	70m	80m
Area 10b	A10b-01	0.014	0.014	0.016	0.025	0.040	0.065	0.101	0.149	0.212	0.305	0.002	0.002	0.002	0.003	0.005	0.008	0.013	0.019	0.026	0.038	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	A10b-02	0.013	0.014	0.016	0.024	0.039	0.063	0.099	0.146	0.207	0.280	0.002	0.002	0.002	0.003	0.005	0.008	0.012	0.018	0.026	0.035	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	A10b-03	0.011	0.012	0.014	0.021	0.034	0.055	0.086	0.128	0.181	0.244	0.001	0.002	0.002	0.003	0.004	0.007	0.011	0.016	0.023	0.031	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	A10b-04	0.009	0.009	0.011	0.016	0.026	0.043	0.067	0.099	0.140	0.190	0.001	0.001	0.001	0.002	0.003	0.005	0.008	0.012	0.018	0.024	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	A10b-05	0.015	0.015	0.015	0.017	0.023	0.037	0.057	0.085	0.120	0.162	0.002	0.002	0.002	0.002	0.003	0.005	0.007	0.011	0.015	0.020	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	A10b-06	0.020	0.020	0.020	0.022	0.024	0.037	0.058	0.086	0.122	0.165	0.002	0.002	0.003	0.003	0.003	0.005	0.007	0.011	0.015	0.021	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	A10b-07	0.023	0.023	0.024	0.026	0.029	0.036	0.055	0.082	0.116	0.157	0.003	0.003	0.003	0.003	0.004	0.004	0.007	0.010	0.015	0.020	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	A10b-08	0.028	0.028	0.029	0.031	0.034	0.039	0.047	0.069	0.098	0.133	0.004	0.004	0.004	0.004	0.004	0.005	0.006	0.009	0.012	0.017	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	A10b-09	0.032	0.032	0.033	0.035	0.039	0.045	0.051	0.058	0.068	0.098	0.004	0.004	0.004	0.004	0.005	0.006	0.006	0.007	0.009	0.012	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	A10b-10	0.033	0.033	0.034	0.037	0.041	0.046	0.053	0.060	0.069	0.128	0.004	0.004	0.004	0.005	0.005	0.006	0.007	0.007	0.009	0.016	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	A10b-11	0.033	0.033	0.034	0.036	0.040	0.046	0.052	0.059	0.074	0.133	0.004	0.004	0.004	0.005	0.005	0.006	0.007	0.007	0.009	0.017	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	A10b-12	0.032	0.032	0.033	0.036	0.040	0.046	0.052	0.059	0.080	0.132	0.004	0.004	0.004	0.004	0.005	0.006	0.007	0.007	0.010	0.017	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	A10b-13	0.032	0.032	0.033	0.036	0.040	0.046	0.053	0.061	0.075	0.134	0.004	0.004	0.004	0.004	0.005	0.006	0.007	0.008	0.009	0.017	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	A10b-14	0.032	0.032	0.033	0.036	0.040	0.046	0.053	0.061	0.068	0.111	0.004	0.004	0.004	0.004	0.005	0.006	0.007	0.008	0.009	0.014	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	A10b-15	0.031	0.031	0.032	0.035	0.039	0.045	0.052	0.059	0.072	0.099	0.004	0.004	0.004	0.004	0.005	0.006	0.006	0.007	0.009	0.012	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	A10b-16	0.026	0.026	0.027	0.029	0.033	0.038	0.049	0.074	0.106	0.144	0.003	0.003	0.003	0.004	0.004	0.005	0.006	0.009	0.013	0.018	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	A10b-17	0.022	0.022	0.022	0.024	0.027	0.036	0.056	0.084	0.120	0.164	0.003	0.003	0.003	0.003	0.003	0.005	0.007	0.011	0.015	0.020	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	A10b-18	0.017	0.017	0.018	0.023	0.036	0.055	0.083	0.119	0.162	0.211	0.002	0.002	0.002	0.003	0.004	0.007	0.010	0.015	0.020	0.026	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	A10b-19	0.013	0.013	0.015	0.022	0.034	0.053	0.080	0.114	0.156	0.204	0.002	0.002	0.002	0.003	0.004	0.007	0.010	0.014	0.020	0.025	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	A10b-20	0.019	0.020	0.022	0.033	0.052	0.081	0.122	0.174	0.238	0.310	0.002	0.002	0.003	0.004	0.007	0.010	0.015	0.022	0.030	0.039	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	A10b-21	0.020	0.021	0.023	0.035	0.055	0.087	0.131	0.190	0.262	0.384	0.002	0.003	0.003	0.004	0.007	0.011	0.016	0.024	0.033	0.048	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001

Result Summary of Copper Concentration for all ASRs at Various Heights above Ground

Area	ASR	Max 1-hour Copper Concentration (µg/m^3) (Criteria = 100 µg/m^3)										Max 8-hour Copper Concentration (µg/m^3) (No Criteria)										Annual Copper Concentration (µg/m^3) (Criteria = 2.4 µg/m^3)									
		1.5m	5m	10m	20m	30m	40m	50m	60m	70m	80m	1.5m	5m	10m	20m	30m	40m	50m	60m	70m	80m	1.5m	5m	10m	20m	30m	40m	50m	60m	70m	80m
Area 10b	A10b-01	0.121	0.121	0.122	0.127	0.136	0.149	0.169	0.197	0.232	0.284	0.114	0.114	0.114	0.115	0.116	0.118	0.120	0.123	0.128	0.134	0.113	0.113	0.113	0.113	0.113	0.113	0.113	0.113	0.113	0.113
	A10b-02	0.120	0.121	0.122	0.126	0.135	0.149	0.168	0.195	0.229	0.270	0.114	0.114	0.114	0.115	0.116	0.117	0.120	0.123	0.128	0.133	0.113	0.113	0.113	0.113	0.113	0.113	0.113	0.113	0.113	0.113
	A10b-03	0.119	0.120	0.121	0.125	0.132	0.144	0.161	0.185	0.214	0.250	0.114	0.114	0.114	0.114	0.115	0.117	0.119	0.122	0.126	0.130	0.113	0.113	0.113	0.113	0.113	0.113	0.113	0.113	0.113	0.113
	A10b-04	0.118	0.118	0.119	0.122	0.128	0.137	0.150	0.169	0.192	0.219	0.114	0.114	0.114	0.114	0.115	0.116	0.118	0.120	0.123	0.126	0.113	0.113	0.113	0.113	0.113	0.113	0.113	0.113	0.113	0.113
	A10b-05	0.121	0.121	0.122	0.122	0.126	0.134	0.145	0.160	0.180	0.204	0.114	0.114	0.114	0.114	0.115	0.116	0.117	0.119	0.121	0.124	0.113	0.113	0.113	0.113	0.113	0.113	0.113	0.113	0.113	0.113
	A10b-06	0.124	0.124	0.124	0.125	0.127	0.134	0.146	0.161	0.182	0.206	0.114	0.114	0.114	0.115	0.115	0.116	0.117	0.119	0.122	0.125	0.113	0.113	0.113	0.113	0.113	0.113	0.113	0.113	0.113	0.113
	A10b-07	0.126	0.126	0.126	0.127	0.129	0.133	0.144	0.159	0.178	0.201	0.115	0.115	0.115	0.115	0.115	0.115	0.117	0.119	0.121	0.124	0.113	0.113	0.113	0.113	0.113	0.113	0.113	0.113	0.113	0.113
	A10b-08	0.129	0.129	0.129	0.130	0.132	0.135	0.139	0.152	0.168	0.187	0.115	0.115	0.115	0.115	0.115	0.116	0.116	0.118	0.120	0.122	0.113	0.113	0.113	0.113	0.113	0.113	0.113	0.113	0.113	0.113
	A10b-09	0.131	0.131	0.131	0.133	0.135	0.138	0.142	0.145	0.151	0.168	0.115	0.115	0.115	0.115	0.116	0.116	0.117	0.117	0.118	0.120	0.113	0.113	0.113	0.113	0.113	0.113	0.113	0.113	0.113	0.113
	A10b-10	0.132	0.132	0.132	0.134	0.136	0.139	0.143	0.146	0.152	0.185	0.115	0.115	0.115	0.116	0.116	0.116	0.117	0.117	0.118	0.122	0.113	0.113	0.113	0.113	0.113	0.113	0.113	0.113	0.113	0.113
	A10b-11	0.131	0.131	0.132	0.133	0.136	0.139	0.142	0.146	0.154	0.188	0.115	0.115	0.115	0.116	0.116	0.116	0.117	0.117	0.118	0.122	0.113	0.113	0.113	0.113	0.113	0.113	0.113	0.113	0.113	0.113
	A10b-12	0.131	0.131	0.131	0.133	0.135	0.139	0.142	0.146	0.158	0.187	0.115	0.115	0.115	0.115	0.116	0.116	0.117	0.117	0.119	0.122	0.113	0.113	0.113	0.113	0.113	0.113	0.113	0.113	0.113	0.113
	A10b-13	0.131	0.131	0.131	0.133	0.136	0.139	0.143	0.147	0.155	0.188	0.115	0.115	0.115	0.116	0.116	0.116	0.117	0.117	0.118	0.122	0.113	0.113	0.113	0.113	0.113	0.113	0.113	0.113	0.113	0.113
	A10b-14	0.131	0.131	0.131	0.133	0.136	0.139	0.143	0.147	0.151	0.175	0.115	0.115	0.115	0.116	0.116	0.116	0.117	0.117	0.118	0.121	0.113	0.113	0.113	0.113	0.113	0.113	0.113	0.113	0.113	0.113
	A10b-15	0.130	0.131	0.131	0.132	0.135	0.138	0.142	0.146	0.154	0.169	0.115	0.115	0.115	0.115	0.116	0.116	0.117	0.117	0.118	0.120	0.113	0.113	0.113	0.113	0.113	0.113	0.113	0.113	0.113	0.113
	A10b-16	0.128	0.128	0.128	0.129	0.131	0.134	0.141	0.154	0.172	0.194	0.115	0.115	0.115	0.115	0.115	0.116	0.116	0.118	0.120	0.123	0.113	0.113	0.113	0.113	0.113	0.113	0.113	0.113	0.113	0.113
	A10b-17	0.125	0.125	0.125	0.126	0.128	0.133	0.145	0.160	0.181	0.205	0.115	0.115	0.115	0.115	0.115	0.116	0.117	0.119	0.121	0.124	0.113	0.113	0.113	0.113	0.113	0.113	0.113	0.113	0.113	0.113
	A10b-18	0.123	0.123	0.123	0.126	0.133	0.144	0.159	0.180	0.204	0.231	0.114	0.114	0.114	0.115	0.115	0.117	0.119	0.121	0.124	0.128	0.113	0.113	0.113	0.113	0.113	0.113	0.113	0.113	0.113	0.113
	A10b-19	0.120	0.120	0.121	0.125	0.132	0.143	0.158	0.177	0.201	0.227	0.114	0.114	0.114	0.115	0.115	0.117	0.119	0.121	0.124	0.127	0.113	0.113	0.113	0.113	0.113	0.113	0.113	0.113	0.113	0.113
	A10b-20	0.124	0.124	0.126	0.132	0.142	0.158	0.181	0.211	0.247	0.287	0.114	0.114	0.115	0.115	0.117	0.119	0.122	0.125	0.130	0.135	0.113	0.113	0.113	0.113	0.113	0.113	0.113	0.113	0.113	0.113
	A10b-21	0.124	0.125	0.126	0.132	0.144	0.162	0.187	0.219	0.260	0.329	0.114	0.114	0.115	0.115	0.117	0.119	0.122	0.126	0.131	0.140	0.113	0.113	0.113	0.113	0.113	0.113	0.113	0.113	0.113	0.113

Result Summary of Titanium Concentration for all ASRs at Various Heights above Ground

Area	ASR	Max 1-hour Titanium Concentration (µg/m³) (No Criteria)										Max 8-hour Titanium Concentration (µg/m³) (No Criteria)										Annual Titanium Concentration (µg/m³) (Criteria = 100 µg/m³)									
		1.5m	5m	10m	20m	30m	40m	50m	60m	70m	80m	1.5m	5m	10m	20m	30m	40m	50m	60m	70m	80m	1.5m	5m	10m	20m	30m	40m	50m	60m	70m	80m
Area 10b	A10b-01	0.003	0.003	0.004	0.006	0.010	0.016	0.025	0.036	0.052	0.074	<0.001	<0.001	<0.001	<0.001	0.001	0.002	0.003	0.005	0.006	0.009	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	A10b-02	0.003	0.003	0.004	0.006	0.010	0.015	0.024	0.036	0.051	0.068	<0.001	<0.001	<0.001	<0.001	0.001	0.002	0.003	0.004	0.006	0.009	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	A10b-03	0.003	0.003	0.003	0.005	0.008	0.013	0.021	0.031	0.044	0.060	<0.001	<0.001	<0.001	<0.001	0.001	0.002	0.003	0.004	0.006	0.007	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	A10b-04	0.002	0.002	0.003	0.004	0.006	0.010	0.016	0.024	0.034	0.046	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.002	0.003	0.004	0.006	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	A10b-05	0.004	0.004	0.004	0.004	0.006	0.009	0.014	0.021	0.029	0.040	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.002	0.003	0.004	0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	A10b-06	0.005	0.005	0.005	0.005	0.006	0.009	0.014	0.021	0.030	0.040	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.002	0.003	0.004	0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	A10b-07	0.006	0.006	0.006	0.006	0.007	0.009	0.013	0.020	0.028	0.038	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.002	0.003	0.004	0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	A10b-08	0.007	0.007	0.007	0.008	0.008	0.010	0.011	0.017	0.024	0.032	<0.001	<0.001	<0.001	<0.001	0.001	0.001	0.001	0.002	0.003	0.004	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	A10b-09	0.008	0.008	0.008	0.009	0.010	0.011	0.012	0.014	0.017	0.024	<0.001	<0.001	0.001	0.001	0.001	0.001	0.002	0.002	0.002	0.003	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	A10b-10	0.008	0.008	0.008	0.009	0.010	0.011	0.013	0.015	0.017	0.031	0.001	0.001	0.001	0.001	0.001	0.001	0.002	0.002	0.002	0.004	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	A10b-11	0.008	0.008	0.008	0.009	0.010	0.011	0.013	0.014	0.018	0.033	<0.001	0.001	0.001	0.001	0.001	0.001	0.002	0.002	0.002	0.004	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	A10b-12	0.008	0.008	0.008	0.009	0.010	0.011	0.013	0.015	0.019	0.032	<0.001	<0.001	0.001	0.001	0.001	0.001	0.002	0.002	0.002	0.004	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	A10b-13	0.008	0.008	0.008	0.009	0.010	0.011	0.013	0.015	0.018	0.033	<0.001	<0.001	0.001	0.001	0.001	0.001	0.002	0.002	0.002	0.004	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	A10b-14	0.008	0.008	0.008	0.009	0.010	0.011	0.013	0.015	0.017	0.027	<0.001	<0.001	0.001	0.001	0.001	0.001	0.002	0.002	0.002	0.003	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	A10b-15	0.008	0.008	0.008	0.008	0.010	0.011	0.013	0.014	0.018	0.024	<0.001	<0.001	<0.001	0.001	0.001	0.001	0.002	0.002	0.002	0.003	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	A10b-16	0.006	0.006	0.007	0.007	0.008	0.009	0.012	0.018	0.026	0.035	<0.001	<0.001	<0.001	<0.001	0.001	0.001	0.002	0.002	0.003	0.004	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	A10b-17	0.005	0.005	0.005	0.006	0.007	0.009	0.014	0.021	0.029	0.040	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.002	0.003	0.004	0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	A10b-18	0.004	0.004	0.004	0.006	0.009	0.013	0.020	0.029	0.040	0.051	<0.001	<0.001	<0.001	<0.001	0.001	0.002	0.003	0.004	0.005	0.006	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	A10b-19	0.003	0.003	0.004	0.005	0.008	0.013	0.019	0.028	0.038	0.050	<0.001	<0.001	<0.001	<0.001	0.001	0.002	0.002	0.003	0.005	0.006	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	A10b-20	0.005	0.005	0.005	0.008	0.013	0.020	0.030	0.043	0.058	0.076	<0.001	<0.001	<0.001	0.001	0.002	0.002	0.004	0.005	0.007	0.009	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	A10b-21	0.005	0.005	0.006	0.008	0.013	0.021	0.032	0.046	0.064	0.094	<0.001	<0.001	<0.001	0.001	0.002	0.003	0.004	0.006	0.008	0.012	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001

Appendix 5.1

Legislation and Standards for Noise Assessment

Legislation and Standards

The relevant legislation and associated guidance applicable to present the study for the assessment of noise impacts include:

- TM on Noise from Places other than Domestic Premises, Public Places or Construction Sites (TM-Places); and
- Hong Kong Planning Standard and Guidelines (HKPSG).

Road Traffic Noise

In accordance with the HKPSG, the maximum permissible hourly noise level (L_{10}) at the external facades of domestic premises is 70dB(A). This criterion applies to domestic premises relying on open windows as a primary means for ventilation.

Fixed Noise

The HKPSG stipulates that in order to plan for a better environment, all fixed noise sources should be located and designed so that when assessed in accordance with the TM-Places, the level of the intruding noise at the facade of the nearest sensitive use should be at least 5 dB(A) below the appropriate Acceptable Noise Limit (ANL) as stipulated in TM-Places or, in the case of the background being 5 dB(A) lower than the ANL, should not be higher than the background. The following table presents the ANL for various Area Sensitivity Ratings (ASR).

Table A5.1: ANLs for fixed noise sources

Time Period	ANL, dB(A)		
	ASR A	ASR B	ASR C
Day (0700 to 1900 hours)	60	65	70
Evening (1900 to 2300 hours)	60	65	70
Night (2300 to 0700 hours)	50	55	60

Note:
[1] ASR – Area Sensitivity Rating

For Discovery Bay in particular, it comprises of a combination of both high-rise and low-rise residential and commercial developments, and landscaping areas distributing within the development boundary. Hence, it is considered appropriate to be described as "Low density residential area consisting of low-rise or isolated high-rise developments" as defined in Table 1 of TM-Places. Besides, there are no influencing factors such as industrial areas, major road with daily flow exceeding 30,000 vehicles per day in the vicinity. Hence, it is appropriate to adopt an ASR of "A". As such, the minimum of ANL-5 or prevailing noise level would be 55dB(A) for daytime and evening periods (7:00 to 23:00) and 45dB(A) for night-time period (23:00 to 7:00).

Similar to road traffic noise assessment, all these criteria only apply to NSRs relying

on opened windows for ventilation.

Firework Display Noise from Disneyland

The Disneyland Theme Park is located at approximately 2.5 km north-east of Discovery Bay. This theme park is a Designated Project (DP) under the EIAO and an EIA Report was submitted to EPD and approved under the EIAO (ref AEIAR – 0323/2000). Hence, the operation of theme park is governed by the noise criteria stipulated under TM-Places and TM-EIAO.

Firework events at Disneyland are organized at 8pm every night. According to its approved EIA Report, a noise criterion of $L_{eq\ (15\ min)}$ 55 dB(A) is recommended for assessing the noise impacts due to fireworks. Hence, this $L_{eq\ (15\ min)}$ 55 dB(A) is still adopted in this assessment.

Similar to road traffic noise assessment, all these criteria only apply to NSRs relying on opened windows for ventilation.

Marine Traffic Noise

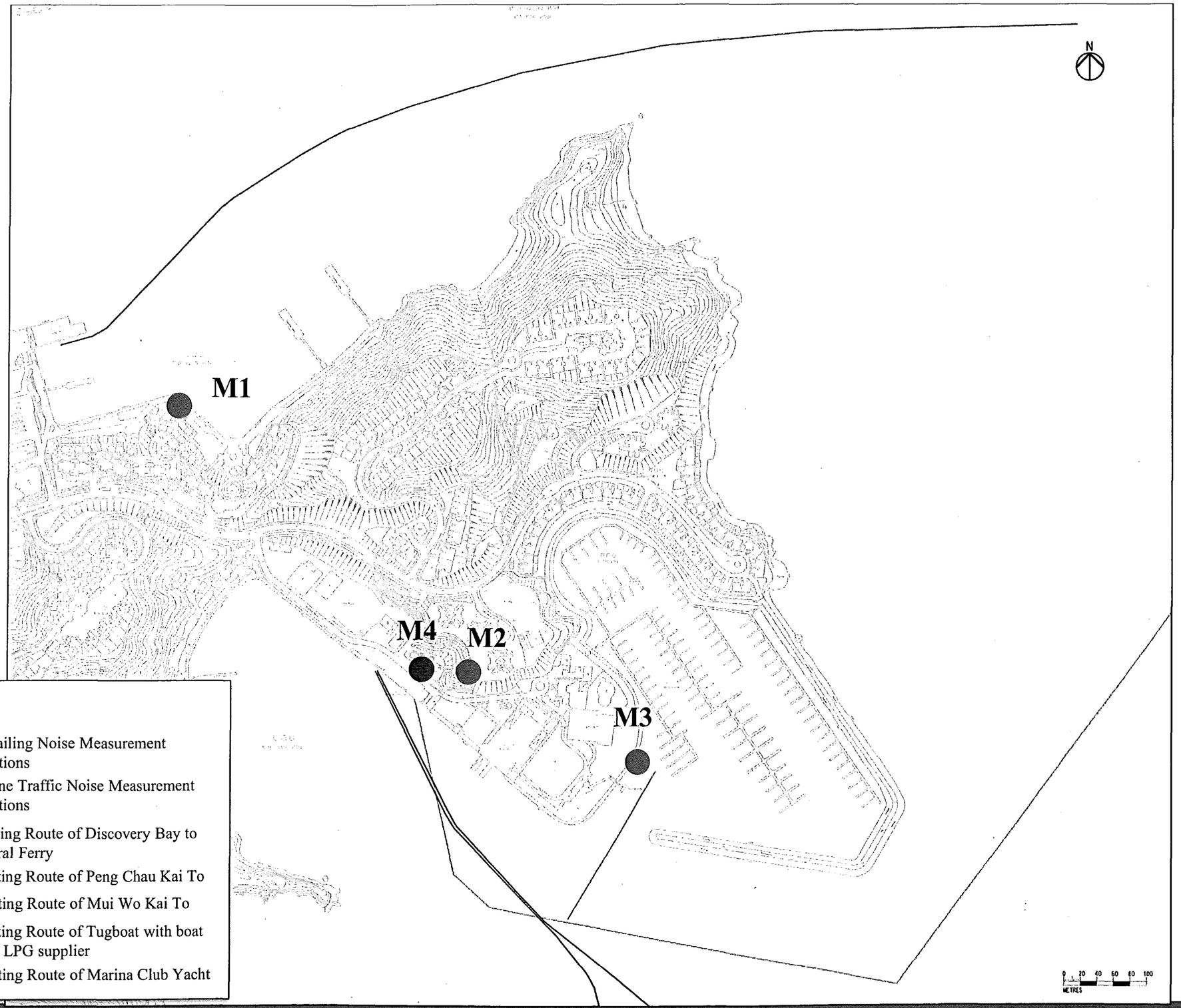
There is no statutory requirement for marine traffic noise. Additional non-statutory noise criteria may therefore need to be considered. An approach has been adopted similar to the approved EIA report for the West Kowloon Cultural District (AEIAR-178/2003). It is considered the predicted noise level will be unlikely to cause any disturbance and nuisance when the marine traffic noise is below the prevailing noise level.

The prevailing noise levels measured near Marina Avenue was 58 dB(A) for daytime / evening time periods and 53 dB(A) for nighttime period in free field setting. The selected prevailing noise measurement location is shown in this appendix. Hence, it is considered appropriate to adopt the criteria of 61 dB(A) for daytime and evening time and 56 dB(A) for nighttime periods, including a facade correction of 3 dB(A).

Similar to road traffic noise assessment, all these criteria only apply to NSRs relying on opened windows for ventilation.

Construction Noise

It is considered the development is in a preliminary stage, there is no construction programme or construction plant inventory for this development at this moment. Once the detailed construction programmed and methodology become available during EIA stage, a quantitative construction noise assessment would be conducted. Mitigation measures will be studied and recommended in EIA stage to reduce the construction noise impacts.



Noise Measurement Locations and Existing Main Marine Traffic Routes

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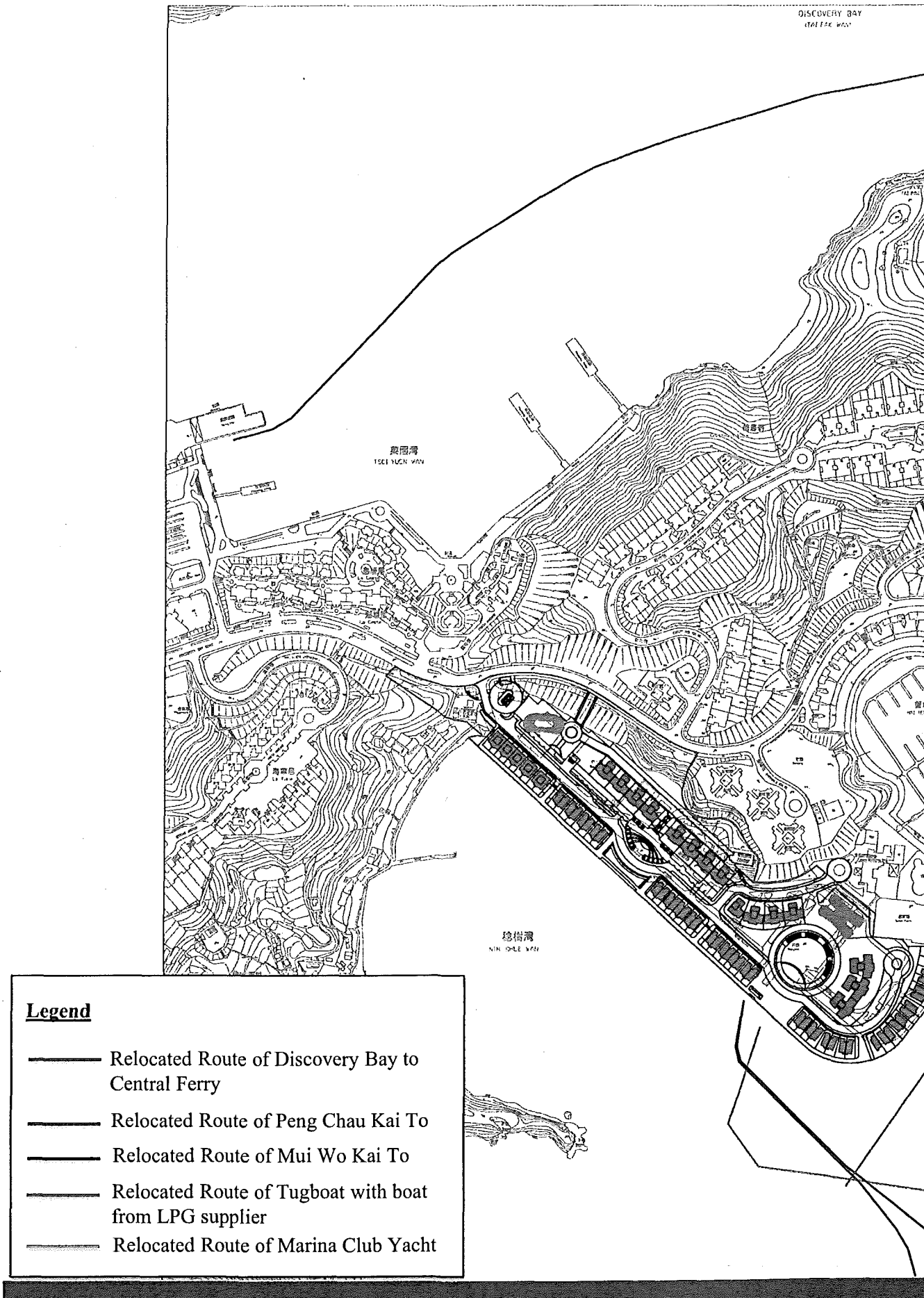
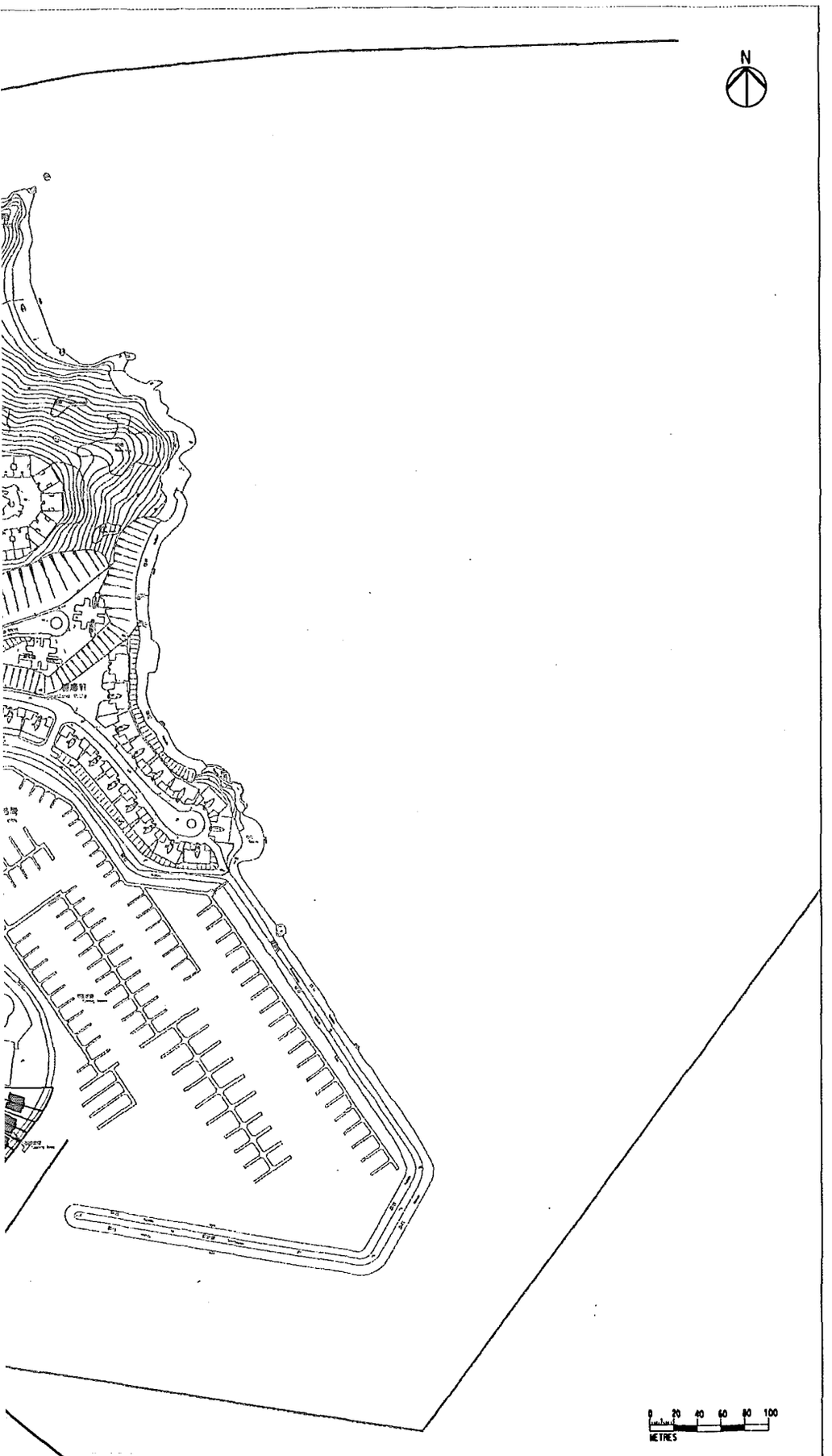


Legend

- Relocated Route of Discovery Bay to Central Ferry
- Relocated Route of Peng Chau Kai To
- Relocated Route of Mui Wo Kai To
- Relocated Route of Tugboat with boat from LPG supplier
- Relocated Route of Marina Club Yacht

Planned Main Marine Traffic Routes



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