

8. AIR QUALITY

8.1 Introduction

This **Section** presents the potential air quality impacts associated with the construction and operation phases of the Project.

8.2 Legislative Requirements and Evaluation Criteria

The principal legislation for the management of air quality in Hong Kong is the *Air Pollution Control Ordinance (APCO) (Cap. 311)*. As the new set of AQOs has come into effect since 1 January 2022, the new AQOs have been adopted as the assessment criteria as shown in **Table 8.1**.

Table 8.1 Hong Kong Air Quality Objectives

Air Pollutant	Averaging Time	New AQOs	
		Concentration ($\mu\text{g m}^{-3}$) (a)	No. of Exceedances Allowed per Year
Nitrogen Dioxide (NO ₂)	1-hour	200	18
	Annual	40	-
Sulphur Dioxide (SO ₂)	10-minute	500	3
	24-hour	50	3
Carbon Monoxide (CO)	1-hour	30,000	0
	8-hour	10,000	0
Respirable Suspended Particulates (RSP) ^(b)	24-hour	100	9
	Annual	50	-
Fine Suspended Particulates (FSP) ^(c)	24-hour	50	18 ^(d)
	Annual	25	-
Ozone	8-hour	160	9
Lead	Annual	0.5	-

Notes:

- (a) Concentrations of gaseous air pollutants (i.e. NO₂, SO₂, CO and O₃) are measured at 293K and 101.325kPa.
- (b) Suspended particles in air with a nominal aerodynamic diameter of 10 μm or less.
- (c) Suspended particles in air with a nominal aerodynamic diameter of 2.5 μm or less.
- (d) On a best endeavours basis, a reduced number of allowable exceedances of 18 days per year for 24-hour FSP (in lieu of 35 days per year as set out in the *Air Pollution Control (Amendment) Bill 2021*) should be adopted for air quality impact assessments for new Government projects.

In addition to the APCO, a maximum hourly average Total Suspended Particulates (TSP) concentration of 500 $\mu\text{g m}^{-3}$ at Air Sensitive Receivers (ASRs) is stipulated in Annex 4 of the *Technical Memorandum on Environmental Impact Assessment Process (EIAO-TM)* to address potential construction dust impacts. The measures stipulated in the *Air Pollution Control (Construction Dust) Regulation* will be followed to ensure that potential dust impacts are properly controlled. Requirements stipulated in the *Air Pollution Control (Non-road Mobile Machinery) (Emission) Regulation* and *Air Pollution Control (Fuel Restriction) Regulation* will also be followed to control potential emissions from non-road mobile machinery during decommissioning /demolition and construction phases. Furthermore, *Air Pollution Control (Marine Light Diesel) Regulation* and *Air Pollution Control (Fuel for Vessels) Regulation* will be followed to control potential emissions from marine vessels arising from the Project.

8.3 Assessment Area and Air Sensitive Receivers

In accordance with Section 3.4.8.2 of the Study Brief (ESB-326/2019), the Assessment Area for air quality impact assessment is defined as an area of 500 m from the boundary of the Project site as shown in **Figure 8.1**.

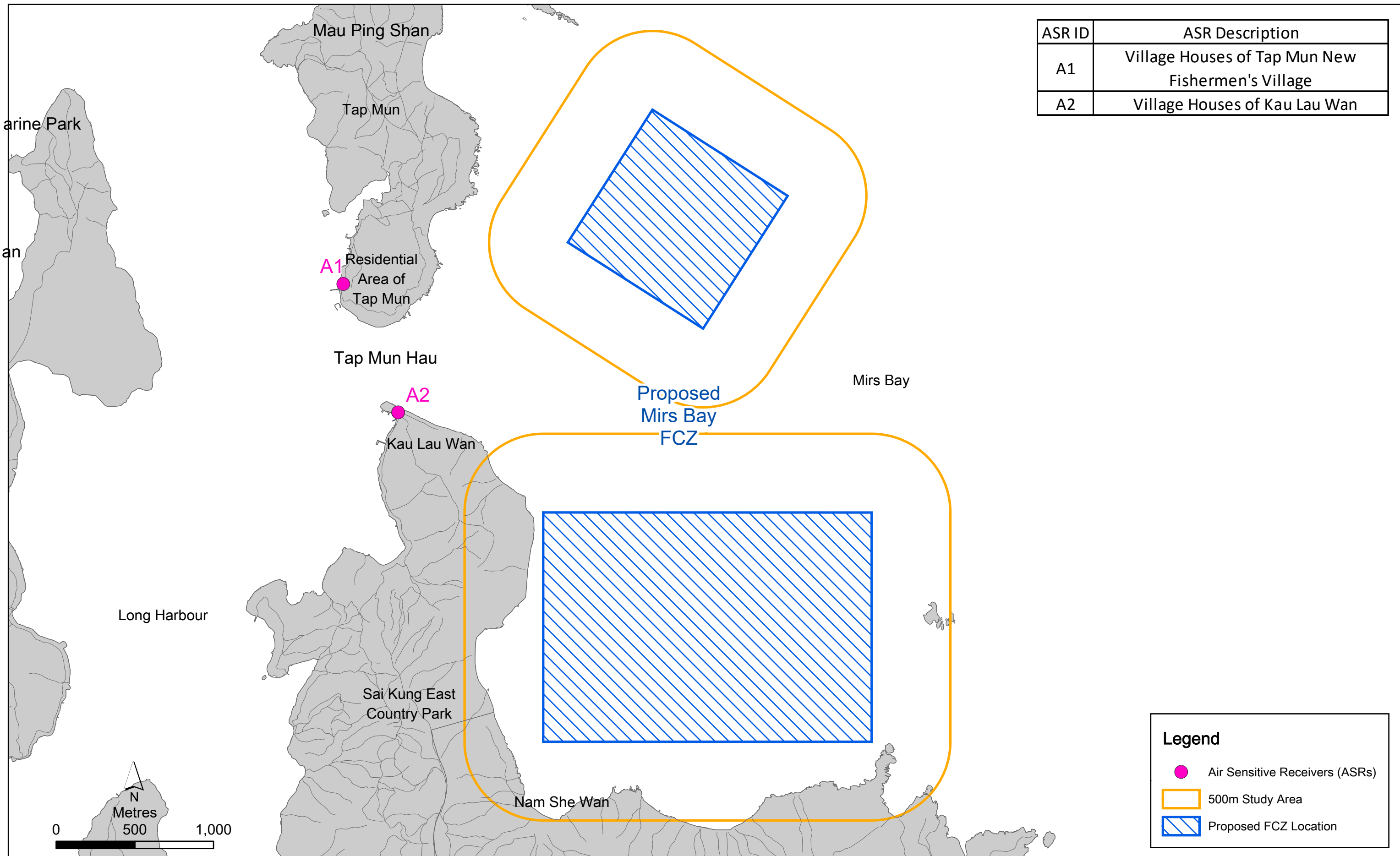


Figure 8.1

Locations of Representative Air Sensitive Receivers

No ASRs have been identified within the 500 m Assessment Area. Village houses along the southwestern coast of Tap Mun and Kau Lau Wan have been identified as the nearest ASRs beyond the 500 m Assessment Area as shown in **Figure 8.1**. Details of the identified representative ASRs are presented in **Table 8.2**.

Table 8.2 Identified Representative ASRs

ASR	Description	Type of Use	Approx. Maximum Height (m above ground)	Approx. Separation Distance from the Project Site Boundary (m)
A1	Village Houses of Tap Mun New Fisherman's Village	Residential	10	1,480
A2	Village Houses of Kau Lau Wan	Residential	10	1,160

8.4 Baseline Conditions

The Project site is located in the waters to the east of Tap Mun and Sai Kung East Country Park in the Northeast New Territories. The Project site is predominantly surrounded by waters within its 500 m Assessment Area. The Project site area and its vicinity is rural in nature with no existing or planned development. No major air emission sources have been identified that may influence the local air quality within the Project site area and its vicinity.

8.4.1 Measured Background Air Quality from Air Quality Monitoring Stations

The nearest EPD's air quality monitoring station (AQMS) is located in Tap Mun, about 1,200m away from the Project site.

Table 8.3 presents the relevant time averaging concentrations of air pollutants measured at EPD's Tap Mun AQMS in the most recent five years (i.e. 2016 to 2020) for comparison with the prevailing AQOs.

Table 8.3 Concentrations of Air Pollutants Measured at EPD’s Tap Mun AQMS in the Recent Five Years (2016 to 2020)

Station	Year	Concentration of Pollutants ($\mu\text{g m}^{-3}$) ^(a)										
		19 th highest 1-hour NO ₂	Annual NO ₂	4 th highest 24-hour SO ₂	4 th highest 10-min SO ₂	10 th highest 24-hour RSP	Annual RSP	19 th highest 24-hour FSP	Annual FSP	10 th highest daily max. 8-hour O ₃	Daily max. 1-hour CO ^(d)	Daily max. 8-hour CO ^(d)
Tap Mun	2016	58	10	15	45	68	30	38	19	<u>169</u>	1,470	1,453
	2017	52	10	14	32	74	35	39	20	<u>192</u>	1,770	1,543
	2018	51	11	13	29	60	31	30	17	<u>184</u>	1,170	1,151
	2019	56	10	12	19	64	31	32	17	<u>212</u>	1,360	1,350
	2020	38	9	10	13	59	25	31	14	<u>177</u>	1,530	1,378
AQOs		200	40	50	500	100	50	50	25	160	30,000	10,000

Note:

(a) Data underlined indicate exceedance of the AQO.

No exceedance of the prevailing AQOs for NO₂, SO₂, RSP, FSP and CO was recorded at EPD’s Tap Mun AQMS for the past five years. The measured 10th highest daily maximum 8-hour O₃ concentrations at EPD’s Tap Mun AQMS have exceeded the relevant AQO criterion for the past five years.

8.4.2 Predicted Future Background Air Quality

The background air pollutant concentrations predicted by the PATH v2.1 model (i.e. Pollutants in the Atmosphere and their Transport over Hong Kong) for the PATH grids within the 500 m Assessment Area in Year 2024 (i.e. the year of tentative commencement of construction and operation of Project) are presented in **Table 8.4**.

Table 8.4 Background Air Pollutant Concentrations Predicted by the PATH v2.1 Model in 2024

PATH Grid	Concentration of Pollutants ($\mu\text{g m}^{-3}$)										
	19 th highest 1-hour NO ₂	Annual NO ₂	4 th highest 24-hour SO ₂	4 th highest 10-min SO ₂ ^(a)	10 th highest 24-hour RSP ^(b)	Annual RSP ^(b)	19 th highest 24-hour FSP	Annual FSP ^(c)	10 th highest Daily Max. 8-hour O ₃	Daily Max. 1-hour CO	Daily Max. 8-hour CO
59,46	36.6	7.0	10.0	33.3	64.2	26.2	31.9	13.9	<u>198.9</u>	921.1	841.6
59,47	38.1	7.3	10.0	33.0	64.2	26.2	32.3	13.8	<u>200.4</u>	922.1	843.2
59,48	41.3	7.9	10.0	33.1	64.0	26.3	32.7	13.7	<u>198.0</u>	924.9	845.9
59,49	41.2	8.6	9.9	33.6	64.4	26.4	33.1	13.7	<u>200.2</u>	924.3	847.4
59,50	44.6	9.2	10.0	31.7	64.5	26.4	33.4	13.8	<u>198.6</u>	925.6	848.3
60,46	36.6	7.2	9.8	31.8	64.5	26.2	31.9	13.8	<u>200.2</u>	916.3	839.2
60,47	38.9	7.6	9.9	32.8	64.4	26.3	32.5	13.7	<u>201.4</u>	918.3	841.8
60,48	42.9	8.3	9.9	32.8	64.4	26.5	32.9	13.7	<u>202.6</u>	918.4	844.4
60,49	46.1	10.2	9.9	32.7	64.8	26.6	33.3	13.8	<u>201.9</u>	919.1	846.7
60,50	49.4	10.7	9.9	31.9	65.0	26.6	33.7	13.8	<u>201.8</u>	920.0	847.6
60,51	52.1	11.1	9.9	32.0	65.2	26.6	34.1	13.9	<u>202.1</u>	921.5	849.0
61,46	37.2	7.5	9.8	30.9	64.4	26.1	31.5	13.8	<u>200.7</u>	907.9	837.4
61,47	39.7	7.9	9.9	32.6	64.2	26.3	32.4	13.7	<u>203.2</u>	906.9	836.6
61,48	44.0	8.5	9.9	32.6	64.6	26.5	32.9	13.7	<u>204.1</u>	911.8	838.1
61,49	48.0	10.3	9.9	32.4	64.8	26.6	33.4	13.8	<u>203.1</u>	913.7	837.7
61,50	46.3	9.5	9.8	32.1	64.9	26.6	33.6	13.8	<u>203.6</u>	910.5	835.0
61,51	49.5	9.5	10.0	32.2	65.0	26.5	34.0	13.8	<u>204.0</u>	909.8	835.3
62,46	39.5	8.0	9.8	30.9	64.0	26.4	31.6	13.7	<u>203.1</u>	902.6	834.2
62,47	42.7	8.4	9.9	32.3	64.4	26.5	32.2	13.7	<u>204.9</u>	902.3	831.5
62,48	46.7	8.9	9.9	32.3	64.7	26.6	32.8	13.7	<u>205.3</u>	906.7	829.9
62,49	49.3	10.5	10.0	32.3	64.9	26.7	33.3	13.8	<u>204.2</u>	907.7	827.2
62,50	48.5	9.6	10.0	32.0	64.8	26.6	33.6	13.8	<u>204.6</u>	904.3	823.6
62,51	50.8	9.6	10.0	32.1	64.8	26.6	33.9	13.8	<u>205.0</u>	904.5	824.3
AQOs ^(d)	200	40	50	500	100	50	50	25	160	30,000	10,000

Notes:

- (a) The multiplicative factor for the stability class calculated for each hour was applied to the 1-hour SO₂ concentrations to estimate the 10-minute SO₂ concentrations.
- (b) An adjustment of 11.0 $\mu\text{g}/\text{m}^3$ and 10.3 $\mu\text{g}/\text{m}^3$ were added to the RSP background for calculation of 24-hour RSP and annual RSP, respectively.
- (c) An adjustment of 3.5 $\mu\text{g}/\text{m}^3$ was added to the FSP background for calculation of annual FSP.
- (d) Data underlined indicate exceedance of the new AQOs.

As shown in **Table 8.4**, predicted background concentrations of NO₂, SO₂, RSP, FSP and CO in all relevant PATH grids in 2024 are below their respective new AQO criteria. The predicted background concentrations of O₃ in 2024 show exceedances of the relevant AQO criterion in these PATH grids.

8.5 Potential Sources of Impact

8.5.1 Construction Phase

The construction of the proposed Project will mainly involve the setup of fish farm structures, including fish rafts / cages, auxiliary facilities and mooring system. No dredging works is required during the construction phase. The scale of construction work on-site is relatively small. Main components of the rafts / cages are manufactured off-site and will be towed to the Project site using tug boat. On-site assembly and anchoring of the fish rafts / cages will be assisted by a small number of marine vessels such as sampans and small speed boats for up to a few trips per day. Anchoring of these vessels might be required. No heavy construction plant would be used. Fish rafts / cages and auxiliary facilities, such as storage space and shelters, would be positioned by anchor lines attaching to the anchorage points on the seabed. Use of winch might be required during the assembly and anchorage of fish rafts / cages.

Limited number of small construction equipment may be used in the assembly and anchoring of the fish rafts/ cages and the installation of the auxiliary facilities. No heavy construction plant would be involved during the construction phase. Emissions may arise from the operation of the tug boats, sampans and small speed boats as well as some construction equipment during the construction phase of the Project. Air pollutants associated with these emissions include NO₂, SO₂, RSP and FSP. The construction of the Project would normally last about a few weeks for each fish raft and is expected to commence in 2024.

8.5.2 Operation Phase

Mariculture activities, such as management of fish raft / cages and fish stocks within the Project site will be undertaken during operational phase. Limited numbers of small power generators will be used on fish rafts to support daily mariculture activities. The transportation of fish stocks, fish feed, fish raft equipment and workforce as well as occasional visitors will make use of small marine vessels such as sampans and speed boats for a few trips a day. No maintenance dredging or sediment removal is anticipated during FCZ operation. With respect to the operational activities, emissions may arise from the operation of small marine vessels and power generators on site during the operation phase of the Project. Air pollutants associated with these emissions include NO₂, SO₂, RSP and FSP.

8.6 Assessment Methodology

8.6.1 Construction Phase

As discussed in **Section 8.5.1**, the construction works of the Project are small scale with the use of limited construction plant and small marine vessels. Air emissions associated with the construction works are thus considered very minor. With the nearest identified ASR located at more than 1 km away from the Project site, adverse air quality impact arising from the construction of the Project is not anticipated. Furthermore, the background pollutant concentrations for the key air pollutants of concern (i.e. NO₂, SO₂, RSP and FSP) within the 500 m Assessment Area during the construction phase are predicted to be low and well below the relevant AQOs. Quantitative assessment of air quality impact due to construction works of the Project is considered not necessary and the construction air quality impact has been addressed qualitatively in **Section 8.7.1**.

8.6.2 Operation Phase

As discussed in **Section 8.5.2**, the operation of the Project only involves the operation of small power generators on site and a few trips of small marine vessels a day. Air emissions associated with the operation activities are thus considered very minor. With the nearest identified ASR located at more than 1 km away from the Project site, adverse air quality impact arising from the operation of the Project is not anticipated. Furthermore, the background pollutant concentrations for the key air pollutants of concern (i.e. NO₂, SO₂, RSP and FSP) within the 500 m Assessment Area during the

operation phase are predicted to be low and well below the relevant AQOs. Quantitative assessment of air quality impact due to operational activities of the Project is considered not necessary and the operational air quality impact has been addressed qualitatively in **Section 8.7.2**.

8.7 Evaluation of Impact

8.7.1 Construction Phase

During the construction phase, main part of the fish rafts/ cages manufactured off-site will be towed to the Project site using tug boat for subsequent setup, assembly and anchoring within the Project site. Other small marine vessels such as sampans and small speed boats may also be used as supporting vessels during the construction. Only a few trips of these small marine vessels (including tug boats, sampans and small speed boats) per day would be involved for the towing, on-site assembly and anchoring of fish rafts / cages. A few construction equipment may also be used to assist with the assembly and anchoring of the fish rafts / cages, as well as installation of the auxiliary facilities on site. As the number of small marine vessels and construction equipment involved in the construction works is limited, potential emissions from the operation of the small marine vessels and construction equipment are expected to be very minor. Also, as the construction period of each fish raft within the Project site is expected to take a few weeks, any potential emissions arising from the construction works would be short-term.

Considering that the potential air emissions associated with the construction works would be limited and short-term, and the large separation distance between the Project site and the identified ASRs (more than 1 km away), adverse air quality impact arising from the construction of the Project is not anticipated. The *Air Pollution Control (Marine Light Diesel) Regulation* and *Air Pollution Control (Fuel for Vessels) Regulation* will be followed to control emissions from the operation of the marine vessels. *Air Pollution Control (Non-road Mobile Machinery) (Emission) Regulation* and *Air Pollution Control (Fuel Restriction) Regulation* will also be followed to control emissions from the operation of the construction equipment.

8.7.2 Operation Phase

During the operation phase, daily mariculture activities including cleaning of fish nets and feeding of fish stocks will be undertaken within the Project site. A few small power generators will be used on site to support these daily mariculture activities. Transportation of fish stock, fish feed, fish raft equipment, daily necessities required by the workforce at the Project site, as well as occasional visitors by small marine vessels such as sampans and small speed boats for a few trips per day will also be involved during the operation phase. As the operational activities only involve limited number of small power generators and just a few vessel trips per day, potential emissions from the operation of these small power generators and vessels are expected to be very minor.

Considering that the potential air emissions associated with the operational activities of the Project would be limited and the large separation distance between the Project site and the identified ASRs (more than 1 km away), adverse air quality impact arising from the operation of the Project is not anticipated. The *Air Pollution Control (Marine Light Diesel) Regulation* and the *Air Pollution Control (Fuel for Vessels) Regulation* will be followed to control emissions from the operation of the marine vessels. *Air Pollution Control (Non-road Mobile Machinery) (Emission) Regulation* and *Air Pollution Control (Fuel Restriction) Regulation* will also be followed to control emissions from the operation of the small power generators within the Project site.

8.8 Mitigation Measures

8.8.1 Construction Phase

Requirements stipulated in the *Air Pollution Control (Marine Light Diesel) Regulation*, the *Air Pollution Control (Fuel for Vessels) Regulation*, the *Air Pollution Control (Non-road Mobile Machinery)*

(Emission) Regulation and the *Air Pollution Control (Fuel Restriction) Regulation* will be followed where appropriate to control emissions from the operation of the marine vessels and construction equipment during the construction phase of the Project. Specifically, the following air quality mitigation measures should be incorporated during construction phase:

- Ultra-low sulphur diesel (ULSD) will be used for all construction equipment, as defined as diesel fuel containing not more than 0.005% sulphur by weight;
- The engine of the construction equipment during idling shall be switched off;
- Regular maintenance of the construction equipment shall be conducted to prevent black smoke emission;
- All marine vessels shall operate using marine light diesel with sulphur content lower than 0.05%; and
- Construction equipment, e.g. mobile generator and air compressor, shall comply with the prescribed emission standards with a proper label approved by EPD.

8.8.2 Operation Phase

Requirements stipulated in the *Air Pollution Control (Marine Light Diesel) Regulation*, the *Air Pollution Control (Fuel for Vessels) Regulation*, the *Air Pollution Control (Non-road Mobile Machinery) (Emission) Regulation* and the *Air Pollution Control (Fuel Restriction) Regulation* will be followed where appropriate to control emissions from the operation of the marine vessels and small power generators during the operation phase of the Project. Specifically, the following air quality mitigation measures should be incorporated during operation phase:

- Ultra-low sulphur diesel (ULSD) will be used for the small power generators, as defined as diesel fuel containing not more than 0.005% sulphur by weight;
- The engine of the small power generators shall be switched off if not in use;
- Regular maintenance of the small power generators shall be conducted to prevent black smoke emission;
- All marine vessels shall operate using marine light diesel with sulphur content lower than 0.05%; and
- Small power generators shall comply with the prescribed emission standards with a proper label approved by EPD.

8.9 Cumulative Impact

No existing or planned development has been identified within the 500 m Assessment Area. The construction and operation of another proposed FCZ at Outer Tap Mun about 1.8 km to the west of the nearest Project site boundary may coincide with that of the Project, subject to the implementation schedule of the proposed FCZ at Outer Tap Mun. Considering the small scale construction works and operational activities involved at the proposed FCZ at Outer Tap Mun similar to those for the Project and the large separation distance from the Project site, cumulative air quality impact from the construction and operation of the proposed FCZ at Outer Tap Mun is not expected. Adverse cumulative impact during the construction and operation phases of the Project is thus not anticipated.

8.10 Residual Impact

No adverse air quality impact is expected to arise from the construction and operation of the Project. Hence, there would be no residual air quality impact during the construction or operation of the Project.

8.11 Environmental Monitoring and Audit

Adverse air quality impact is not anticipated to arise from the construction and operation of the Project. Environmental monitoring and audit during the construction and operation phases of the Project is considered not necessary.

8.12 Conclusion

8.12.1 Construction Phase

Emissions from small marine vessels and construction equipment during the construction phase would be minor and short-term and potential air quality impact arising from these emissions is expected to be minimal. Considering that there is large separation distance between the Project site and the identified ASRs (i.e. more than 1 km apart), adverse air quality impact during the construction phase is not anticipated with requirements of relevant regulations under the APCO properly followed. Environmental monitoring and audit is considered not necessary during the construction phase of the Project.

8.12.2 Operation Phase

Emissions from small marine vessels for transportation and power generators associated with the daily mariculture activities during the operation phase would be minor and potential air quality impact arising from these emissions is expected to be minimal. With large separation distance from the identified ASRs (i.e. more than 1 km away), the Project is not expected to cause adverse air quality impact during the operation phase provided that requirements of relevant regulations under the APCO are properly followed. Environmental monitoring and audit is considered not necessary during the operation phase of the Project.