CONTENTS

3. AIR QUALITY IMPACT ASSESSMENT 3-1

3.1 Introduction 3-1

3.2 Relevant Legislation and Guidelines 3-1

3.3 Baseline Conditions 3-2

3.4 Air Sensitive Receivers 3-4

3.5 Identification for Potential Impacts 3-5

3.6 Assessment Methodology 3-6

3.7 Evaluation of Impacts 3-6

3.8 Mitigation Measures 3-8

3.9 Cumulative Impacts 3-10

3.10 Residual Impacts 3-10

3.11 Monitoring and Audit Requirements 3-11

3.12 Conclusion 3-11

Figures

Figure 3.1 Air Sensitive Receivers (ASRs) within Assessment Area

Tables

Table 3.1 - Hong Kong Air Quality Objectives
Table 3.2 - Concentrations of Air Pollutants Measured at EPD's Tung Chung AQMS in the Recent Five Years (2017-2021)
Table 3.3 - Background Air Pollutant Concentrations Predicted by the PATH v2.1 Model in 2025
Table 3.4 - Identified Representative Air Sensitive Receivers (ASRs)

3. AIR QUALITY IMPACT ASSESSMENT

3.1 Introduction

3.1.1 This Section presents the potential air quality impacts associated with the construction and operation phases of the Project in accordance with the requirements stated in *Clause 3.4.4* of the *EIA Study Brief (ESB-334/2020)* and is based on the criteria and guidelines for evaluation and assessment of air quality impacts stated in *Annexes 4 and 12* of the of the *Technical Memorandum on Environmental Impact Assessment Process (EIAO-TM)*. It presents the potential impacts to the identified Air Sensitive Receivers (ASRs) for the Project.

3.2 Relevant Legislation and Guidelines

3.2.1 The principal legislation for the management of air quality in Hong Kong is the *Air Pollution Control Ordinance (APCO) (Cap. 311)*. The prevailing AQOs that have been adopted as the assessment criteria are shown in **Table 3.1**.

Table 3.1 - Hong Kong Air Quality Objectives

Air Pollutant	Averaging Time	Prevailing AQOs	
		Concentration ($\mu g\ m^{-3}$) [(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 (O_3)	8-hour	160	9
Lead	Annual	0.5	-

Notes:
(a) Concentrations of gaseous air pollutants (i.e. NO_2, SO_2, CO and O_3) 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.

3.2.2 In addition to the APCO, a maximum hourly average Total Suspended Particulates (TSP) concentration of 500μg m^{-3} at Air Sensitive Receivers (ASRs) is stipulated in *Annex 4* of the *EIAO-TM* to address potential construction dust impacts.

3.2.3 The measures stipulated in the *Air Pollution Control (Construction Dust) Regulation* will be followed to ensure that potential dust impacts are properly controlled.

3.2.4 Requirements stipulated in the Air Pollution Control (Non-road Mobile Machinery) (Emission) Regulation, Development Bureau Technical Circular No.1/2015 (Emissions Control of NRMM in Capital Works Contracts of Public Works) and the Air Pollution Control (Fuel Restriction) Regulation and will be followed to control potential emissions from non-road mobile machinery (NRMM) during construction phase.

3.2.5 Development Bureau Technical Circular No. 13/2020 (Timely Application of Temporary Electricity and Water Supply for Public Works Contracts and Wider Use of Electric Vehicles in Public Works Contracts) will be followed to specify the use of Electric Vehicles (EVs) and installation of a designated medium-speed charger for each EV in public works contracts, and timely provision of electricity for a wider use of electric equipment to help reduce the use of diesel generators.

3.3 Baseline Conditions

3.3.1 The Project site is located in Mui Wo, Lantau Island. The Project site and its vicinity is rural in nature with villages, small-scale agricultural and industrial establishment such as storage yards and workshops scattered in and around the villages within a 500m Assessment Area. No major air emission sources have been identified that may influence the local air quality within the Assessment Area.

3.3.2 The nearest EPD's air quality monitoring station (AQMS) is located in Tung Chung, about 5.8km away from the Project site. **Table 3.2** presents the relevant time averaging concentrations of air pollutants measured at EPD's Tung Chung AQMS in the most recent five years (i.e. 2017 to 2021) for comparison with the prevailing AQOs.

Table 3.2 - Concentrations of Air Pollutants Measured at EPD's Tung Chung AQMS in the Recent Five Years (2017-2021)

Year	Concentration of Pollutants (µg m^{-3}) [(b)]										
	19th highest 1-hour NO_2	**Annual NO_2**	**4th highest 24-hour SO_2**	**4th highest 10-min SO_2**	**10th highest 24-hour RSP**	**Annual RSP**	**19th highest 24-hour FSP**	**Annual FSP**	**10th highest daily max. 8-hour O_3**	**Daily max. 1-hour CO**	**Daily max. 8-hour CO**
2017	144	36	21	87	81	34	51	21	187	1810	1544
2018	156	33	19	88	73	31	37	18	173	1780	1353
2019	149	33	18	57	75	30	43	19	208	2260	1874
2020	113	28	8	24	66	25	34	14	168	1530	1388
2021	115	26	9	19	63	26	38	17	158	1240	1073
Prevailing AQOs [(a)]	**200**	**40**	**50**	**500**	**100**	**50**	**50**	**25**	**160**	**30,000**	**10,000**

Note:
(a) Data underlined indicate exceedance of the AQO.
(b) Tung Chung AQMS data were referenced from the Annual Air Quality Monitoring Results from 2017 to 2021 on EPD's website. Time-averaging concentrations of the air pollutants relevant to the current set of AQOs, effective from 2022, are provided.

3.3.3 No exceedance of the prevailing AQOs for NO_2, SO_2, RSP and CO was recorded at EPD's Tung Chung AQMS for the past five years. The measured 19th highest daily FSP concentration at EPD's Tung Chung AQMS has exceeded the relevant AQO criterion in 2017. Besides, the measured 10th highest daily maximum 8-hour O_3 concentrations have exceeded the relevant AQO criterion for the past five years except the year 2021.

3.3.4 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 Assessment Area in Year 2025 (i.e. the year of tentative commencement of construction of Project) are presented in **Table 3.3**.

Table 3.3 - Background Air Pollutant Concentrations Predicted by the PATH v2.1 Model in 2025

PATH Grid	Concentration of Pollutants (μg m^{-3})										
	19th highest 1-hour NO_2	Annual NO_2	4th highest 24-hour SO_2	4th highest 10-min SO_2 (a)	10th highest 24-hour RSP (b)	Annual RSP	19th highest 24-hour FSP	Annual FSP (c)	10th highest daily max. 8-hour O_3	Daily max. 1-hour CO	Daily max. 8-hour CO
21,27	100.2	17.5	11.5	63.8	66.0	27.3	38.0	14.7	231.1	912.4	824.1
21,28	107.8	17.3	11.6	76.4	66.2	27.3	37.6	14.7	232.7	919.3	839.5
22,26	98.1	19.3	11.3	68.4	65.5	27.4	36.2	14.5	233.1	911.6	817.4
22,27	101.7	20.4	11.5	72.8	67.5	28.4	37.8	15.5	229.9	917.8	830.4
22,28	107.8	19.8	11.5	78.1	65.4	27.4	36.1	14.7	229.4	917.2	837.6
23,27	107.8	25.5	11.3	73.0	65.3	27.5	34.7	14.5	223.2	915.3	830.0
23,28	107.4	22.4	11.7	76.7	64.6	27.2	34.7	14.4	224.6	909.2	824.5
Prevailing AQOs	**200**	**40**	**50**	**500**	**100**	**50**	**50**	**25**	**160**	**30,000**	**10,000**

Note:
(a) The multiplicative factor for the stability class calculated for each hour was applied to the 1-hour SO_2 concentrations to estimate the 10-minute SO_2 concentrations.
(b) An adjustment of 11.0μg/m^3 and 10.3μg/m^3 were added to the RSP background for calculation of 24-hour RSP and annual RSP, respectively.
(c) An adjustment of 3.5μg/m^3 was added to the FSP background for calculation of annual FSP.
(d) Data underlined indicate exceedance of the new AQOs.

3.3.5 As presented in **Table 3.3**, predicted background concentrations of NO2, SO2, RSP, FSP and CO in all relevant PATH grids in 2025 are below their respective AQO criteria. The predicted background concentrations of O_3 in 2025 show exceedances of the relevant AQO criterion in these PATH grids.

3.4 Air Sensitive Receivers

3.4.1 In accordance with *Section 3.4.4.2* of the *EIA Study Brief (ESB-334/2020)*, the Assessment Area for air quality impact assessment is defined as an area of 500 m from the boundary of the Project site. Representative air sensitive receivers (ASRs) identified within the Assessment Area are shown in **Figure 3.1** and listed in **Table 3.4**.

Table 3.4 - Identified Representative Air Sensitive Receivers (ASRs)

ASR	Description	Type of Use	Approx. Maximum Height (m above ground)	Approx. Separation Distance from the Project Site Boundary (m)
A1	Tai Tei Tong	Residential	9	95
A2	Nam Bin Wai	Residential	8	40
A3	Ma Po Tsuen	Residential	4	10
A4	Ling Tsui Tau	Residential	5	10
A5	Tsoi Yuen Tsuen	Residential	4	20
A6	Mui Wo Kau Tsuen	Residential	2	≤5
A7	Chung Hau	Residential	8	20
A8	Ngan Ho Court	Residential	44	70

ASR	Description	Type of Use	Approx. Maximum Height (m above ground)	Approx. Separation Distance from the Project Site Boundary (m)
A9	Silver View Centre	Residential	8	≤5
A10	Silver Waves Court	Residential	6	225
A11	Silvermine Beach Hotel	Hotel	11	170
A12	Luk Tei Tong	Residential	9	15
A13	Mui Wo School	Education	5	≤5
A14	Lick Hang Kindergarten	Education	4	130
A15	Lai Lai Nursing Centre	Community	8	130
A16	Mui Wo Government Offices	Community	12	180
A17	Pak Tai Temple	Place of Worship	7	140
A18	Church of Christ in China Mui Wo Church	Place of Worship	5	50
A19	Tin Hau Temple	Place of Worship	3	50
A20	Hung Shing Temple	Place of Worship	6	15
A21	Mui Wo Municipal Services Building	Office	20	10
A22	Mui Wo Fire Station	Government	12	30
A23	Mui Wo Rest Garden	Recreational	-	200

3.5 Identification for Potential Impacts

Construction Phase

3.5.1 In accordance with the preliminary construction programme presented in **Appendix 2.4**, the major construction activities in the Assessment Area include the construction of stormwater pumping station and associated drains, construction of diversion box culvert, river improvement works, construction of tidal gate and river revitalisation works at Luk Tei Tong Bypass Channel.

3.5.2 Major fugitive dust emission (in terms of TSP, RSP and FSP) may arise from the following construction works:

- Excavation works and stockpiling of excavated materials, associated with the construction of stormwater pumping station, drains, diversion box culvert and river improvement works;
- Piling works associated with the construction of stormwater pumping station; and
- Movements of site vehicles on haul roads.

3.5.3 In addition, gaseous emission from fuel combustion may arise from the use of powered mechanical equipment (PME) for various construction works. The key air pollutants of concern from fuel combustion emission include RSP, FSP, NO_2 and SO_2.

3.5.4 Odour impact may also arise from the excavation of river sediment associated with the construction of tidal gate, construction of mechanical penstock, modification of agricultural weir, construction of fish ladders and river reprofiling works.

Operation Phase

3.5.5 During operation phase of the project, regular maintenance desilting and debris clearance will be necessary for the river channel of Tai Tei Tong River, Pak Ngan Heung River, Luk Tei Tong Bypass Channel and Luk Tei Tong River to remove excessive silts, vegetation growth, rubbish and obstructions. Typically, desilting and debris clearance would be conducted in monthly interval and after rainstorm in wet season (April to October), and only after rainstorm during dry season (November to March). Such maintenance works would require only light mechanical equipment such as a small loader and crane truck, and hand-held equipment. Therefore, adverse impacts from the fugitive dust and gaseous emissions due to the use of PMEs are not expected.

3.5.6 Odour impact may also arise from the desilting works but is expected to be minor with the proper implementation of good site practices in **Section 3.8.2**.

3.6 Assessment Methodology

3.6.1 Only 1 to 2 excavators will be used for the excavation works in an active works area. Construction works for drains, diversion box culvert and river improvement works will be conducted in sections, where each section will be about 10 m long. Piling works associated with stormwater pumping station are scheduled to last for only 4 months throughout the construction period. Only 2 drill rigs will be used for the piling of mini piles. The PMEs that are in operation simultaneously will only be limited to the active works area. Hence, the air emissions associated with the construction activities are expected to be minor. In addition, the background pollutant concentrations for the key air pollutants of concern (i.e. NO_2, SO_2, RSP and FSP) within the 500 m Assessment Area in 2025 are predicted to be low and well below the relevant AQOs. The Project activities during operation phase are expected to be less frequent and in a substantially smaller scale, as compared with those during construction phase.

3.6.2 In view of the above, quantitative assessment of air quality impact due to construction and operation activities of the Project is considered not necessary and the construction and operation phases air quality impact have been addressed qualitatively in **Section 3.7**.

3.7 Evaluation of Impacts

Construction Phase

Fugitive Dust

3.7.1 The excavation work for stormwater pumping station will require an excavation depth up to 15 m and generate ~22,000 m^3 of excavated materials. However, the size of excavation works area will only be approximately 1,650 m^2 and such excavation work is scheduled to last for about 4 months only.

3.7.2 The excavation works for drains, diversion box culvert and river improvement will require an excavation depth ranges from 1 to 5.5 m and generate ~2,500 m^3 to ~11,950 m^3 of excavated materials, depending on the location and construction activities. The excavation works will last for 4 to 15 months. However, such excavation work will be carried out section-by-section of about 10 m each with an active excavation works area ranges from only 10 to 141 m^2.

3.7.3 Considering altogether the excavation works for drains, diversion box culvert and river improvement works; and for stormwater pumping station, a total amount of ~53,607 m^3 of excavated materials is estimated to be generated throughout the construction period, and ~3,839 m^3 will be reused on-site. It is expected to have at most 3 active excavation works areas at the same time with 1 to 2 excavators in operation in each works area.

3.7.4 Onsite stockpiling of excavated material will be temporary and backfilled when the associated excavation work is completed. Tarpaulin sheets will also be used to cover the temporary stockpiles to reduce potential dust emissions.

3.7.5 In view of the above justifications from **Section 3.7.1** to 3.7.4, adverse fugitive dust impact associated with the excavation works and the onsite stockpiling of excavated materials is not expected with the implementation of good construction site practises and relevant mitigation measure recommended in the *Air Pollution Control (Construction Dust) Regulation*.

3.7.6 Mini piles will be required for the construction of wet well and the pumping station structure at the stormwater pumping station. The piling activities are small-scale in nature where only 2 drill rigs will be utilized and confined only to the works area of stormwater pumping station. The piling work is scheduled to last for 4 months only throughout the construction period. Adverse fugitive dust impact associated with the piling works is thus not expected with the implementation of good construction site practises and relevant mitigation measure recommended in the *Air Pollution Control (Construction Dust) Regulation*.

3.7.7 Fugitive dust from site vehicles movement on haul roads is expected to be mainly due to the regular C&D waste transportation by dump trucks to/from the works area. A total of 12 truck trips per day (i.e. 11 truck trips for inert C&D materials and 1 truck trip for non-inert C&D materials per day) is estimated to be required throughout the 29-month construction period with excavation. For the construction period without excavation works, only 1 truck trip for non-inert C&D materials per day is estimated. Since the construction activities will not be undertaken concurrently at all works areas during the construction period, the C&D waste transportation activity by dump trucks will be distributed to the different active works areas along the Project alignment.

3.7.8 In addition, site vehicles travelling offsite will be on existing paved roads. All vehicles will also be washed to remove any dusty materials from the bodies and wheels, and the dusty C&D materials carried by the dump trucks will also be covered before leaving the works area.

3.7.9 In view of the above justifications from **Section 3.7.7** to **3.7.8**, adverse fugitive dust emission associated with the site vehicle movement is not expected with proper implementation of the associated good construction site practices.

Gaseous Emission from PMEs

3.7.10 On average 3 PMEs will operate simultaneously in an active works area. A maximum of 7 active works areas (including 3 active works areas for excavation works and 4 areas for other work, such as formwork erection, concreting, etc.) is expected and thus only a maximum of 21 PMEs are expected to operate simultaneously among all active works areas. In addition, requirements in the *Air Pollution Control (Non-road Mobile Machinery) (Emission) Regulation, Development Bureau Technical Circular No.1/2015 (Emissions Control of NRMM in Capital Works Contracts of Public Works)* and *Air Pollution Control (Fuel Restriction) Regulation* will be followed to control the emissions from the PMEs. Adverse air quality impact associated with the gaseous emission from PMEs is not anticipated.

Odour

3.7.11 Excavation of river sediment will be involved for the construction of tidal gate, construction of mechanical penstock, modification of agricultural weir, construction of fish ladders and river reprofiling works. Depending on the quality of the river sediment, the excavation and handling of river sediment may cause odour impacts during construction. With the implementation of good site practice recommended in **Section 3.8.1**, odour impact is not anticipated.

Operation Phase

Odour

3.7.12 The desilting works during operation phase are considered small-scale and infrequent in which the works would be typically conducted in monthly interval and after rainstorm in wet season (April to October), and only after rainstorm during dry season (November to March). Depending on the quality of the silt, the desilting work may cause odour impacts during the operation phase of the Project. With the implementation of good site practice recommended in **Section 3.8.2**, odour impact is not anticipated.

3.8 Mitigation Measures

Construction Phase

3.8.1 The following control measures stipulated in the *Air Pollution Control (Construction Dust) Regulation* and good site practices will be incorporated into the Contract Specifications and implemented throughout the construction phase:

- Impervious sheet shall be provided for skip hoist for material transport;

- The area where any dusty work take place should be sprayed with water or a dust suppression chemical immediately prior to, during and immediately after such work as far as practicable;

- All dusty materials should be sprayed with water or a dust suppression chemical immediately prior to any loading, unloading or transfer operation;

- Dropping heights for excavated materials should be controlled to a practical height to minimise the fugitive dust arising from unloading;

- Temporary stockpiles of dusty materials shall be either covered entirely by impervious sheets or sprayed with water to maintain the entire surface wet all the time;

- Stockpiles of more than 20 bags of cement, dry pulverised fuel ash and dusty construction materials shall be covered entirely by impervious sheeting sheltered on top and 3-sides;

- All exposed areas shall be kept wet to minimise dust emission;

- During transportation by truck, materials should not be loaded to a level higher than the side and tail boards, and should be dampened or covered before transport;

- Immediately before leaving a construction site, all vehicles should be washed to remove any dusty materials from the bodies and wheels. However, all spraying of materials and surfaces should avoid excessive water usage;

- NRMMs shall comply with the prescribed emission standards with a proper label approved by EPD in accordance with the *Air Pollution Control (Non-road Mobile Machinery) (Emission) Regulation*;

- ULSD will be used for all construction plant on-site, as defined as diesel fuel containing not more than 0.005% sulphur by weight) as stipulated in *Environment, Transport and Works Bureau Technical Circular (ETWB-TC(W)) No 19/2005* on Environmental Management on Construction Sites;

- On-site construction equipment shall be connected to mains electricity supply and the use of diesel generators and diesel-powered equipment shall be avoided as far as practicable to minimise the gaseous emission from these machineries;

- The engine of the construction equipment during idling shall be switched off;

- Regular maintenance of construction equipment deployed on-site shall be conducted to prevent black smoke emission;

- For construction works that are in close distance (i.e. <10m) to the ASRs, adopt at least 2.4m and higher hoarding height close to the ASRs; and

- Avoid dusty works and stockpiling near the ASRs with close distance (i.e. <10m).
- Excavated river sediment will be reuse on-site, stockpiling of river sediment will be avoided as far as possible. If temporary stockpiling of river sediment is necessary, the excavated sediment will be covered by tarpaulin to avoid potential dust / odour emission.
- To minimize the potential odour / dust emissions during excavation and transportation of the sediment, the excavated sediment will be wetted during excavation / material handling and shall be properly covered when placed on trucks or barges. Loading of the excavated sediment the barge will be controlled to avoid splashing and overflowing of the sediment slurry to the surrounding water.

Operation Phase

3.8.2 If temporary stockpiling of desilted material is necessary, the stockpiles will be covered by tarpaulin to avoid potential odour emission and avoided to be placed near the ASRs with close distance (i.e., <10m). Desilted material shall also be properly covered when placed on trucks or barges.

3.9 Cumulative Impacts

3.9.1 With reference to **Section 2.16**, the Project would have potential interface with the Desilting Works at River Silver Mui Wo. Location of this interfacing project is presented in **Figure 2.5**.

3.9.2 The construction works for "Desilting Works for River Silver Mui Wo" will be carried out after annual review of the silting situation and is restricted to be carried out from December to February (non-bathing season) or closing date of Silvermine Bay Beach. Hence, it is not expected to have continuous and prolonged overlapping period with this Project. Given the limited size of the works area (i.e. 1350m^2), significant fugitive dust and odour impacts are not expected. Desilting works will also be carried out manually by handheld equipment such that fugitive dust emission from the desilting works is limited. Close liaison with the Contractor of this interfacing project will also be taken place, if possible, to minimize the simultaneous construction activities with this interfacing project. In addition, with the mitigation measures and good site practice in place, adverse cumulative impact on air quality is not expected.

3.10 Residual Impacts

3.10.1 No adverse residual air quality impact is expected to arise from the construction of the Project with the implementation of the recommended mitigation measures.

3.10.2 The desilting works during operation phase are considered small-scale and infrequent. No adverse residual air quality impact is expected to arise from the operation of the Project with the implementation of the recommended mitigation measures.

3.11 Monitoring and Audit Requirements

3.11.1 Adverse air quality impact associated with the construction and operation of the Project is not expected with the implementation of the recommended mitigation measures. Site inspections and audits are recommended to ensure the proper implementation of the recommended mitigation measures during the construction phase of the Project.

3.11.2 Since the recommended mitigation measures can readily mitigate the potential air quality impact, air quality monitoring during the construction and operation phases of the Project is considered not necessary.

3.12 Conclusion

3.12.1 During construction phase of the Project, potential air quality impact from fugitive dust may arise from excavation works and stockpiling of excavated material and piling works. Potential air quality impact may also arise from the gaseous emission due to the use of PMEs. However, adverse air quality impacts due to fugitive dust, gaseous emission from PMEs and odour impact arise from excavation of river sediment during the construction phase are not expected with the implementation of recommended mitigation measures.

3.12.2 During operation phase of the Project, regular maintenance desilting and debris clearance will be necessary. Adverse air quality impacts due to fugitive dust gaseous emission from PMEs and odour impact arise from maintenance works are not anticipated with the implementation of recommended mitigation measures.

3.1.1 Site inspections and audits during construction phase of the Project to ensure proper implementation of the mitigation measures are recommended. Air quality monitoring is considered not necessary during the construction and operation phases of the Project.