MTR Corporation Ltd

Environmental Impact Assessment Study for Tung Chung Line Extension

Executive Summary

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1 Introduction

1.1 Background

1.1.1.1 Tung Chung Line Extension (the Project) was first initiated in the Railway Development Strategy 2014 (RDS-2014) announced by the Government of the Hong Kong Special Administrative Region, which includes the conceptual scheme of Tung Chung West (TCW) Extension and a possible Tung Chung East (TCE) Station.

1.1.1.2 This new railway system has been included in the approved Schedule 3 EIA for Tung Chung New Town Extension (TCNTE), which has included the new stations at TCE area and TCW area and the associated trackwork and tunnel. However, a separate Schedule 2 EIA study for this railway system is conducted to address the associated environmental impacts, taking into account of the latest design.

1.1.1.3 In July 2020, MTR Corporation Ltd. (i.e. the Project Proponent) commissioned Ove Arup & Partners Hong Kong Limited to provide consultancy services for the compilation and submission of an EIA Report to fulfil the relevant legislative requirements under the EIAO.

1.2 Site Location and History

1.2.1.1 The Project is an approximately 1.3km extension of the existing Tung Chung Line (TCL) with two new stations namely TCE Station and TCW Station.

1.2.1.2 The at-grade TCE Station will be located approximately 2km east of the existing Tung Chung Station (TUC) at the south of the future TCNTE (East) new reclamation area. The station is bounded by the future roads in the reclamation area and the existing TCL and Airport Express Line (AEL).

1.2.1.3 The underground TCW Station and above-ground station facilities will be located at the existing rural area – west of Yat Tung Estate. The area is an open space and currently occupied by orchard and some temporary structures.

1.2.1.4 The Emergency Access Point (EAP)/ Emergency Egress Point (EEP) building will be located at an artificial slope near Shun Tung Road.

1.3 Scope of the Project

1.3.1.1 **Figure 1.1** shows the latest alignment and locations of the following key elements.

- A new TCE Station (at-grade) and diversion of a section of existing TCL;
- Railway alignment (in the form of a tunnel) extending from existing overrun of TUC to the new TCW Station;
- A new TCW Station (underground) and overrun tunnel;

- EAP/ EEP building; and
- Station associated facilities (entrances, vent shaft structures, etc.).

1.3.1.2 **Figure 1.1** also shows the temporary works sites, works areas and barging facility for the Project.

1.3.1.3 The EIA report has included locations of the works sites and works areas of the Project for supporting the construction of the Project based on the latest information at the time of writing.

1.4 Scope of this EIA Report

1.4.1.1 Pursuant to Section 5(7)(a) of the EIA Ordinance, the Director of Environmental Protection issued a Study Brief (No.: ESB-329/2020 dated 4 June 2020) for the EIA study. This EIA study focused on assessing the potential impacts associated with the construction and operation of the Project in accordance with the Study Brief requirements.

1.5 Purpose of this Executive Summary

1.5.1.1 This Executive Summary (ES) highlights the key information and findings of the Tung Chung Line Extension EIA Study.

2 Project Description

2.1 Purposes and Objectives of the Project

2.1.1.1 As mentioned in **Section 1.1**, the Railway Development Strategy 2014 (RDS-2014) had included the conceptual scheme of TCW Extension and a possible TCE Station. The Project forms one complementary package of sustainable transport solution in support of the future land supply, housing developments, and airport expansion plans at Lantau North.

2.1.1.2 This new railway system has been taken into account in the approved Schedule 3 EIA for TCNTE (i.e. AEIAR-196/2016). The purpose of this Project is to provide an environmental and convenient public transportation mode for both the existing and future population in TCE and TCW. Hence, it is an integral part of the new town extension.

2.1.1.3 By introducing this new transportation infrastructure to Tung Chung, the local communities, both the existing and planned population, could enjoy a modern and green railway system and hence reduce the reliance on road-based traffic.

2.1.1.4 According to the latest information, a new intermediate station would be introduced in TCE area (i.e. TCE Station). Some sections of the existing TCL tracks in TCE Area would need to be slightly diverted to suit the location of the new TCE Station which is located on reclaimed land formed by the new town reclamation. The existing TCL will also be extended westward by approximately 1.3km from the existing TUC. Another new station in TCW area (i.e. TCW Station) will be introduced at the end of this extension and is located to the west of Yat Tung Estate.

2.2 Need of the Project

2.2.1.1 With the TCE and TCW Stations in place, both the existing and planned population would be offered the opportunity for convenient access to a modern and green train system that connects to other parts of Hong Kong efficiently. For TCE area, in particular, the latest planning is to accommodate a new population of more than 140,000. The existing population including but not limited to Ying Tung Estate would also enjoy the convenience of accessing the new TCE Station. Similarly, for TCW area, the latest planning is to accommodate a new population of more than 35,000. The existing population including but not limited to Yat Tung Estate, Mun Tung Estate, village houses along Tung Chung Road, etc. would enjoy the convenience of accessing the new TCW Station.

2.2.1.2 These 2 new stations would attract more people to select this electrified train system instead of relying on road-based vehicles. In other words, implementing the Project would help to control the increase of road traffic noise and vehicular emission throughout the new town extension process.

2.3 Scenarios "With" and "Without" the Project

2.3.1 Without Project Scenario

2.3.1.1 Without the Project in place, the planned population and neighbouring existing population requiring commuting to other parts of HK would either select road-based vehicles (i.e. buses or private cares, etc.) to travel to their destinations directly, or select connecting buses to the existing TUC and transit via TCL. For TCW area as an example, most of the existing population at Yat Tung Estate, Mun Tung Estate, villages along Tung Chung Road would also need to take connecting buses to the existing TUC and transit via TCL. This would obviously increase the reliance on road-based vehicles. Hence, the road traffic noise impact and air quality impact due to vehicular emissions would be adverse.

2.3.2 With Project Scenario

2.3.2.1 With the introduction of the 2 new train stations at TCE and TCW areas, all the planned population and neighbouring existing population would have the choice to get access to these new stations and then transit to TCL swiftly. This would definitely reduce the reliance on road-based vehicles for commuting to other parts of Hong Kong.

2.4 Tackling Environmental Challenges and Options Considered

2.4.1.1 Due considerations have been given in formulating options to address the environmental challenges in this Project. The hierarchy of "Avoid, Minimize and Mitigate" has been fully adopted in the process to protect the environment as much as practicable. A summary of the key considerations for options on the alignment, design, and construction methodology of the Project is given in **Tables 2.1**, **2.2**, **2.2a** and **2.3** below.

Table 2.1 Summary of alignment options considered

Alignment Options	Pros	Cons	Preferred Option (Y/N)
Option 1 Alignment in EIA SB	• Avoided all the mangroves, mudflats, woodland, most of the Ma Wan Chung SAI by adopting TBM tunnelling • TCW Station is located at orchards with low ecological value • Avoided diversion of Wong Lung Hang nullah	• Land resumption for some private lands required at the west and north of the TCW Station • Alignment runs underneath a small part of Ma Wan Chung and the burial ground in Rocky Lion Hill along Shun Tung Road, but would be in granite layer with sufficient vertical separation.	**Y**

Alignment Options	Pros	Cons	Preferred Option (Y/N)
Option 2 Yu Tung Road Alignment	• Avoided all environmental resources and constraints in Ma Wan Chung • Avoided the ecological resources • Land resumption for private land not required	• Diversion of Wong Lung Hang nullah required • Likely exceedance of groundborne vibration set by North Lantau Hospital even with best practicable mitigation measures • Potential impacts of electromagnetic interference at the North Lantau Hospital • Alignment runs close to the burial ground on Rocky Lion Hill along Shun Tung Road, but would be in the granite layer with sufficient vertical separation.	N
Option 3 Chung Yan Road Alignment	• Land resumption for private land not required • Avoided diversion of Wong Lung Hang nullah • Avoided the ecological resources	• Location of TCW Station would not cover the target catchment which makes this option not attractive • Alignment runs underneath the burial ground on Rocky Lion Hill along Shun Tung Road, but would be in granite layer with sufficient vertical separation.	N

Table 2.2 Summary of Options for EAP/EEP Considered

Options for EAP / EEP	Pros	Cons	Preferred Option (Y/N)
Option A EAP/EEP at Tung Chung Road North	• Avoided Ma Wan Chung SAI	• Located at secondary woodland which has moderate ecological value, and hence higher ecological impacts • Constrained EVA access • Potential objections from local residents • Able to serve Alignment Option 1 only	N
Option B EAP/EEP at Shun Tung Road	• Avoided Ma Wan Chung SAI • Located at an artificial slope with plantation	• Requires due consideration on the aesthetic design for the building structure	**Y**

Options for EAP / EEP	Pros	Cons	Preferred Option (Y/N)
	only and hence much less ecological impacts • Fewer constraints for EVA access • Less potential objections from local communities on burial grounds • Able to serve all the 3 Alignment Options		

Table 2.2a Summary of Options foTBM Launching Shaft Considered

Options for TBM Launching Shaft	**Pros**	**Cons**	**Preferred Option (Y/N)**
Option 1 Near Tung Chung Crescent	• Comparatively less construction risk	• Requires noise enclosure for the launching shaft	**Y**
Option 2 At TCW Station	• Nil	• Additional land resumption at TCW likely to be required • Programme for TCW Station opening is adversely affected • Requires noise enclosure for the shaft near Tung Chung Crescent • Slightly higher construction risk	**N**
Option 3 At immediate west of Shun Tung Road	• Nil	• Programme for TCW Station opening is adversely affected • Requires noise enclosure for the shaft near Tung Chung Crescent • Additional impacts to existing utilities at Shun Tung Road • Prolonged occupation of Shun Tung Road for construction of cut & cover tunnel • Additional C&D materials are generated • Additional impacts to existing trees and burial grounds on Shun Tung Road slope	**N**

Table 2.3 Options for tunnelling through Ma Wan Chung

Tunnelling options through Ma Wan Chung	**Pros**	**Cons**	**Preferred Option (Y/N)**
Option 1 Open cut, cut-&-cover, or immersed tube	• N.A.	• Significant marine works such as dredging and temporary reclamation • Major environmental impacts even if all the practicable measures are implemented	N
Option 2 TBM tunnelling	• Avoidance of marine works • Avoidance of direct environmental impacts in air quality, noise, water quality, waste, ecology, fisheries, land contamination and sediment, landscape and visual aspects	• Potential groundborne noise impact	**Y**
Option 3 Drill and blast	• Avoidance of marine works • Avoidance of direct environmental impacts in airborne construction noise, water quality, ecology, fisheries, land contamination and sediment, landscape and visual aspects	• Potential risk due to the use of explosives • Potential higher impulsive vibration impact • Potential dust impact	N

2.4.1.2 Besides, due consideration has also been given in formulating the design of the Project to overcome environmental challenges encountered. The key principles adopted to tackle all the environmental challenges are listed in **Table 2.4** below.

Table 2.4 Key design considerations and the associated environmental benefits

Design Approach	Key Design Considerations and the Associated Environmental Benefits
Avoidance of marine works	• Adopt flat top barge arrangement to avoid dredging and marine works for the setting up of the barging point • Adopt Tunnel Boring Machine (TBM) tunnelling at Ma Wan Chung to avoid any marine works • Avoid direct impacts on the important marine/ intertidal ecological resources in the vicinity such as Tung Chung River and Ma Wan Chung
Avoidance of works within / direct impact upon Tung Chung River and its estuary, and Tai Ho Wan	• Avoid marine works in the current design • Avoid direct impacts to ecologically important areas such as Tung Chung River and Tai Ho Wan
Avoidance of works within the intertidal zone	• Allow a setback from the coastline of Tung Chung Bay in the current design • Limit construction works beyond the tidal influence zone and above the high-water mark at the abandoned drainage channel at the west of Yat Tung Estate • Avoid direct impacts to the intertidal zone in Tung Chung Bay and Wong Lung Hang estuary
Avoidance of works within Country Parks,	• Strategically locate the above-ground structures at areas of low ecological values

Design Approach	Key Design Considerations and the Associated Environmental Benefits
Site of Special Scientific Interest (SSSI), Conservation Area (CA) and Costal Protection Area (CPA)	• Avoid any impacts to Lantau North (Extension) Country Park, Tai Ho Stream SSSI, Tai Ho Priority Site, CA and CPA
Avoidance of works within secondary woodland	• Strategically relocate the EAP/ EEP to an artificial slope consisting of plantation of low ecological value at Shun Tung Road • Avoid or minimize loss of secondary woodland
Avoidance of re-diversion of Wong Lung Hang nullah	• Avoid any re-diversion of the Wong Lung Hang nullah due to the overrun tunnel • Avoid any direct impacts on the Wong Lung Hang estuary
Avoidance of works within SAI	• Adopt TBM tunnelling within the granite layer underneath Ma Wan Chung • Avoid any direct impacts to Ma Wan Chung Site of Archaeological Interest (SAI) • No excavation works would be conducted within Ma Wan Chung SAI and the engineering works would be conducted at least 10m below ground, which would be the granite layer
Minimisation of surface runoff and provision of necessary treatment facilities	• Adopt special enhancement measure such as sheet piles or hoarding with concrete footing along the western boundary of the construction site/works areas for TCW Station • Minimise any untreated surface runoff into the Tung Chung River estuary and the Wong Lung Hang estuary
Minimisation of noise disturbance during construction	• Adopt noise mitigation measures such as use of Quality Powered Mechanical Equipment (QPME), noise enclosure at TBM launching shaft/ retrieval shaft and screen cover at EAP/ EEP during construction phase • Adopt temporary movable noise enclosures for the D-wall construction of TCW Station • Minimise construction noise impacts to large water birds at Tung Chung River and Wong Lung Hang as well as many Noise Sensitive Receivers (NSRs) in close proximity
Minimisation of air quality impacts during construction	• Adopt mitigation measures for fugitive dust such as regular spray, exposed earth surface covered by tarpaulins, standard wheel washing facilities at the construction site exits, vehicle washing at the exit of the barging facility with the provision of vehicle washing facilities • Provision of 3-side with top cover and spraying system at unloading points at the barging facility • Blasting to be carried out in a fully enclosed environment • Avoid using exempted Non-Road Mobile Machinery (NRMM) where practicable • Use power supplied from power utilities when practicable
Minimisation of human disturbance during construction	• Install site hoarding of appropriate height along site boundaries during construction phase • Confine construction activities and material storage within the construction sites • Do not provide dedicated access to the nearby ecological sensitive areas outside the construction sites

Design Approach	Key Design Considerations and the Associated Environmental Benefits
	• Minimise unnecessary human access and disturbance to nearby areas as far as practicable
Minimisation of the risk of unauthorised filling activities	• Adopt trip-ticket system to monitor the disposal of construction and demolition materials • Provide warning signs to deter any illegal dumping activities • Adopt marine transport at the proposed barging facility and proposed land-based transport through Tuen Mun – Chek Lap Kok (TM-CLK) Link for transportation routes of C&D materials
Provision of Global Positioning System (GPS) for dump trucks to prevent illegal dumping	• Install GPS or equivalent system at all dump trucks for delivery of inert C&D materials from the site to disposal locations to track down their instant locations • Ensure the dumps trucks transportation routes follow the designated roads • Avoid direct impacts to all the ecological habitats in Tung Chung Valley
Maintain the Visual Corridor Planned in TCNTE	• Design the TCE Station to maintain the north-south corridor as one of the planning considerations during the preparation of RODP adopted in the approved EIA report

2.5 Proposed Alignment and Development Scheme

2.5.1.1 Considering all the environmental constraints identified and engineering/operational requirements, the design team has developed the preliminary design for the Project, with the key elements summarized in **Table 2.5**. **Figure 1.1** shows all the key elements for the Project.

Table 2.5 Key elements of the Project

Key element	Location	Descriptions
TCE Station and associated at-grade railway track	Between the existing TUC and Sunny Bay Station	• An above-ground station and its associated facilities • Slight diversion of existing TCL track in TCE is required to suit TCE Station • With at-grade ballast track and station concrete track of about 1.5km in length
TCW Station and associated underground railway track	West of Yat Tung Estate	• An underground station and its associated facilities • Extension of existing TCL • With underground track of about 1.3km in length
TBM tunnelling	Between Tung Chung Crescent and Tung Chung West Station	• With tunnel length of about 1.3km in length • At least 10m underneath Ma Wan Chung Village
EAP/EEP	Artificial slope west of Shun Tung Road	• An above-ground structure • An underground shaft of about 25m in length
Works sites	TCE and TCW	• Construction activities for the construction of TCE Station, TCW Station, railway tracks, tunnel, EAP/EEP, vent shaft • Allocation of associated construction plants, temporary traffic management, site investigation works, minor utility works, etc.
Works areas	TCE and TCW	• General storage • Site offices • Workshops • Barging facility

Key element	Location	Descriptions
		• Temporary traffic management, site investigation works, minor utility works, etc.
Barging facility	To the north of Tung Chung Waterfront Road	• An area of about 13,000m^2 • Two berths for the delivery of construction wastes/materials • A small stockpiling area of about 700m^2

2.5.2 Proposed Construction Methodology

2.5.2.1 Potential environmental impacts have been duly considered and assessed throughout the EIA stage to avoid the adverse environmental impacts of the Project. As such, environmentally conscious construction methodologies have been adopted to avoid, minimise and mitigate environmental impact from the Project as far as practicable.

Construction of the TCE Station

2.5.2.2 This station is located at the reclaimed land formed under the TCNTE. Typical construction sequence of this above-ground TCE Station is given below:

- Site clearance/site formation;
- Pre-bored socket H-piling and bored piling for foundations;
- Construction of above-ground structures; and
- Site reinstatement.

At-Grade Tracks in the Vicinity of TCE Station

2.5.2.3 Typical construction sequence of implementation at-grade track is given below:

- Site clearance;
- Construction of mini-piles and retaining wall;
- Site formation;
- Removal of existing noise barriers;
- Existing TCL track modification;
- Installation of turnouts;
- Provision of noise barriers;
- Realignment of TCL down track;
- Site formation;
- Realignment of TCL up track;
- Site reinstatement; and
- Removal of abandoned TCL tracks.

Tunnelling through Ma Wan Chung

2.5.2.4 Typical construction sequence of the TBM launching and retrieval shaft are given below:

- Site clearance;
- Construction of pipe pile and diaphragm wall;
- Excavation and installation of struts;
- Construction of permanent cast-in-situ concrete tunnels between the existing overrun tunnels and the future TBM tunnel;
- Removal of struts; and
- Backfilling and site reinstatement.

2.5.2.5 The following environmental aspects would be benefited due to the use of TBM tunnelling.

- Less construction dust impact;
- Less airborne construction noise impact;
- Less water quality impact;
- Fewer trees to be affected;
- Less ecology and fisheries impact;
- Less cultural heritage impact;
- Less landscape and visual impact;
- Less land contamination and sediment issue; and
- Less waste generation.

Tung Chung West Station (TCW Station)

2.5.2.6 Typical construction sequence of the underground TCW Station construction is given below. After site clearance, the diaphragm wall and foundation would be constructed. The cofferdam would be excavated progressively and struts would be installed as temporary lateral support. Afterward, top-down construction would be adopted for the permanent concrete structure of the station box. Last, all struts would be removed, and the site would be backfilled.

- Site clearance;
- Construction of D-walls;
- Construction of piles;
- Excavation and installation of struts;
- Construction of roof (ground level) slab of station box;

- Construction of transfer level slab;
- Construction of concourse level slab;
- Construction of track level (base) slab;
- Construction of platform level structure;
- Removal of struts;
- Construction of internal walls; and
- Backfilling and site reinstatement.

2.5.2.7 Typical construction sequence (i.e. from ground floor to roof) of above-ground station entrances and the vent shaft structures is given below. The entrances and vent shaft structures would be constructed from ground floor to roof.

- Construction of ground level slab;
- Construction of walls; and
- Construction of roof slab.

EAP/EEP at West of Shun Tung Road

2.5.2.8 The typical construction sequence of EAP/EEP is given below:

- Site clearance;
- Construction of pipe pile wall;
- Excavation and installation of struts and soil nail for EAP/EEP building;
- Foundation construction;
- Excavation and installation of rock dowel for underground shaft;
- Structural construction; and
- Site reinstatement.

Establishing Barging Facility

2.5.2.9 In order to avoid dredging at this area, flat top barges would be deployed to form 2 temporary unloading points to allow lorries/dump trucks to drive on and reach the spoil carriers berthing at the end of the barges. By adopting this approach, any marine works including dredging and seawall modification below the high water mark would be avoided. The maximum number of barges would be 1 per berth at any one time.

2.6 Environmental Initiatives

2.6.1.1 While a number of design initiatives have been incorporated to tackle various environmental challenges, the Project aims to achieve more than the statutory

requirements. In addition, the Project would be designed to adapt the climate change and consider strategies to improve climate resilience. Thus, various environmental initiatives have been identified for the Project. These initiatives cover different aspects including:

- PV Panels;
- Solar Tubes; and
- Rainwater Harvesting.

2.6.1.2 While these initiatives are generally considered feasible at this stage, the extent of applications and other details have to be revisited and further established during the detailed design stage when the engineering design is further developed.

2.7 Summary of Environmental Benefits and Environmental Achievements of the Project

2.7.1.1 Site constraints and impacts have been identified and assessed and mitigation measures/good site practices, if necessary, have been recommended to avoid negative environmental impacts to the surroundings. Additionally, comments from district councils, green groups, and other stakeholders have also been reviewed and incorporated where practicable. A number of environmental initiatives covering good managing practices, waste minimisation, and nature conservation have been recommended for incorporation in the detailed design.

2.7.1.2 The key environmental benefits and achievements of the Project are listed below.

- Reduce the reliance on road-based vehicles;
- Promote the use of environmentally friendly rail system;
- Reduce road traffic noise; and
- Reduce vehicular emissions.

2.8 Tentative Implementation Programme

2.8.1.1 A summary of the key construction works period is listed below. All site reinstatement works would be completed between Q1 2028 and Q4 2029, with the exception of TCW, which would start in Q4 2027. After the commencement of the Project, the removal of the existing TCL track and associated site reinstatement would be conducted from Q4 2029 to Q4 2030.

- TCE: Q2 2023 – Q1 2028
- Launching/Retrieval Shaft at Tung Chung Crescent: Q2 2023 – Q3 2027
- EAP/EEP: Q2 2023 – Q4 2025
- TCW: Q2 2023 – Q4 2027
- Barging Facility: Q2 2023 – Q4 2029

3 Summary of Environmental Impact Assessment

3.1 Air Quality

3.1.1 Construction Phase

3.1.1.1 Fuel combustion from the use of Powered Mechanical Equipment (PME) during construction works could be a source of Nitrogen Dioxide (NO_2), Sulphur Dioxide (SO_2) and Carbon Monoxide (CO). Emissions from machines and non-road vehicles are controlled by the Air Pollution Control (Non-road Mobile Machinery) (Emission) Regulation. The introduction of ultra-low sulphur diesel for vehicle fleet and implementation of the Air Pollution Control (Fuel Restriction) Regulations have also reduced the SO_2 emission from road transport and fuel combustion. Besides, good site practices have also been recommended and implemented to control and reduce the emission from the use of non-road mobile machinery from the Project. Hence, the emissions from non-road mobile machinery are considered relatively small.

3.1.1.2 During construction phrase, site clearance, soil excavation, backfilling, etc. could generate construction dust. A quantitative construction dust impact assessment has been carried out, taking into account the cumulative impacts from major dust sources as well as the concurrent construction projects in the vicinity. With the implementation of the mitigation measures as stipulated in the Air Pollution Control (Construction Dust) Regulation, dust control measures including watering once per hour on exposed construction areas with dust emission and stockpile, provision of 3-side screen with top cover and water spraying system at the unloading points of barging facility and good site practices, the predicted 1-hour Total Suspended Particulate (TSP) for both existing and planned air sensitive receivers would be in a range of 143 ug/m^3 to 459 ug/m^3. While 10^{th} 24-hour highest and annual Respirable Suspended Particulate (RSP) for both existing and planned air sensitive receivers would be from 66 ug/m^3 to 88 ug/m^3 and 27 ug/m^3 to 43 ug/m^3 respectively, 36^{th} 24-hour highest and annual Fine Suspended Particulate (FSP) concentrations for both existing and planned air sensitive receivers would be from 24 ug/m^3 to 29 ug/m^3 and 15 ug/m^3 to 18 ug/m^3 respectively. The predicted 1-hour TSP, 24-hour/annual RSP/FSP on area in the vicinity of the construction sites would comply with the respective criteria. Hence, no adverse residual air quality impact during the construction phase is anticipated.

3.1.2 Operational Phase

3.1.2.1 Trains to be operated in the Project are electrified, there is no air emission during the normal operation. Hence, no adverse residual air quality impact during the operational phase is anticipated.

3.2 Noise Impact

3.2.1 Airborne Construction Noise Impact

3.2.1.1 Airborne construction noise assessment has been conducted. Without the implementation of mitigation measures, the predicted construction noise impact would exceed the relevant criteria by maximum of 16 dB(A) for existing and planned residential NSRs as well as 10 dB(A) for educational NSRs during examination period, With the implementation of mitigation measures such as good site practices, quieter plant, silencer, movable noise barrier, noise enclosure, the predicted construction noise impact would be 64-75 dB(A) and 57-65 dB(A) for existing residential and educational NSRs respectively, and 62-71dB(A) for planned residential NSRs. Hence, construction noise impacts at all the representative NSRs would be controlled to acceptable levels and adverse construction noise impacts are not anticipated.

3.2.2 Groundborne Construction Noise Impact

3.2.2.1 Groundborne construction noise impact arising from the construction of tunnel alignment between TCW Station and TUC has been investigated. The predicted groundborne construction noise impact would be less than 45dB(A) at the representative NSR (i.e. Ma Wan Chung) and adverse groundborne construction noise impacts are not anticipated. Hence, no mitigation measures are proposed.

3.2.3 Airborne Rail Noise Impact

3.2.3.1 Airborne rail noise impact has been assessed. Without the implementation of mitigation measures, the predicted airborne rail noise impact would be <45 – 65dB(A) and <45 – 62dB(A) for the residential NSRs at TCE area during day and night-time period representatively. With the implementation of the noise mitigation measures such as speed reduction, cantilevered arm noise barrier and vertical barrier, the predicted airborne rail noise impact would be <45 – 65dB(A) and <45 – 59dB(A) for the residential NSRs during day and night-time period representatively. Hence, adverse airborne rail noise impacts are not anticipated.

3.2.4 Groundborne Rail Noise Impact

3.2.4.1 Groundborne rail noise impact arising from the underground rail operation has been examined. The predicted groundborne rail noise impact would be <30 – 38dB(A) and <30 – 36dB(A) for the residential NSRs such as Ma Wan Chung Village and Yat Tung Estate during day and night-time period representatively. Hence, adverse groundborne rail noise impacts are not anticipated.

3.2.5 Fixed Noise Sources Impact

3.2.5.1 Fixed noise impacts generated from the planned ventilation louvres from EAP / EEP, TUC, TCE and TCW Stations have been evaluated. Maximum allowable Sound Power Levels of each planned fixed noise source have been predicted and other fixed noise sources in the vicinity have been included in the assessment. With

the proper selection of plant and adoption of acoustic treatment such as enclosure and silencer, adverse noise impacts from those louvres of the Project and the other fixed noise sources from TCNTE are not anticipated.

3.3 Water Quality

3.3.1 Construction Phase

3.3.1.1 There are no marine dredging works for the Project is required according to the latest construction method. The potential sources of water quality impact during the construction phase are mainly from operation of barging facility and land-based construction activities including construction runoff, sewage from the workforce, and accidental spillage. With the mitigation measures such as Best Management Practices and good site practices as well as enhancement measures including provision of barrier such as sheet piles or hoarding with concrete footing along the western boundary of the construction site/works areas for TCW Station, adverse impacts are not anticipated during construction phase.

3.3.2 Operational Phase

3.3.2.1 The potential water quality impacts are mainly from the stormwater runoff, wastewater from facility washing, sewage from the sanitary fitment of station operation, track runoff from tunnel sections and discharge from cooling systems. Stormwater runoff from station structures generated from the Project would be discharged to the public storm drain while sewage, wastewater as well as runoff from tunnel rail tracks section generated from the Project would be conveyed to sewer. Hence, adverse impacts are not anticipated during operational phase.

3.4 Waste Management Implications

3.4.1 Construction Phase

3.4.1.1 Waste generation during construction phase has been assessed for potential waste management implications. The main types of waste that would be generated include construction and demolition (C&D) materials, land-based marine sediment, chemical waste and general refuse. It has been estimated that 456,000 m^3 of inert C&D materials, 19,610 m^3 of non-inert C&D materials, 140 m^3 of land-based marine sediment, a few hundred kilograms/litres per month of chemical waste, as well as 540 tons of general refuse would be generated.

3.4.1.2 In order to reduce the number of surplus materials to be disposed of, strategic mitigation measures such as the opportunity for on-site sorting, reusing C&D materials, etc. are devised. With the proper implementation of the recommended migration measures such as good site practices, waste reduction through good management and control, properly storage, collection and transportation of waste, all dump trucks engaged on site for delivery of inert C&D materials from the site to Public Fill Reception Facilities (PFRFs) equipped with Global Positioning

System (GPS) or equivalent system, preparation of a Construction and Demolition Management Plan (C&DMMP) etc., adverse environmental impacts from waste management during construction phase are not anticipated.

3.4.2 Operational Phase

3.4.2.1 Waste generation during operational phase has been assessed for potential waste management implications. The main types of waste that would be generated include municipal solid waste from the public, station employees and commercial operators within the stations and the maintenance of the stations, tracks and EAP/EEP, and chemical waste from the maintenance of the stations, tracks and EAP/EEP. It is expected that the total quantity of municipal solid waste to be generated would be approximately a hundred kg per day while the railway maintenance activities would generate a few hundred kg of waste per month. The maximum quantity of chemical waste to be generated would be a few hundred litres per month, subject to future operational needs.

3.4.2.2 With the implementation of recommended mitigation measures for the handling, transportation and disposal of the identified waste such as employment of a reputable waste collector to remove municipal solid waste regularly, reduction of generation of chemical wastes following the Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes, adverse environmental impacts form waste management during operational phase are not anticipated.

3.5 Land Contamination

3.5.1.1 Potentially contaminative land uses within the assessment area have been examined, as well as their potential impacts on future use. The land use in the assessment area manly includes rail tracks, pedestrian walkway, site office, car park area, storage area for general construction materials, vegetation, and hillside. There are no potentially contaminated areas within the assessment area based on the desktop review, site surveys and identification of potentially contaminated area. Land contamination of the underground work area has been excluded from the assessment area since tunnelling work would be conducted underneath the soil layer at TCW area. Land contamination issues are not anticipated.

3.6 Ecology

3.6.1.1 Due consideration on impact avoidance and impact minimisation have been taken in the Project. No dredging or marine works is required under the Project.

3.6.1.2 A literature review and ecological surveys have been used to establish the ecological baseline. As there would be no marine works for the Project, direct marine ecological impact is not anticipated. A total of 14 habitat types, including coastal waters, were identified within the Assessment Area. A number of species of conservation importance had been recorded within the Assessment Area

including Romer's Tree Frog (outside Project Site), *Aquilaria sinensis* and Tiny Grass Blue etc. The TCE section is located on existing developed area and reclaimed land with limited ecological value. The ecological sensitive habitats and species around the TCW section have been avoided by the proposed underground tunnel and careful site selection for above ground works. Insignificant impact to species of conservation importance is anticipated. Indirect ecological impacts including noise, vibration, dust and potential water quality deterioration would be either insignificant or would be mitigated by appropriate mitigation measures together with environmental monitoring and audit. No significant ecological impact would be arisen from the Project.

3.7 Fisheries

3.7.1.1 The TCL realignment works at TCE would also be land-based. No direct impact to fisheries resources nor operation is anticipated. Potential fisheries impact would be indirect water quality impact which would be controlled by construction site best practices. Adverse fisheries impacts are not anticipated in both construction and operational phase.

3.8 Landscape and Visual

3.8.1 Landscape and Visual Baseline

3.8.1.1 The Landscape Resources (LRs) and Landscape Character Areas (LCAs) of the Project were identified and assessed. Within the assessment area, there are a total of 19 LRs and 13 LCAs. The LRs and LCAs are considered to be relatively tolerable to change as a result of the Project and thus, the potentially affected LRs such as channelised watercourse, artificial seawall, major transport corridor etc. and LCAs such as inshore water landscape, strait landscape, transportation corridor landscape etc. have a low to medium sensitivity to accommodate changes. Some LRs such as mangrove, reedbed, natural watercourse etc. and LCAs such as settled valley landscape, upland hillside landscape, etc are considered to be high sensitivity as a result of the Project.

3.8.1.2 A total of 22 Visually Sensitive Receivers (VSRs) within the Visual Envelop (VE) of the Project were identified and assessed. Majority of VSRs have high sensitivity to change as a result of the Project.

3.8.2 Landscape and Visual Impact Summary

3.8.2.1 The Project may pose adverse impacts on some of the LRs and LCAs. With the implementation of proper mitigation measures during construction phase and operational phase, most of the residual landscape impacts on the concerning LRs such as planation, major transport corridor etc. and LCAs such as coastal upland and hillside landscape, transportation corridor landscape etc. are anticipated to be insignificant to slight by operation year 10. For some other LRs such as secondary

woodland, shrubland & grassland, mangrove etc. and LCAs such as inshore water landscape, strait landscape, inter-tidal coast landscape etc., no landscape impacts are anticipated without mitigation measures so that mitigation measures would not be necessary for these LRs and LCAs.

3.8.2.2 The visual impacts on VSRs such as the Visionary, Tung Chung Crescent, Yat Tung Estate, Mun Tung Estate etc. are anticipated to be in the range of insignificant to moderate/substantial and insignificant to moderate without the provision of mitigation measures during construction phase and operational phase respectively. However, with the mitigation measures such as optimisation of green provision on structures and architectural aesthetic design of built structures etc. in place, the likely residual visual impacts and possibility would be insignificant to slight by operation day 1 and operation year 10 when the mitigation measures have matured and taken effect. Hence, the visual impacts are considered acceptable with the mitigation measures.

3.9 Cultural Heritage

3.9.1 Terrestrial Archaeology

Construction Phase

3.9.1.1 An archaeological impact assessment has been conducted for the Project including TCE Station and at-grade track realignment, TCW Station and the tunnel section connecting existing TUC and TCW Station, and the barging facility. Based on desk-based study, the TCE Station and at-grade track realignment as well as the barging facility would be constructed on a reclaimed land. No terrestrial archaeological potential is expected.

3.9.1.2 For the tunnel section connecting existing TUC and TCW Station, since the TBM tunnelling are mainly within rock stratum, the vibration would be expected to be low. Given the separation distance, the ground settlement and vibration generated from the tunnelling works from the construction works would not be expected to significantly impact on the archaeology.

3.9.1.3 Due to the close proximity of the tunnelling works to the sea, the actual groundwater level is expected to be very close to the sea level. The construction will not significantly affect the groundwater level, resulting in no significant change from the current status and no significant impact on archaeology.

3.9.1.4 For the TCW Station, an archaeological field investigation was conducted. No major archaeological impacts are expected within the whole project area arising from the Project. An area to the extreme north end of the TCW Station area and above and adjacent to the tunnel alignment is not accessible for field investigation during the EIA Study. Further archaeological survey including field scan, six auger tests and two test pit excavations will be carried out by a qualified archaeologist

who obtains a licence under the Antiquities and Monuments Ordinance (Cap. 53) prior to the commencement of construction works to verify the presence of any potential archaeological interest including in situ kiln structures. Locations and scope should be agreed with AMO prior to implementation. The exact locations of the auger tests and test pits would be subject to site circumstances and constraints. Subject to the findings of the further archaeological testing, options for mitigation measures such as in-situ preservation, relocation and preservation by record etc would be fully investigated and agreed with AMO.

3.9.1.5 AMO should be informed immediately in case of discovery of antiquities or supposed antiquities in the course of the project works in accordance with the Antiquities and Monuments Ordinance (Cap. 53), so that appropriate mitigation measures, if needed, can be timely formulated and implemented in agreement with AMO.

Operational Phase

3.9.1.6 The main identified potential impact arising from the operation of the Project is train vibration on artefacts and features of Ma Wan Chung Site of SAI and area of archaeological interest. The recommended groundborne vibration limits for vibration-sensitive building as stipulated in Building Department (BD)'s codes and references would be adhered to. Hence, the vibration impact due to rail operation would be controlled to acceptable level.

3.9.2 Built Heritage

3.9.2.1 The literature review conducted for the built heritage impact assessment has also collated relevant information on Declared Monuments and Graded Historical Buildings. A field survey was also conducted for built heritage to identify all built heritage resources within or in vicinity of the project boundary. Results indicate there are two Declared Monuments (i.e. Tung Chung Fort and Tung Chung Battery) and two Grade 2 Historic Building (i.e. Hau Wong Temple (Tung Chung) and Tin Hau Temple (Tung Chung)). Number of other resources including shrines, broken bridges, boundary stones, stele and other concerned buildings were identified.

Construction Phase

3.9.2.2 The construction works associated with the Project, including TCW Station, EAP/ EEP buildings, associated works area, barging facility and tunnel alignment have the potential to directly or indirectly impact on built heritage buildings and structures. No built heritage sites except the Kadoorie Agricultural Aid Association (KAAA) stele would be directly impacted. As a good practice, the KAAA stele will be relocated/ removed after consultation with the respective stakeholders.

3.9.2.3 For the indirect impact, given the separation distances between the built heritage resources and the works sites, no impacts are identified from the nature of works, ground settlement and vibration.

Operational Phase

3.9.2.4 No direct impact to the built heritage due to the Project is anticipated.

3.9.2.5 For the indirect impacts on built heritage are related to TCW Station above-ground associated structures, EAP/ EEP buildings and structures and train movement. Buildings and structures relate to visual impact while the train movement relates to ground settlement and vibrations.

3.9.2.6 Given the separation distances between the buildings and structures of the Project and the built heritage, impact from the EAP/ EEP buildings on the built heritage resources such as Tung Chung Battery and Tung Chung Fort is insignificant. In comparison with Yat Tung Estate, the sizes of TCW associated above-ground structures are minor. Therefore, the visual impacts on the built heritage are considered minimal.

3.9.2.7 As the expected vibration induced from the train movement would not exceed the recommended ground-borne vibration limits for vibration-sensitive building as stipulated in BD's codes and references. No significant vibration levels are expected within the historic buildings and structures within the Ma Wan Chung zone. In addition, the rail alignment would be underground near Ma Wan Chung village and would not pose visual impacts.

3.10 Hazard to Life

3.10.1.1 According to the latest design, overnight storage of explosives on site is not required. Therefore, hazard-to-life assessment is not required.

3.10.1.2 However, drill-and-blast works may be required for the construction of the EAP/ EEP and TCW Station. As the transport of explosives will be transported by Mines Division of Civil Engineering and Development Department (CEDD), potential risk relating transport of explosives is not anticipated. In addition, with the implementation of proposed mitigation measures, potential risk arising from the use of explosives for the construction of EAP/ EEP and TCW Station is not anticipated.

3.10.1.3 As the operation of the Project does not involve any use of explosives, potential risk during operational phase is not envisaged.

4 Environmental Monitoring and Audit

4.1.1.1 An Environmental Monitoring and Audit (EM&A) programme has been formulated for Project which is a DP listed under Schedule 2 of the EIAO, with details presented in the separate EM&A Manual. Key aspects which require monitoring include air quality (i.e. construction dust) and noise (i.e. airborne construction noise and airborne rail noise).

4.1.1.2 The EM&A programme will provide management actions to check the effectiveness of the recommended mitigation measures and compliance with relevant statutory criteria, thereby ensuring the environmental acceptability of the construction and operation of the Project.

5 Conclusion

5.1.1.1 The Project supports the Railway Development Strategy 2014 (RSD-2014) to provide the TCW Extension and a TCE Station. The Project would serve the transportation demand for both the existing and planned population in Tung Chung of which the proposed railway stations at TCE area and TCW area were already included in the approved EIA study of the Tung Chung New Town Extension (TCNTE).

5.1.1.2 An EIA Report has been prepared to fulfil the requirements as specified in the EIA Study Brief (No.: ESB-329/2020) and the EIAO-TM. All the latest design information has been incorporated into the EIA process. The aspects that have been considered in this EIA Report include:

- Project Description and Consideration of Alternatives;
- Air Quality Impact;
- Noise Impact;
- Water Quality Impact;
- Waste Management Implications;
- Land Contamination;
- Ecological Impact (Terrestrial and Marine);
- Fisheries Impact;
- Landscape and Visual Impact;
- Impact on Cultural Heritage;
- Hazard to Life; and
- EM&A Requirements.

5.1.1.3 Overall, the EIA Report has predicted that the Project would be environmentally acceptable and individual impacts are minimized with the implementation of the proposed mitigation measures for construction and operational phases. An environmental monitoring and audit programme has been recommended to check the effectiveness of recommended mitigation measures.