

Kwu Tung Station (NOL)

San Tin Station

Ngau Tam Mei Station

Ngau Tam Mei Depot

Consultancy Agreement No. C1603

Environmental Impact Assessment Study for Northern Link

Executive Summary

November 2023

Au Tau Station

Kam Sheung Road Station (NOL)

 Northern Link (NOL)



AGREEMENT NO. C1603

ENVIRONMENTAL IMPACT ASSESSMENT STUDY FOR NORTHERN LINK

Executive Summary

November 2023

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TABLE OF CONTENTS

1	INTRODUCTION	1
1.1	Background.....	1
1.2	Scope of Project	1
1.3	Environmental Impact Assessment Study	2
1.4	Purpose of this Executive Summary.....	2
2	PROJECT DESCRIPTION	3
2.1	Description and Objective of the Project	3
2.2	Benefits of the Project.....	3
2.3	Consideration of Alternatives/Options	5
2.4	Construction Programme	5
2.5	Public Views and Consultation	5
3	KEY FINDINGS OF ENVIRONMENTAL IMPACT ASSESSMENT	7
3.1	Approach to the EIA.....	7
3.2	Air Quality	7
3.3	Airborne Noise	8
3.4	Ground-borne Noise	9
3.5	Water Quality	9
3.6	Sewerage and Sewage Treatment Implication	10
3.7	Waste Management Implications	10
3.8	Land Contamination.....	11
3.9	Ecology (Terrestrial and Aquatic)	12
3.10	Fisheries	13
3.11	Landscape and Visual	13
3.12	Cultural Heritage	14
3.13	Hazard to Life	16
4	ENVIRONMENTAL MONITORING AND AUDIT	17
5	CONCLUSION	18

LIST OF FIGURES

C1603/C/NOL/ACM/M50/301	Proposed Project
C1603/C/NOL/ACM/M50/305	Proposed NOL Alignment and Construction Methods
C1603/C/NOL/ACM/M50/306 to	Proposed Works Area and Works Site
C1603/C/NOL/ACM/M50/318	

LIST OF ABBREVIATIONS

The following abbreviations shall have the meaning hereby assigned to them except when the context of this Report otherwise requires:

Abbreviations	Full Title
AB	Ancillary Building
ALARP	As Low As Reasonably Practicable
ANR	Ardeid Night Roost
AQOs	Air Quality Objectives
ASRs	Air Sensitive Receivers
ATWTW	Au Tau Water Treatment Works
AUT	Au Tau
BCP	Boundary Control Point
C&D	Construction and Demolition
CAP	Contamination Assessment Plan
CAR	Contamination Assessment Report
CBA	Cost-Benefit-Analysis
CNMP	Construction Noise Management Plan
CZ	Consultation Zone
D&B	Drill-&-Blast
DEP	Director of Environmental Protection
DEVB	Development Bureau
DfMA	Design for Manufacture and Assembly
DP	Designated Project
EAL	East Rail Line
EAPs	Emergency Access Points
EEPs	Emergency Egress Points
EIA	Environmental Impact Assessment
EIAO	Environmental Impact Assessment Ordinance
EIAO-TM	Technical Memorandum on Environmental Impact Assessment Process
EM&A	Environmental Monitoring and Audit
EP	Environmental Permit
EPD	Environmental Protection Department
EPP	Effluent Polishing Plant
FSP	Fine Suspended Particulates
FNMP	Fixed Noise Sources Management Plan
G/IC / GIC	Government, Institution or Community
GB	Green Belt
GBN	Ground-borne Noise
GBNSR	Ground-borne Noise Sensitive Receiver
KTN NDA	Kwu Tung North New Development Area
KTU	Kwu Tung
LMCSL	Lok Ma Chau Spur Line
MiC	Modular Integrated Construction
MTR	MTR Corporation Limited
NAPs	Noise Assessment Points
NCO	Noise Control Ordinance

Abbreviations	Full Title
NDA	New Development Areas
NO ₂	Nitrogen Dioxide
NOL	Northern Link
NRMM	Non-road Mobile Machinery
NSR	Noise Sensitive Receiver
NTM	Ngau Tam Mei
NTD	Ngau Tam Mei Depot
PHD	Pat Heung Depot
PHI	Potentially Hazardous Installation
PME	Powered Mechanical Equipment
PP	Project Profile
QPME	Quality Powered Mechanical Equipment
QRA	Quantitative Risk Assessment
RAP	Remediation Action Plan
RDS	Railway Development Strategy
RDS-2014	Railway Development Strategy 2014
RR	Remediation Report
RSP	Respirable Suspended Particulates
SAT	San Tin
STLMC DN	San Tin Lok Ma Chau Development Node
SWLs	Sound Power Levels
TBM	Tunnel Boring Machine
TML	Tuen Ma Line
TOD	Transit-oriented Development
TPRP	Tree Preservation and Removal Proposal
TSP	Total Suspended Particulates
VB	Ventilation Building
VSR	Visually Sensitive Receiver
WBA	Wetland Buffer Area
WCA	Wetland Conservation Area
WCZs	Water Control Zones
WPCO	Water Pollution Control Ordinance
WQOs	Water Quality Objectives
WRL	West Rail Line
WRCW	West Rail Compensatory Wetland
WSRs	Water Sensitive Receivers
XRL	Express Rail Link

1 INTRODUCTION

1.1 Background

- 1.1.1 The Northern Link (NOL) (hereinafter referred to as “the Project”) is one of the seven railway schemes recommended to be taken under the Railway Development Strategy 2014 (“RDS-2014”). The Project will be a heavy underground railway line with a route length of about 10.7km between Kam Sheung Road (KSR) Station on the Tuen Ma Line (TML) and Kwu Tung (KTU) Station on the Lok Ma Chau Spur Line (LMCSL) of East Rail Line (EAL).
- 1.1.2 The Project connects the EAL and the TML, forming a railway loop in the Northern New Territories. Passengers will be able to interchange at KSR Station on TML and KTU Station on EAL. The Project will also serve the transportation needs of the potential New Development Areas (NDAs) in the Northern New Territories and enhance cross-boundary movement. A Project Profile (PP) (No. PP-629/2021) for the Project was submitted to Environmental Protection Department (EPD) for application of an EIA Study Brief, which was subsequently issued on 9 August 2021 (No. ESB-346/2021).
- 1.1.3 The Project is shown in **Figure No. [C1603/C/NOL/ACM/M50/301](#)**, with the proposed construction method and the proposed works areas/works sites shown in **Figure Nos. [C1603/C/NOL/ACM/M50/305](#) and [C1603/C/NOL/ACM/M50/306 to 318](#)** respectively.

1.2 Scope of Project

- 1.2.1 The NOL runs underground in tunnel between KSR(NOL) and KTU(NOL) Stations with three proposed intermediate stations at Au Tau (AUT), Ngau Tam Mei (NTM) and San Tin (SAT), to support the unleashing of the development potential along its alignment. An at-grade depot is proposed at NTM area, and there would be other aboveground structures including station entrances and ancillary buildings, i.e. ventilation shafts/buildings, Emergency Access Points (EAPs) and Emergency Egress Points (EEPs), as well as enabling works to the south of KSR (NOL) Station for potential southern extension, to the north of SAT Station for potential bifurcation to Lok Ma Chau Loop and Huanggang Port, and to the east of KTU(NOL) Station for potential eastern extension to Ping Che areas.
- 1.2.2 The Project comprises the following key elements:
- i. Construction and operation of 10.7km underground railway line between KSR(NOL) Station and KTU(NOL) Station;
 - ii. Construction and operation of five new stations, namely KSR(NOL) Station, AUT Station, NTM Station, SAT Station and KTU(NOL) Station;
 - iii. Construction and operation of associated railway facilities, including ancillary buildings such as ventilation shafts/buildings, EAPs and EEPs;
 - iv. Construction and operation of a depot at Ngau Tam Mei area; and
 - v. Enabling works to the south of KSR Station for potential southern extension, to the north of SAT Station for potential bifurcation to Lok Ma Chau Loop and Huanggang Port, and to the east of KTU(NOL) Station for potential extension to Ping Che areas.
- 1.2.3 A temporary explosive magazine site for overnight storage of explosives that will be used for construction of underground tunnel / adit / railway facilities is proposed at Tai Shu Ha in Yuen Long. This magazine site was formerly used for the construction

of the High Speed Rail (Hong Kong Section) (HSR) (formerly named as “the Hong Kong Section of Guangzhou-Shenzhen-Hong Kong Express Rail Link (XRL)”) and the Liantang/Heung Yuen Wai Boundary Control Point (BCP) project. This site will be decommissioned upon completion of construction works of the Project.

1.2.4 The Project will comprise the following Designated Projects (DPs) under Schedule 2 of the EIA Ordinance (EIAO):

- Item A.2 of Part I – A railway and its associated stations;
- Item A.4 of Part I – A railway siding, depot, maintenance workshop;
- Item A.7 of Part I – A railway tunnel more than 800m in length between portals;
- Item K.10 of Part I – A depot for the storage of explosives (as defined by section 2 of the Dangerous Goods Ordinance (Cap. 295));
- Item Q.1 of Part I – The Project includes underground works partly in a country park and a conservation area, and aboveground works in a conservation area; and
- Item 11 of Part II – Decommissioning of a depot for the storage of explosives (as defined by section 2 of the Dangerous Goods Ordinance (Cap. 295)).

1.3 Environmental Impact Assessment Study

1.3.1 An environmental impact assessment (EIA) study was conducted for the Project in accordance with the requirements of the EIA Study Brief (No. ESB-346/2021) and the *Technical Memorandum on Environmental Impact Assessment Process* (EIAO-TM). The purpose of this EIA Study is to provide information on the nature and extent of environmental impacts arising from the construction and operation of the Project. The information obtained in the EIA Study will contribute to decisions by Director of Environmental Protection on:

- i. the overall acceptability of any adverse environmental consequences that are likely to arise as a result of the Project;
- ii. the conditions and requirements for the detailed design, construction and operation of the Project to mitigate against adverse environmental consequences wherever practicable; and
- iii. the acceptability of residual impacts after the proposed mitigation measures are implemented.

1.4 Purpose of this Executive Summary

1.4.1 This Executive Summary (ES) highlights the key information and findings of the EIA Study.

2 PROJECT DESCRIPTION

2.1 Description and Objective of the Project

- 2.1.1 The NOL, located in the northern part of the New Territories connecting the EAL and the TML, is one of the seven railway schemes recommended to be taken forward under the RDS-2014. The NOL starts at KSR(NOL) Station and ends at KTU(NOL) Station with a route length of about 10.7km including three proposed intermediate stations at Au Tau (AUT), Ngau Tam Mei (NTM) and San Tin (SAT).
- 2.1.2 The KSR Station of NOL is proposed to be located next to the existing KSR Station on TML. The proposed location of AUT Station is located at the existing brownfield site adjoining the planned public housing development in Sha Po, while both the NTM Station and the SAT Station are located within the planned development areas in Ngau Tam Mei and San Tin being studied under “Land Use Review Study for Ngau Tam Mei Area” (by others) and “San Tin / Lok Ma Chau Development Node - Investigation” (also known as “San Tin Technopole”) (by others) respectively. The location of KTU(NOL) Station will be next to the planned KTU Station on EAL, and both KTU Stations are located in the future town centre of Kwun Tong North New Development Area (KTN NDA) (by others).
- 2.1.3 There is a total of seven Ancillary Buildings (ABs) with the function of EAP/EEP/Ventilation Building (VB) along the 10.7 km long underground railway alignment to fulfil statutory requirements of operations, fire services and evacuation. A depot proposed to the south of NTM Station will provide train stabling sidings, maintenance and permanent way facilities for supporting the operation of the Project. The Ngau Tam Mei Depot (NTD) connection tracks will bifurcate from the crossover in NOL railway line between Pok Wai Ancillary Building (PWA) and Long Ha Tsuen Ancillary Building (LHA) and approach to NTD from the south end.
- 2.1.4 The Project as a railway loop in the northern New Territories through connecting the EAL and the TML could promote land and economic development along the alignment. Through this railway corridor, the passengers will be able to interchange at KSR Station with TML and KTU Station with EAL, which will greatly improve the transport connectivity in Northern New Territories.
- 2.1.5 By serving long-term transport needs, the Project promotes development of the Northwestern New Territories (i.e. Ngau Tam Mei, San Tin and Kwu Tung) through the provision of transport infrastructure, thereby creating greater value for the community. The Project will enhance the convenience for the public, including for living, housing, working, business and learning in Northwestern New Territories and even across all of Hong Kong.

2.2 Benefits of the Project

- 2.2.1 As the railway will be powered by electricity, it is widely recognised as a more sustainable form of transport than road transport in terms of carrying capacity and energy effectiveness. Potential environmental implications such as roadside air pollution associated with electrically-powered trains are far less in comparison with those of road vehicles. With the anticipated increase in railway patronage and reduction in the overall road traffic volumes through providing a more convenient, time-saving and easily accessible transport option brought about by the Project, improvements in air quality, noise pollution, on-road safety and the overall quality of the ambient environment will also be afforded.
- 2.2.2 The main benefits of the Project include:
- Provision of railway services to the existing and future communities in Northwestern New Territories to encourage greater use of the whole railway

system, by enhancing coverage, and thereby improving the mobility and transport connections to the existing TML and EAL, alleviating traffic congestion, which in turns reducing the road traffic noise and vehicular emissions; and

- Support the unleashing of the development potential of the Northwestern New Territories.

More Connected Mobility for the Future

2.2.3 The Project will connect the TML and the EAL, forming a railway loop and shortening journey times in the Northern New Territories. The road journey between Yuen Long / KSR and KTU now takes about 60 to 80 minutes during rush hours. With the commissioning of NOL, including its three intermediate stations, the journey time by railway from KSR to KTU is expected to be shortened to about 12 minutes.

2.2.4 The Project will also provide more route alternatives for residents in the New Territories, helping diverting railway passenger flow in the Northeastern New Territories and alleviating road traffic pressure. In addition, the Project enhances cross-border population mobility, particularly for those living in the Western New Territories to travel easily to the Lo Wu Control Point and the Lok Ma Chau Control Point via NOL.

Extend Railway Services to Existing and Future Communities

2.2.5 The Project is crucial to unleash the development potential of the largely underutilised land along its alignment and increase the supply of land and housing. Except a few low-to-medium density existing/planned residential developments in the vicinity of KSR(NOL) and AUT Stations, the areas along the alignment are yet to be developed.

2.2.6 The areas around the proposed KSR(NOL) Station and AUT Station are currently covered by existing land use, such as Kam Sheung Road Flea Market, public parking space, the existing Mo Fan Heung, the planned Kam Tin South and Sha Po Public Housing Developments. Integration between the proposed stations and the surrounding existing and future developments is encouraged in order to capitalise the benefits of improved accessibility and connectivity.

2.2.7 Furthermore, the areas around the proposed NTM Station and SAT Station are currently mainly covered by brownfield sites, agricultural lands and other rural land uses. In view of the on-going land use review in the vicinity of the proposed NTM Station and also the on-going investigation study for the San Tin / Lok Ma Chau Development Node (STLMC DN) that covers the location of the proposed SAT Station, there are significant opportunities to promote transit-oriented development (TOD). A majority of the developments and population, as well as possible employment, of the new developments could therefore be located within the catchment area of and integrate with the proposed stations to optimise land resources and harness the potential created by the Project.

Support Future Housing Development and Northern Metropolis Development

2.2.8 The Project will offer an efficient and environmentally friendly railway transport system to the residents in the vicinity, reducing the travelling time for the existing population as well as the additional population arising from the developments in future. The availability of the Project can open up development opportunities with more efficient and concentrated land uses for the areas along its alignment, realising the infrastructure-led, capacity creating planning approach as advocated by government.

2.3 Consideration of Alternatives/Options

2.3.1 Several alternatives/options were developed during the preliminary design stage. The preferred scheme for the Project to be taken forward for design and construction was selected according to various engineering and environmental factors including those discussed in **Section 2.5**.

2.3.2 As part of the selection process, various construction methodologies were also reviewed in order to determine the most effective means and environmentally friendly construction method(s). The review considered environmental benefits, engineering feasibility, site conditions and programme aspects.

2.3.3 The selected alignment, locations of station and depot and construction methods are regarded as a feasible and balanced scheme, which could achieve the needs of the Project and benefit to the public as discussed below:

- Minimisation of the potential impacts to nearby sensitive receivers through adoption of underground railway scheme.
- Avoidance/minimisation of the direct impact and disturbance to sensitive ecological areas, including wetland, sites of conservation importance (including Country Parks, Conservation Areas, Mai Po Inner Deep Bay Ramsar Site, and species of conservation interest) through proper selection of alignment.
- Provision of depot at Ngau Tam Mei instead of PHD eastern expansion area to limit the number of affected sensitive receivers.
- Optimisation by adopting the combination of EAP/EEP and cross passages along the alignment to minimise the number of ABs as far as practicable to minimise environmental impacts, including ecological, noise, air quality, landscape and visual impacts to the nearby sensitive receivers, arising from the construction and operation of ABs. With the combination of functional facilities and the application of cross passages, the total number of ABs was optimised to 7, such that no ABs would be located within or near the West Rail Compensatory Wetland (WRCW).
- Adoption of Modular Integrated Construction (MiC) and Design for Manufacture and Assembly (DfMA) method, which is considered to be more environmentally friendly than traditional construction methods due to reduced in-situ concreting works, waste generation as well as the associated noise, dust and water quality impacts, for the construction of the stations and ABs as far as practicable.
- Thorough scrutinisation of construction sequences/works to minimise the extent of cumulative environmental impacts due to interfacing with other concurrent projects as far as practicable.

2.4 Construction Programme

2.4.1 Construction of NOL is anticipated to commence tentatively in 2025 with a target on completion in 2034.

2.5 Public Views and Consultation

2.5.1 MTR Corporation attaches great importance to the views and options of stakeholders and considers that the support of the community is important in the development of a new railway project. The Corporation has taken an active approach to conducting continuous dialogue with different stakeholders.

2.5.2 In addition to timely consultation with public and local stakeholders, the Corporation liaised closely with various parties, including District Councils and Rural Committees,

to consult their opinions and share updates of NOL since March 2021, regular consultations with Green Groups were carried out to obtain views and understand their interests proactively. In this regard, such that public's views and concerns could be incorporated suitably in the design stage to avoid and minimise the potential environmental impacts. Apart from consultation activities, public views were also received during the public inspection of Project Profile (No. PP-629/2021) between 1 Jul and 14 Jul 2021.

- 2.5.3 Most of the feedback received during public consultation and inspection related to environmental issues were mainly related to construction noise, water quality and air quality and ecology. Suggestions received during the public consultation included avoidance of significant ecological impact by adopting full underground option instead of elevated option, and provision of environmental mitigation measures to minimise various environmental impacts.
- 2.5.4 The project design has taken into consideration of feedbacks and suggestions to minimise potential environmental impacts with adoption of appropriate mitigation measures. Underground scheme was adopted to avoid / minimize the potential impact on ecological sensitive areas, dust and noise impact during construction and operational phases. Environmentally friendly design will be adopted in the station design as far as practicable to cater for sustainability and blend the station into the surrounding environment. Environmentally friendly design will not only reduce carbon emissions, enhance energy saving, social connectivity and environmental sustainability, but also minimise occupation of space by minimising the provision of fixed plant items (e.g. cooling towers, chiller plants and ventilation fans). Appropriate aboveground structures design including proper landscape and visual design measures would be adopted to ease the public concern as well as to minimise the potential impacts. The NTD will be decked with a small trough area which would be provided with noise canopies to minimise the potential noise impact.

3 KEY FINDINGS OF ENVIRONMENTAL IMPACT ASSESSMENT

3.1 Approach to the EIA

3.1.1 The EIA process provides a means of identifying, assessing and reporting the environmental impacts associated with the construction and operation of the Project based on the engineering design information available at this stage. It is an iterative process that has been followed in parallel with the design process to identify the potential environmental issues of various design options, and develop alternatives as well as appropriate mitigation measures to be incorporated into the design, construction and operation of the Project. Public views have also been considered and incorporated into the design and EIA process where appropriate. Mitigation measures were recommended to avoid some potential environmental impacts, while others are minimized or mitigated to acceptable levels.

3.1.2 The findings of this EIA Study have determined the likely nature and extent of the following environmental impacts predicted to arise from the construction and operation of the Project:

- Air Quality;
- Airborne Noise;
- Ground-borne Noise;
- Water Quality;
- Sewerage and Sewage Treatment Implications;
- Waste Management Implications;
- Land Contamination;
- Ecology (Terrestrial and Aquatic);
- Fisheries;
- Landscape and Visual;
- Cultural Heritage; and
- Hazard to life.

3.2 Air Quality

Assessment Scope and Key Criteria

3.2.1 Assessment of potential air quality impacts on air sensitive receivers (ASRs) arising from the construction of the Project were conducted in accordance with the criteria and guidelines as stated in Annexes 4 and 12 of the EIAO-TM as well as the requirements given in Clause 3.4.3 of the EIA Study Brief. The assessment for construction dust impact is within 500m study area from the Project boundary including works sites and works areas.

3.2.2 The rail system to be employed in the Project will be electric-powered, and air-emission free during normal operation. Train inspection/maintenance/repairing services will be provided at Ngau Tam Mei Depot, which would not cause any emission. NRMM (non-road mobile machinery) to be used in the depot would comply with the prescribed emission standard (i.e. approved NRMM) with relevant labels under the requirements of the *Air Pollution Control (NRMM) (Emission) Regulation*, and limited air emission is anticipated. The potential air quality impact during operational phase is considered insignificant and quantitative assessment is deemed unnecessary.

Construction Phase

- 3.2.3 Potential air quality impacts from the construction works for the Project would mainly be related to construction dust from site clearance, site formation, demolition works, excavation, tunnelling works (e.g. TBM, cut-and-cover, drill-and-blast and mining), backfilling, spoil handling, vehicle movement on haul roads within works area/works sites and wind erosion of the exposed site area. Design control measures and dust suppression measures such as regular watering during the dusty construction activities, blasting door and regular watering during blasting operation will be implemented during the construction of the Project, no adverse construction dust impact is anticipated. A comprehensive EM&A programme would be conducted to ensure the proper implementation of measures and the compliance of AQOs during the construction of NOL.

3.3 Airborne Noise

Assessment Scope and Key Criteria

- 3.3.1 Assessment of potential noise impacts on noise sensitive receivers (NSRs) arising from the construction and operation of the Project were conducted in accordance with the criteria and guidelines as stated in Annexes 5 and 13 of the EIAO-TM and the Noise Control Ordinance (NCO), as well as the requirements given in Clause 3.4.4 of the EIA Study Brief. The assessment covers the NSRs within 300m study area from the Project boundary including works sites and works areas.

Construction Phase

- 3.3.1 The construction noise impacts of the Project during normal daytime working hours were predicted according to the plant inventory and construction programme developed by the Project Engineer. All practicable noise mitigation measures, including the use of QPME, deployment of construction noise barriers and enclosures, adoption of quieter construction methods (including use of TBM, large diameter bored piling, MiC, DfMA, silent piling, rubber head poker vibrator), as well as sequencing of construction activities and proper scheduling of works at critical works areas, have been exhausted to minimise the potential construction noise impacts. With the implementation of the proposed mitigation measures, the mitigated noise levels at all NSRs would comply with the construction noise criterion as set out in EIAO-TM, except that exceedance is anticipated at a planned school site during examination period. Close liaison with representatives of the planned education institution / Examination Authority is recommended to confirm the examination period and avoid noisy construction activities within such periods. Construction Noise Management Plan(s) (CNMP(s)) should be prepared based on the best available information before the issue of tender and the commencement of construction works, subject to the contract arrangement of the Project and agreement with EPD, with details on the construction method, plant inventory and recommended noise mitigation measures in order to minimise the construction noise impact and comply with the EIAO-TM.

Operational Phase

- 3.3.2 The noise impact associated with operation of the fixed plant noise sources was assessed. The predicted fixed plant noise levels at the representative NSRs would comply with the stipulated noise criteria based on the calculated maximum allowable Sound Power Levels (SWLs) for the planned equipment. There would be no residual fixed plant noise impact with the adoption of the proposed maximum permissible sound power levels for the planned fixed plant.
- 3.3.3 The NTD has been designed with a concrete deck with vertical walls which lined internally with noise absorption materials with due consideration of engineering and operation constraints to further minimize the noise nuisance to the NSRs nearby from

train operation within NTD. The small trough section has been minimised as far as practicable and would also be covered by noise canopies with natural ventilation feature. With such design, there would be no direct line of sight from any NSRs to the airborne railway noise sources. Therefore, adverse airborne railway noise impact due to the operation of the Project is not anticipated.

3.4 Ground-borne Noise

Assessment Scope and Key Criteria

- 3.4.1 Assessment of potential ground-borne noise impacts on the representative NSRs arising from the construction and operation of the Project were conducted in accordance with the criteria and guidelines as stated in Annexes 5 and 13 of the EIAO-TM and the Noise Control Ordinance (NCO), as well as the requirements given in Clause 3.4.4 of the EIA Study Brief. The assessment covers the NSRs within 300m study area from the Project boundary including works sites and works areas.

Construction Phase

- 3.4.2 Construction ground-borne noise impacts would mainly arise from tunnel boring machine (TBM) operation for tunnelling works, as well as PME used for rock breaking/drilling including breakers and rock drills. Predicted results indicate that the PME and TBM induced ground-borne noise levels would comply with the daytime criteria at all representative GBNSRs, while potential exceedance of ground-borne noise criterion at a planned school site was predicted during examination period due to TBM operation. Close liaison with representatives of the planned education institutions is recommended to confirm the examination period and avoid TBM operation within such periods.

Operational Phase

- 3.4.3 Predictions of operational ground-borne railway noise levels at the identified representative NSRs were performed. The predicted operation ground-borne noise levels at the representative NSRs were ranged from <20 to 47 and <20 to 33 dB(A) during day/evening and night-time periods respectively, and would not exceed the statutory noise criteria. In addition, potential cumulative impacts from the operation of existing rail lines were considered and no adverse cumulative impact is anticipated.

3.5 Water Quality

Assessment Scope and Key Criteria

- 3.5.1 The potential water quality impacts were identified and analysed for compliance with the prevailing Water Quality Objectives (WQOs) stipulated under the Water Pollution Control Ordinance (WPCO), the criteria and guidelines stated in Annexes 6 and 14 of the EIAO-TM.
- 3.5.2 The assessment area basically covers 500m from the Project boundary including works sites and works areas, Kam Tin River and River Beas catchment area, inland watercourses and relevant Water Sensitive Receivers (WSRs) within the Deep Bay Water Control Zone (WCZ).

Construction Phase

- 3.5.3 During construction phase, the potential water quality impacts would arise from the wastewater generated from general construction activities, construction site run-off, groundwater infiltration and change in groundwater levels, groundwater from contaminated areas, contaminated site runoff and wastewater from land decontamination, demolition works, construction works in close proximity to and in inland water, removal or diversion of watercourses, removal or filling of ponds,

accidental spillage of chemicals and sewage effluent from construction workforce. Provided that proper site management practices and the mitigation measures including adequate construction site drainage, provision of sediment removal facilities, practical groundwater control measures and chemical toilets would be implemented, no adverse water quality impact during construction phase would be anticipated.

Operational Phase

- 3.5.4 The key potential source of water quality impact during operational phase would be related to non-point source stormwater runoff, sewage and wastewater effluents. Adequate drainage system should be provided to collect the stormwater runoff. Most of the sewage and wastewater effluents generated from operation of depot, ancillary buildings and stations would be connected to the public sewerage system and diverted to public sewers. At some satellite locations without nearby public sewerage systems (Section 7.6 of the EIA Report refers), sewage generated will be stored at onsite sewage holding tanks before being tankered away by competent contractors regularly. With proper design of drainage and sewerage systems and implementation of the recommended mitigation measures, no adverse water quality impact during operational phase would be anticipated.

3.6 Sewerage and Sewage Treatment Implications

Assessment Scope and Key Criteria

- 3.6.1 The impact assessment has been carried out in accordance with the criteria and guidelines outlined in Annexes 6 and 14 of the EIAO-TM, other relevant guidance note and practice guide, and the requirements given in Clause 3.4.6 of the EIA Study Brief.

Operational Phase

- 3.6.2 The Project is located within the existing Yuen Long sewerage catchment and the planned STLMC sewerage catchment. Existing sewerage systems were identified in the vicinity of KSR(NOL) and AUT Stations, while the planned sewerage systems in Kam Tin South, Sha Po, Ngau Tam Mei, San Tin and Kwu Tung North as well as the planned Shek Wu Hui Effluent Polishing Plant (EPP) and / or planned STLMC EPP were also identified.
- 3.6.3 The proposed sewers will be generally connected to nearby existing or planned sewerage systems via the proposed terminal manholes to minimise the construction implications. For locations where there are unavailable existing or planned public sewerage systems nearby, sewage will be tankered away regularly by competent contractors. It is anticipated that there are no adverse impacts to the existing and planned sewerage system due to the Project.

3.7 Waste Management

Assessment Scope and Key Criteria

- 3.7.1 The potential waste management implications were assessed in accordance with the criteria and guidelines stated in Annexes 7 and 15 of the EIAO-TM, and the requirements given in Clause 3.4.7 of the EIA Study Brief.

Construction Phase

- 3.7.2 Different types of waste generated from the Project during construction phase would include Construction and Demolition (C&D) materials (from construction of stations, NTD and ABs, TBM tunnels, drill-and-blast tunnels, mined tunnels and cut and cover tunnels), land-based sediments, general refuse from workforce, and chemical wastes

from the maintenance of construction plant and equipment.

- 3.7.3 The C&D materials comprise both inert (e.g. rocks, soil, broken concrete, building debris) and non-inert components (e.g. vegetation and wood). Based on preliminary design information, it was estimated that the total volume of C&D materials is approximately 4,273,650 m³ of inert materials and approximately 125,250 m³ of non-inert materials. It is also expected that there would be approximately 24,820 kg of general refuse generated daily at the peak time and small to a few hundred litres of chemical wastes generated monthly during the construction period. With the implementation of the mitigation measures recommended, no unacceptable environmental impacts arising from storage, handling, collection, transport and disposal of wastes are expected.
- 3.7.4 It is anticipated that approximately 64,530m³ of excavated land-based sediment would be generated during the construction phase. According to the available sampling works and laboratory testing results at the time of the EIA study, approximately 31,180m³ out of total 64,530m³, have been classified and the quantities of different category of sediment were estimated. For the remaining 33,350m³ sediment, it is estimated based on the assumption of same/nearby sediment profile of outstanding sediment sampling location according to the nearby completed sediment sampling works GI information. The proposed outlet for the remaining land-based sediment will be subject to the sediment testing results to be obtained after land resumption. The possibility of reusing excavated sediment will be subject to the further review during detailed design and construction stages. With the implementation of the recommended mitigation measures and the requirements of PNAP No. 252 (ADV-21), no unacceptable environment impacts would be expected from excavation, transportation and disposal of land-based sediment.

Operational Phase

- 3.7.5 The main waste types generated during the operation of the Project would include general refuse and chemical waste from the staff, commercial operators and maintenance activities. The handling, collection, transportation and disposal practices of the identified waste generated would follow the current practices at other operating railway lines. With the implementation of recommended measures and good practices, it is anticipated that no unacceptable impacts would arise.

3.8 Land Contamination

Assessment Scope and Key Criteria

- 3.8.1 Potential of land contamination at the Project boundary including works sites and works areas were examined. A land contamination assessment was completed in accordance with the guidelines stated in the Annex 19 of the EIAO-TM, other relevant guidance note and practice guide, and the requirements given in Clause 3.4.8 of the EIA Study Brief.

Potential Land Contamination Issues

- 3.8.2 Potentially contaminated land within the Project boundary was identified through the site appraisal exercise. Based on the site appraisal results, a total of 121 potentially contaminated sites were identified with potential land contamination concerns within the Project. A sampling and testing programme, including the potential hotspots identified within the assessment area, was proposed and documented in the Contamination Assessment Plan (CAP). As the concerned facilities are still in operation, there could be change in site activities and land uses within the assessment area prior to the commencement of construction works which may cause further contamination issues. Further site re-appraisal within the whole Project Site, associated SI works and any necessary remediation action are recommended to be

carried out after site operation has ceased but prior to the commencement of construction works by means of excavation at the concerned area(s). The remediation works, if required, should be completed and Remediation Report(s) (RR(s)) demonstrating the completion of remediation works at the area(s) (if any) confirmed with contamination will be prepared and submitted to EPD for approval prior to the commencement of construction works by means of excavation, except for land remediation works, at the contaminated areas.

- 3.8.3 The recommended further works, including the submission of Supplementary CAP(s), Contamination Assessment Report(s) (CAR(s)) / Remediation Action Plan(s) (RAP(s)) and RR(s), would need to follow EPD's Guidance Manual, Guidance Note and Practice Guide.
- 3.8.4 With the implementation of the recommended further works for the concerned areas, any soil / groundwater contamination would be identified and properly treated. Land contamination impacts are therefore considered surmountable to future occupants.

3.9 Ecology (Terrestrial and Aquatic)

Assessment Scope and Key Criteria

- 3.9.1 The potential ecological impact was evaluated based on available information from relevant literature and field surveys conducted for the purposes of the EIA, and assessed in accordance with the criteria and guidelines stated in Annexes 8 and 16 of the EIAO-TM and the requirements given in Clause 3.4.9 of the EIA Study Brief. The assessment area covers 500m from the Project boundary including works sites and works areas.

Construction and Operational Phases

- 3.9.2 Potential direct impacts on significant ecological resources, such as Wetland Conservation Area (WCA), Wetland Buffer Area (WBA), Sha Po Marsh, egretries, ardeid night roosts (ANR), Tai Lam and Lam Tsuen Country Parks, were avoided/minimised through adopting underground alignment scheme, optimizing the Project footprint, and selection of construction method. Through underground tunnelling construction methods, above-ground works were minimised as far as practical and developed areas with relatively lower ecological values were also selected as construction works sites and areas as far as practical to minimise the ecological impacts on natural habitats.
- 3.9.3 Disturbance minimizing measures e.g. phasing of works, establishment of buffer zone, scheduling of working hours, control of construction runoff and groundwater infiltration will be implemented to mitigate potential indirect impacts to the ecological sensitive areas along the alignment such as Country Parks, Kam Po Road Egrety and ANR, WRCW and fishponds.
- 3.9.4 For the bat roost found in a classroom of Pok Wai Public School, mitigation measures including arrangement of construction works programme, bat inspection before the commencement of demolition work, installation of bat exclusion devices and provision of a bat shelter are proposed to avoid and minimize potential direct injury/mortality of the bats. A detailed vegetation survey would be conducted at the proposed works sites/areas, and a Protection and Transplantation Proposal should be prepared accordingly prior to the commencement of construction works to mitigate potential impacts on floral species of conservation importance recorded within the Project footprint. It was estimated that an area of about 1 ha would be required for the wetland compensation due to the construction and operation of the Project, and potential wetland compensation area of about 1.9ha was identified. A Habitat Creation and Management Plan (HCMP) covering habitat design and construction methods, monitoring protocol with particular focus on target species,

detailed design and implementation details of the compensatory wetland for the unavoidable direct loss of wetlands with moderate ecological values or above should be prepared to form the basis of the proposed compensatory wetland.

- 3.9.5 With the implementation of the above recommended mitigation measures, no unacceptable ecological impacts are anticipated to arise from the construction and operation of the Project.

3.10 Fisheries

Assessment Scope and Key Criteria

- 3.10.1 The potential impacts on culture fisheries were evaluated based on available information from relevant literature and site inspections on pond culture fisheries resources and activities within the assessment area conducted for the purposes of the EIA, and assessed in accordance with the criteria and guidelines stated in Annexes 9 and 17 of the EIAO-TM and the requirements given in Clause 3.4.10 of the EIA Study Brief.

Construction and Operational Phases

- 3.10.2 The Project would only involve land-based construction works within the proposed works site/area. Short-term loss of active and inactive fishponds of 0.71 and 0.23 ha are anticipated respectively due to at-grade construction works within the assessment area, while short- and long-term abandoned fishponds loss are anticipated to be 0.61 ha and 0.13 ha respectively. The active and inactive fishponds areas to be lost (i.e. 0.06% and 0.02% of fishpond areas in Hong Kong respectively) do not account for a significant proportion of the total fishponds area in Hong Kong. The fisheries impacts arising from the Project is therefore considered minor. In addition, with the implementation of mitigation measures for controlling water quality impact, the Project would not cause any unacceptable water quality impact to adjacent active fishponds near NOL alignment during construction and operation. Impacts on groundwater table, and indirect impacts due to noise and vibration are anticipated to be insignificant. Overall, no unacceptable fisheries impact is anticipated from the Project.

3.11 Landscape and Visual

Assessment Scope and Key Criteria

- 3.11.1 The assessment evaluated the impacts to landscape resources and visual sensitive receivers (VSRs) according to EIAO GN 8/2010 and the criteria and guidelines stated in the Annexes 10 and 18 of EIAO-TM respectively, and the requirements given in Clause 3.4.11 of the EIA Study Brief.

Construction and Operational Phases

- 3.11.2 The Project is an underground railway corridor, with limited aboveground structures including stations, ancillary buildings and depot. Potential landscape and visual impacts were therefore minimised and confined to aboveground works only.
- 3.11.3 The key sources of impact during construction phase are from activities associated with the construction of the aboveground structures within the works sites and works areas of the Project. The surface works would inevitably affect existing landscape resources such as trees. Potential impacts were considered during the preliminary design of the Project to minimise works sites and works areas in order to avoid direct impacts on significant landscape resources. Neither Registered Old and Valuable Trees (OVTs) nor rare and protected species will be affected by the Project, and the affected trees are mainly common tree species. It is estimated that 4,411 nos. of trees (excluding 712 nos. of undesirable tree species) would be potentially affected

by the proposed works, in which approximately 1,522 removed trees and 45 transplanted trees within permanent boundary under MTRCL's future maintenance. Opportunities for tree compensation have been fully explored and incorporated in the proposed mitigation measures as much as practicable during the course of EIA study where potential sites for on-site and off-site tree compensation were identified/studied in consultation with relevant stakeholders (relevant government departments including DEVB, ArchSD, HA/HD, HyD, LCSD, AFCD, CEDD and LandsD etc.). Exact number of trees to be retained, transplanted and felled and associated compensation proposal would therefore be further explored with the consideration of available areas for tree planting and operation constraints during the preparation of detailed Tree Preservation and Removal Proposals (TPRPs) in accordance with LAO Practice Note 6/2023 to be submitted to relevant government departments in later stage of the Project with an aim to achieve a tree compensation ratio of 1:1 in terms of number as far as practicable.

- 3.11.4 Given that some of the stations, including the AUT Station, NTM Station, SAT Station and KTU(NOL) Station, as well as associated above ground railway facilities and structures, are proposed with the consideration of the planned developments while the KSR(NOL) Station is within the existing railway related landuse, it is considered that the Project would not conflict with current and future statutory town plans of the areas. In addition to the adoption of aesthetic architectural and green design of the aboveground structures, potential visual impact arising from these structures would be acceptable.
- 3.11.5 Although the Project will have certain adverse landscape and visual impacts, they will be mitigated as far as practicable by appropriate mitigation measures including both on-site and off-site compensatory planting. In view of the above, it is considered that, with the implementation of the appropriate mitigation measures, the overall residual landscape impacts are minimised to marginally acceptable level, and the overall residual visual impacts are minimised to acceptable level during the construction and operational phases of the Project.

3.12 Cultural Heritage

Assessment Scope and Key Criteria

- 3.12.1 The potential impact on cultural heritage was assessed in accordance with relevant guidelines and the criteria stated in Annexes 10 and 19 of the EIAO-TM. The assessment area covers 500m from the Project boundary including works sites and works areas.

Built Heritage

- 3.12.2 A desktop literature review and field surveys were conducted to establish built heritage baseline condition. A total of 40 built heritage either granted a declared monument status or with confirmed/proposed grading and 180 other identified items were identified within 500m assessment area. No direct impact is anticipated on any built heritage either granted a declared monument status or with confirmed/proposed grading during the construction and operation of the Project. Direct impact on two other identified items is anticipated due to the demolition of Fung Kat Vegetable Marketing Co-operative Society Ltd. and Pok Wai Public School. Cartographic and photographic record, and other documentation means (including 3D scanning), should be carried out for these items prior to the commencement of the construction works at the respective locations and the record should be shared with AMO for record purposes and future use, such as research, exhibition and educational programmes.
- 3.12.3 There may be potential indirect vibration impact on the other identified item (i.e. San Yau Vegetable Marketing Co-operative Society Ltd.) due to close proximity to the

works sites. Monitoring of ground-borne vibration, tilting and ground settlement is proposed for the built heritage that may be impacted by ground-borne vibration, tilting and ground settlement under Buildings Ordinance. As the access roads of San Yau Vegetable Marketing Co-operative Society Ltd. will fall within the project works site for NTD, temporary change of access may be required. A safe access route should be maintained for the users of the Society to ensure they can operate as usual. With these measures in place, it is anticipated that the Project would have no adverse impacts on the identified items during construction phase.

Archaeology

- 3.12.4 Archaeological field survey was conducted as part of the EIA study intended to confirm those areas of uncertain archaeological potential identified in the at-grade Project's works sites and works areas. In the survey and excavation area, a total of six locations were investigated, and 13 archaeological test pits were excavated in three of them. All test pits were 2 meters by 1 meter in size with rectangular shape. All excavation was conducted until reaching the sterile layer as much as possible to obtain comprehensive information. Based on the results of this survey, it is confirmed that Pok Wai Survey Area, Long Ha Tsuen Survey Area, the north of NTM Station, north of SAT Station, Ki Lun Tsuen Survey Area and Pak Shek Au Survey Area have low or no archaeological potential.
- 3.12.5 Based on the desktop review, the archaeological field survey conducted between April and June 2023, additional survey information and archaeological impact assessment from recent project and archaeological prediction modelling, a total of two areas with moderate archaeological potential and 21 areas with high archaeological potential are identified within the 500m assessment area. Among these 23 archaeological potential areas, three of them have encroached onto the at-grade Project area. The encroached areas are constituting to three archaeologically sensitive areas (ASA) that required to be further surveyed/studied, namely Mai Po Lung (South) ASA, Long Ha ASA and Ngau Tam Mei ASA.
- 3.12.6 Long Ha ASA and Ngau Tam Mei ASA are located in the at-grade Project Areas, which include the north of AUT Station, and south of NTM Station and NTD. Considering their high archaeological potential and potential direct impact to archaeology, survey-cum-excavation is proposed at these areas after land resumption and before the commencement of site formation and construction works, in order to fully retrieve archaeological data. Further archaeological investigation should be conducted on NTM-TP3 after land resumption and before the commencement of site formation and construction works in order to yield adequate archaeological information.
- 3.12.7 For the sake of satisfying licence requirements and provide a more comprehensive analysis on the archaeological potential within the Licence Area, future archaeological survey is recommended on the south of SAT Station after land resumption and before commencement of site formation and construction works.
- 3.12.8 Mai Po Lung (South) ASA is located in the at-grade Project works site and works area to the northwest of SAT Station. Considering that the ASA has experienced some level of modern disturbance yet there might be archaeological deposits as suggested in past discoveries, archaeological watching brief is thus recommended to be carried out during the course of excavation works.
- 3.12.9 If antiquities or supposed antiquities under the Antiquities and Monuments Ordinance (Cap. 53) are discovered during the construction phase, the project proponent is required to inform AMO immediately for discussion of appropriate mitigation measures to be agreed by AMO before implementation by the project proponent to the satisfaction of AMO.

3.13 Hazard to Life

Assessment Scope and Key Criteria

- 3.13.1 The hazard to life assessment is conducted in accordance with the criteria and guidelines as stated in the requirements given in the Clause 3.4.13 of the EIA Study Brief, as well as Annex 4 of the EIAO-TM.

Potential Hazard to Life Issues

- 3.13.2 Given that Au Tau Water Treatment Works (ATWTW) has been delisted from Potentially Hazardous Installation (PHI) Registers according to the latest information, and thus there would not be any hazard-to-life concerns due to the operation of ATWTW.
- 3.13.3 Within the entire alignment of about 10.7km, only a 1.1km long tunnels would be constructed by drill-&-blast (D&B) and mined tunnelling methods which would require the use of explosives. To ensure timely delivery of explosives to blasting site and maintain the construction process, a temporary explosive magazine site at Tai Shu Ha (Yuen Long), which had been formerly operated as the magazine site for the tunnel construction works of MTRCL's the Hong Kong Section of Guangzhou-Shenzhen-Hong Kong Express Rail Link (approved EIA Report with Register No.: AEIAR-143/2009 refers) and CEDD's Liantang/Heung Yuen Wai Boundary Control Point project (approved EIA Report with Register No.: AEIAR-193/2015 refers), for overnight storage of explosives is required.
- 3.13.4 The temporary magazine site at Tai Shu Ha (Yuen Long) would follow the relevant design requirements in terms of sufficient separation distances and the design of the storage facilities. Review findings indicated that the associated risk for the operation of temporary magazine site would be insignificant.
- 3.13.5 With proper design and maintenance of the blasting face and provision of blast door or cover, in addition to the fact that the blasting would be connected inside the tunnel section and with the blast cover shut, the associated risk would be well within the acceptable region during the use of explosives at the D&B tunnel section.
- 3.13.6 For the storage and transportation risk, a preliminary review found that there is mainly low-density population within the 100m influence zones. However, since the number of buildings is noticeable, QRA was conducted and the risk for Overnight Storage of Explosives and Transport of Explosives slightly enter the "ALARP" region.
- 3.13.7 The assessment results for cumulative risk from storage, transportation and use of explosives show that the criterion of Annex 4 of the EIAO-TM for Individual Risk are complied. For the societal risk, although the societal risk for use of explosives entered the "ACCEPTABLE" region, the result for storage and transportation of explosives slightly entered the "ALARP" region. Hence, the societal risk lies within the "ALARP" region. A Cost-Benefit-Analysis (CBA) was therefore conducted to study the cost-effectiveness of different measures and justified mitigation measures have been recommended. It is still recommended to implement all the best practices to minimize the risk even further.

4 ENVIRONMENTAL MONITORING AND AUDIT

- 4.1.1 The EIA Study of the Project has demonstrated its compliance with the EIAO-TM requirements. Actual impacts during the construction works will be monitored through a detailed EM&A programme. Full details of the programme are presented in a separate EM&A Manual associated with the EIA Report. The EM&A programme will provide management actions and detail the recommended mitigation measures 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 This EIA Study assessed the overall acceptability of the environmental impacts likely to arise as a result of the construction and operation of the Project, in accordance with the EIA Study Brief (No. ESB-346/2021), EIAO-TM and other relevant guidelines and criteria. It has demonstrated the protection of the population and environmentally sensitive resources and the acceptability of any possible environmental impacts from the Project. The findings of EIA Study indicated that, with the implementation of the recommended mitigation measures, the Project would be environmentally acceptable and in compliance with the relevant assessment standards / criteria of the EIAO-TM. Where appropriate, EM&A mechanisms were recommended to verify the environmental acceptability of the Project and to check the effectiveness of the recommended mitigation measures.