

Civil Engineering and Development
Department

**Tung Chung New Town Extension
Project**

Executive Summary

219844-REP-145-02

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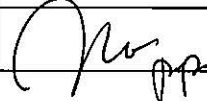
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Contents

	Page
1 INTRODUCTION	1
1.1 General	1
1.2 Project Description	1
2 ENVIRONMENTAL INITIATIVES	4
2.1 Appreciation of Existing Environment	4
2.2 Environmental Initiatives	5
3 SUMMARY OF ENVIRONMENTAL IMPACT ASSESSMENT	17
3.1 Approach to Environmental Impact Assessment	17
3.2 Air Quality	17
3.3 Noise Impact	20
3.4 Water Quality	25
3.5 Sewerage and Sewage Treatment Implications	28
3.6 Waste Management Implications	29
3.7 Land Contamination	32
3.8 Ecology	33
3.9 Fisheries	37
3.10 Landscape and Visual	40
3.11 Cultural Heritage	45

- Figure 1.1** Location of Project
Figure 2.1 Key Environmental Initiatives

1 INTRODUCTION

1.1 General

1.1.1.1 This Executive Summary summarises the results of the Environmental Impact Assessment (EIA) for Tung Chung New Town Extension (TCNTE) Project, including the possible development areas (PDAs) at both Tung Chung East (TCE) and Tung Chung West (TCW). The EIA has been prepared in accordance with the requirements of the Environmental Impact Assessment Ordinance (EIAO) and the EIA Study Brief (ESB-285/2015).

1.2 Project Description

1.2.1.1 Tung Chung New Town Extension has been identified by the Hong Kong Government as one of the initiatives for providing land supply in the short to medium-term to accommodate various land uses for Hong Kong's housing, economic and social needs, while conserving the natural environment of Tung Chung at the same time. (Project location is illustrated on **Figure 1.1**).

1.2.1.2 Geographically Tung Chung enjoys a strategic location, as it is surrounded by many tourist attractions and strategic infrastructures such as the Hong Kong International Airport and Hong Kong – Zhuhai – Macao Bridge. The continued development of Tung Chung is premised on the development of a sustainable and greenery new town optimizing the development potentials of the extension areas and capitalizing on its niche brought by the imminent completion of major infrastructure nearby. In parallel, there is window of opportunities brought by the natural and rural setting of Tung Chung Valley for lower density developments that are complementary to the conservation of the natural environment. On the other hand, with proximity to the proposed Tung Chung West railway station and the surrounding mountain backdrop to the east, there is scope for higher density developments for public housing to be located to the west of Tung Chung Road.

1.2.1.3 The TCNTE covers over 200ha area of land including reclaiming about 120.5 ha of land in TCE, about 8.6ha of land for the proposed Road P1 (Tung Chung – Tai Ho Section) and developing some fallow agricultural land in TCW. Extensive public engagement activities, including forums, workshops, roving exhibitions, focus group meetings and briefing sessions, had been carried out. The public and different stakeholders expressed their views on development needs, economic

development, ecology, environment and cultural heritage, connectivity, land use and urban design, etc. Key environmental concerns from public include impact on Chinese White Dolphin due to reclamation works at TCE; prohibition of reclamation at TCW; conservation of Tung Chung Stream and other ecologically sensitive areas in TCW; avoidance of declared monuments and graded historic buildings in TCW; revitalization of existing channelized section of Tung Chung Stream and concern on air quality in Tung Chung. All comments collated had been compiled and analysed, which form the basis for the formulation of the Recommended Outline Development Plan (RODP).

1.2.1.4 Responding to public expectation after three stages of public engagement activities, sustainable urban design and balanced allocation of open space with community facilities would be implemented to enhance the living quality in Tung Chung. Different commercial facilities, including offices, retails, hotels and marina, would also be in place to offer a wider range of job opportunities, which could be even more diversified added with the nearby developments. Furthermore, there would be land reserved for recreational, educational and community uses such as waterfront promenade, a sports ground, clinics and a post-secondary institution.

1.2.1.5 The Study is a Designated Project (DP) under Item 1 Schedule 3 of EIAO - Engineering feasibility study of urban development projects with a study area covering more than 20 ha or involving a total population of more than 100,000. To implement the extension project, there are various key items among most of which are classified as Designated Projects under Schedule 2 of the EIAO and an EIA Study has been undertaken. This includes the planned reclamation at TCE and for the proposed Road P1 (Tung Chung – Tai Ho Section), Tung Chung Stream, marina, distributor roads at TCE and TCW, etc. (The complete list and details are shown in the below table).

Table 1.1: Key project items

Project Elements	Details
Reclamation	About 129.1 ha reclamation area (about 120.5 ha for TCE and about 8.6 ha for the Road P1 (Tung Chung – Tai Ho Section))
Existing Land	About 124.5 ha existing land (about 4 ha for TCE, about 0.5 ha for the Road P1 (Tung Chung – Tai Ho Section) and about 120 ha for TCW))
Revitalisation of Tung Chung Stream	Revitalisation of the existing channelised section of Tung Chung Stream at the PDA at TCW and partly proposed as River Park
Sustainable Urban Drainage System	Provision of sustainable urban drainage system within TCW which comprises dual-purpose stormwater attenuation and treatment ponds
Distributor Roads	Construction of a Primary Distributor Road and District Distributor Roads within PDAs at TCE and TCW

Project Elements	Details
Sewage Pumping Stations	Construction of sewage pumping stations, some with individual capacity more than 2,000m ³ /day within PDAs at TCE and TCW
Sewerage System	Provision of sewerage system for the existing unsewered villages and proposed residential developments within TCW
Outdoor Sporting Facility	Land formation for an outdoor sporting facility with a capacity of over 10,000 persons at the PDA at TCE as part of the reclamation
Marina	Land formation for a marina with about 95 berths at the PDA at TCE as part of the reclamation

1.2.1.6 Apart from the above key project items, a number of associated infrastructures such as service reservoir, gravity sewer/ rising main, drainage, fresh water supply, flushing water supply, etc, and community facilities supporting the development such as waterfront promenade, cycle track network and cycle park are also taken into account in the development.

2 ENVIRONMENTAL INITIATIVES

2.1 Appreciation of Existing Environment

2.1.1 TCW

2.1.1.1 Tung Chung West is characterised by its rich natural and heritage resources. There are many traditional villages and declared monuments in the district. In the course of development, efforts have been spent to highlight Tung Chung's unique characteristics by integrating the old and the new, to promote the district into a tourism attraction. In conjunction with the development of community and economy, the potential impacts of the development on the surrounding natural resources are one of the key concerns.

2.1.1.2 Tung Chung Stream – The Tung Chung Stream consists of the natural and artificial sections. The natural section of Tung Chung Stream is of ecological importance with high diversity of freshwater fish species. Record of species of conservation importance including Beijiang Thick-lipped Bard and Philippine Neon Goby are found. Downstream of the Tung Chung Stream is the Tung Chung Bay area in which there are abundant mudflats along some sections of the coastline. These mudflats have supported a vast number of mangroves and other special species including but not limited to horseshoe crabs, seagrasses, pipefishes, seahorses etc. The artificial section was a result of the flooding prevention measures implemented decades ago that part of the natural stream was being modified into an engineering channel.

2.1.1.3 Tung Chung Valley – Exist on Tung Chung Valley are several recognized local indigenous villages (Ngau Au, Lam Che, Nim Yuen, Shek Lau Po, Mok Ka, and Shek Mun Kap) and graded historic buildings (Hau Wong Temple and the Entrance Gate at Shek Mun Kap). The other parts of Tung Chung Valley consists of mainly fallow agricultural land with some active farming practices. Endangered Romer's Tree Frog and rare Jhora Scrub Hopper are present in Tung Chung Valley.

2.1.1.4 Ma Wan Chung – public opinions reflected that the distinct fishing village feature of Ma Wan Chung Village should be preserved. Residents and tourists can enjoy its ambience. At the natural knoll to the east of Ma Wan Chung are two declared monuments, (namely Tung Chung Fort and Tung Chung Battery). Parking facilities would be provided and improvement works would be carried out to support the revitalisation of Ma Wan Chung Village.

2.1.1.5 Yat Tung Estate – In the immediate vicinity of Ma Wan Chung is Yat Tung Estate and therefore due considerations have been taken into account with respect to land use compatibility, enhance connectivity between TCW and TCE as well as external connectivity, and provision of more government, institutional and community facilities to better serve the existing residents.

2.1.2 TCE

2.1.2.1 Tai Ho Bay to the east – Tai Ho Bay is an area of ecological importance, within which there are Site of Scientific Interests (SSSI) and important habitats comprising mudflats and mangroves. Ayu, migratory fish is found getting into and out of Tai Ho Bay via Tai Ho inlet. Recent surveys found dolphin habitats in the Proposed The Brothers Marine Park.

2.1.2.2 No natural coastlines – Most of the coastline which will be affected by TCE development is the seawall formed by previous reclamation for existing Tung Chung New Town.

2.1.2.3 Tung Chung East adjoins immediately to the existing and planned developments in Tung Chung New Town including housing and hotel developments. Considerations including ensuring land use compatibility and sufficient transport and infrastructure capacity, etc. have been duly incorporated into the RODP.

2.2 Environmental Initiatives

2.2.1 TCW

2.2.1.1 Preservation of the Natural Coastline – is to avoid any reclamation in Tung Chung Bay. For the natural coastline to the west of Wong Lung Hang nullah in which ecological surveys have confirmed that the conditions of mangroves and mudflats are more intact, a Coastal Protection Area (CPA) zoning has been proposed. All these would help to avoid the direct impacts on the habitats such as mudflat, mangroves etc. in Tung Chung Bay. Besides, it would reduce the loss of fishing ground and minimise the loss of general marine waters habitat. Thus, the fishery spawning grounds which support fishery production could be protected.

- 2.2.1.2** Revitalising the artificial sections of the Tung Chung Streams – as Tung Chung Stream and Tung Chung Bay are ecologically connected, the existing engineering channel (approximately 625m long) in Tung Chung Stream would be revitalised, and part of them will become a River Park which would be further extended upstream to reach Shek Mun Kap Road. This River Park would introduce elements of eco-education such as viewing decks / boardwalk and passive recreation zone for appreciation of the natural environment. Besides, given the characteristics of Tung Chung Stream, the remaining natural sections of Tung Chung Stream would be provided with either Conservation Area (CA) or Green Belt (GB) zoning to provide better protection.
- 2.2.1.3** Innovative Sustainable Urban Drainage System – the ecology along Tung Chung Stream is also closely related to the approach to tackling water discharge into the stream. Unlike the conventional drainage system in which surface runoff would pass through gullies to filter off dirt and debris and then discharged into the receiving water bodies, the innovative Sustainable Urban Drainage System (SUDS) within TCW includes the provision of a series of regional stormwater attenuation and treatment ponds. With the implementation of SUDS, effectiveness in filtering pollutants has been greatly improved which could further enhance the protection for Tung Chung Stream.
- 2.2.1.4** Ensuring Clean Water Bodies by Adequate Sewerage Infrastructure – sewerage system would be provided for the existing villages. For the planned population, sewage would be conveyed by sewerage system such as sewers and pumping stations to Siu Ho Wan Sewage Treatment Works. All sewage pumping stations (SPSs) will be fitted with a) 100% standby pumping capacity with spare pump up to 50% pumping capacity; b) twin rising mains; c) dual-feed power supply; d) emergency storage facilities up to 6-hours ADWF capacity; and e) emergency communication mechanism amongst relevant government departments to avoid emergency discharge into Tung Chung Stream.
- 2.2.1.5** Preservation of Built Heritage – all built heritage including Declared Monuments (e.g. Tung Chung Fort and Tung Chung Battery) and Graded Historic Buildings (e.g. Hau Wong Temple and Entrance Gate at Shek Mun Kap) are well preserved and kept intact.

2.2.2 TCE

2.2.2.1 Careful Consideration on Reclamation Extent – extensive efforts have been exercised to optimise the extent of the TCE reclamation with due consideration on the environment and the keen demand for land. There would be no encroachment on Tai Ho Wan and the proposed The Brothers Marine Park, which have been identified to have high ecological values. The proposed reclamation is located at the area with lowest use of Chinese White Dolphins within North Lantau Waters. Non-dredged reclamation would be adopted to minimise water pollution during construction. Continuous waterfront promenade has been provided for the residents and visitors to enjoy scenic view of Tung Chung Bay. The waterfront promenade is highly accessible by the various linear parks directly linking up to the MTR station and is provided with bike lane and street shops to enhance its vibrancy.

2.2.2.2 Proactive Design of Sewerage Facilities – sewage generated from the planned population would be conveyed by sewerage system including sewers and pumping stations to Siu Ho Wan Sewage Treatment Works. All SPSs will be fitted with a) 100% standby pumping capacity with spare pump up to 50% pumping capacity; b) twin rising mains; c) dual-feed power supply; d) emergency storage facilities up to 6-hours ADWF capacity; and e) emergency communication mechanism amongst relevant government departments. All SPSs would be equipped with measures to avoid emergency discharge into the neighbouring water bodies.

2.2.2.3 A Quiet & Clean Residential Community – TCE is located along North Lantau Highway (NLH) with heavy traffic volume. Residential developments need to be located farther away from NLH to ensure a comfortable living environment. The RODP has therefore adopted a sensible land use allocation by locating the commercial buildings along the NLH, which serve dual purposes: to screen out the traffic noise from NLH to the residential district while at the same time capitalizing the precious property value of being located right next to the MTR station. The provision of the more environmental friendly railway system can also help reducing road based traffic and hence the associated vehicular noise and emission.

2.2.3 Other Initiatives

2.2.3.1 Other than the above initiatives that are specific to TCW and TCE, other initiatives such as the space provision of railway stations, extension of waterfront promenade, construction of cycling tracks and space

provision of charging facilities for environmentally friendly buses have also been incorporated in both TCW and TCE.

2.2.3.2 Railway provision - for train stations, space has been allocated in both TCW and TCE for new train stations to serve both the existing and planned population. This would allow the community to have better accessibility to the more environmental friendly transport system which would in turn help reducing road based traffic and hence their associated vehicular noise and emission.

2.2.3.3 Concept of “Walkable city” - pedestrian and cycling connectivity throughout the new town is one of the key design concepts driving the configuration of the spatial framework of the new town. The footpath, cycle track and carriageway would be well integrated under a three-zone concept, i.e. district distributor, local distributor (suburban) and local distributor (rural). Key destinations within TCNTE such as proposed railway stations, waterfront promenade and neighbourhood centres would be linked up by comprehensive open space, footpaths and cycle tracks, to allow convenient and comfortable movement within the development. Trees would be planted along the footpath and cycle track to provide separation from the carriageway, a barrier from road traffic noise, and shading for the pedestrians and cyclists. This would create a comfortable walking and cycling environment.

2.2.3.4 By promoting walking and cycling, vehicular emissions within TCNTE can be greatly reduced due to reduced demand for fossil fuel-powered vehicles. Integrated pedestrian network within the new development area includes walkway system, pedestrian facilities, pedestrianized plazas, linkage to Public Transport Interchanges (PTIs) and railway stations. Emphasis has been placed on the needs of pedestrians in transport and land use planning. This aims to reduce the number of short motorized trips and the conflict between pedestrians and vehicles with a view to increasing mobility, enhancing road safety and improving pedestrian environment in general.

2.2.3.5 Extensive waterfront promenade - the new waterfront promenade linking TCE and TCW would form a distinctive component of Tung Chung’s coastal identify and also operate as pedestrian walkway to enhance connectivity of the entire Tung Chung New Town. It would be designed as a continuous, barrier free public open space devoted to pedestrians and cyclists that intimately connected with the inner landscape framework of the development. It would provide both functional and recreational resources and serve as a natural focus for the residents and visitors. There would be a variety of waterfront facilities that create an attractive, vibrant visual scene and the potential

for varied recreational pursuits. In general, there would be an over 5km long pedestrian promenade with seating, shelters and canopy tree planting. A cycle track would run adjacent to the promenade. Behind the cycle track would be a broad landscaped buffer, heavily planted with lawn areas, shrubs and trees.

3 SUMMARY OF ENVIRONMENTAL IMPACT ASSESSMENT

3.1 Approach to Environmental Impact Assessment

3.1.1.1 The EIA process provides a means of identifying, assessing and reporting the environmental impacts and benefits of the project. It is an iterative process that has been followed in parallel with the design process to identify the potential environmental effects of various design options, and develop alternatives as well as mitigation measures to be incorporated into the design, construction and operation of the Project. Feedback and advice obtained from the various stakeholder engagement activities have been considered and incorporated into the EIA process where appropriate. Mitigation measures have been proposed to avoid some potential environmental impacts, or to minimise or mitigate to acceptable levels.

3.2 Air Quality

3.2.1 Introduction

3.2.1.1 Potential air quality impacts associated with the construction and operational phases of the project have been assessed in accordance with the criteria and guidelines as stated in the requirements given in Section 3.4.1 and Appendix B of the EIA Study Brief, as well as Section 1 of Annex 4 and Annex 12 of the Technical Memorandum on EIA Process issued under the EIAO (TM-EIAO).

3.2.1.2 Quantitative assessments using the relevant air models approved by EPD have been conducted for both the construction and operational phase impact assessments. Cumulative air quality impact, project contribution, and changes in air quality levels from existing baseline conditions have been determined.

3.2.2 Construction Phase

3.2.2.1 The key activities that could potentially result in dust emissions during construction phase of the project have been identified. These activities include reclamation, site clearance, soil excavation, backfilling, site formation and wind erosion of open sites. In addition, construction dust emissions from concurrent projects have also been identified and included in the cumulative air quality impact assessment where appropriate. The assessment has include representative Air Sensitive Receivers (ASRs) in the vicinity and considered the relevant air

pollutants such as Total Suspended Particulates (TSP), Respirable Suspended Particulates (RSP) and Fine Suspended Particulates (FSP).

3.2.2.2 Assessment results indicate that, with the implementation of the mitigation measures as stipulated in the Air Pollution Control (Construction Dust) Regulation and dust control measures (i.e. watering once per hour on exposed worksites and haul road, and good site practices), the predicted concentrations of TSP, RSP and FSP at representative ASRs would comply with the Air Quality Objectives (AQOs) and TM-EIAO.

3.2.2.3 A summary of the predicted concentrations for key representative air pollutant after the implementation of mitigation measures is tabulated below:

Table 3.1: Summary of construction dust impacts (after implementation of mitigation measures)

Area	TSP Conc. ($\mu\text{g}/\text{m}^3$)	RSP Conc. ($\mu\text{g}/\text{m}^3$)		FSP Conc. ($\mu\text{g}/\text{m}^3$)		AQOs / TM-EIAO Compliance
	Max. 1-hour	10 th highest 24-hour	Annual	10 th highest 24-hour	Annual	
	(500)	(100)	(50)	(75)	(35)	
Existing Tung Chung Town	146 - 404	79 - 97	40 - 50	57 - 61	27 - 30	Yes
TCE	147 - 466	78 - 99	40 - 50	58 - 61	28 - 30	Yes
TCW	143 - 309	78 - 81	39 - 42	57 - 59	27 - 28	Yes

Note: Respective criteria of each pollutant are given in ().

3.2.2.4 The mostly affected receivers would be those in the immediate vicinity of construction sites during the period with heavy construction activities. For example, the planned public rental housing at Tung Chung Area 56 would be more affected during heavy construction activity in TCE that are conducted in the vicinity. In summary, no adverse air quality impact during construction phase is anticipated when all the proposed mitigation measures are implemented.

3.2.3 Operational Phase

3.2.3.1 Key existing and planned / committed air pollution sources in the vicinity of the Project during operational phase include the vehicular emission from neighbouring roads, such as North Lantau Highway, Hong Kong Link Road, Hong Kong Boundary Crossing Facilities, and Tuen Mun - Chek Lap Kok Link, Hong Kong International Airport, and Organic Waste Treatment Facilities Phase I etc. The assessment has also considered other emission sources that would have certain influence on the background air quality level, including territory wide

vehicular emission, power plants, marine traffic emission, as well as regional emission from the Pearl River Delta. Key representative air pollutants include Nitrogen Dioxide (NO₂), RSP and FSP.

3.2.3.2 During the course of formulating the Recommended Outline Development Plan (RODP), air quality impact on the newly introduced population in the Tung Chung East development area is one of the key concerns given the close proximity to the heavily trafficked North Lantau Highway (NLH). Sufficient buffer distance from NLH has been provided for the air sensitive receivers. For example, a separation distance of at least 180m between NLH and the residential buildings will be provided. Nevertheless, quantitative assessment has been conducted according to Appendix B of the EIA Study Brief. Assessment results indicate that the cumulative air quality impact during operational phase for the assessment year would comply with the AQOs. Hence, the operation of the project will not result in adverse residual air quality impacts and mitigation measures are therefore not required. A summary of the predicted concentrations for key representative air pollutants is given below.

Table 3.2: Summary of predicted concentrations for key representative air pollutants

Area	NO ₂ Conc. (µg/m ³)		RSP Conc. (µg/m ³)		FSP Conc. (µg/m ³)		AQO Compliance
	19 th highest 1-hour	Annual	10 th highest 24-hour	Annual	10 th highest 24-hour	Annual	
Tung Chung Town	112 - 163	23 - 36	73 - 78	38 - 39	55 - 58	27 - 28	Yes
TCE	141 - 168	28 - 31	76 - 78	39 - 39	57 - 59	27 - 28	Yes
TCW	111 - 131	22 - 28	73 - 77	38 - 39	55 - 58	27 - 27	Yes

3.2.3.3 Higher pollutant concentrations (e.g. annual NO₂) are generally predicted at existing residential and educational ASRs located adjacent to the NLH, such as One Citygate, Tat Tung Road Park, Ling Liang Church E Wun Secondary School, Ling Liang Church Sau Tak Primary School, Novotel Citygate Hong Kong, and Man Tung Road Park. For planned residential and educational ASRs in TCE, as sufficient setback distance between the NLH has already been considered in the layout design, the predicted pollutant concentrations are generally lower than the existing ASRs. For existing and planned ASRs in TCW, such as Shek Mun Kap, Yat Tung Estate – Kui Yat House and the planned residential developments, which are located further away from the major highways, the predicted pollutant concentrations are lower.

3.2.3.4 The air quality assessment has also quantified the contributions due to the proposed Project. For the planned ASRs in TCE, the traffic due to

the Project would contribute to less than $3\mu\text{g}/\text{m}^3$ in terms of annual NO_2 . For the existing ASRs in the vicinity of TCE, the traffic due to the Project would contribute to less than $2\mu\text{g}/\text{m}^3$ in terms of annual NO_2 .

3.2.3.5 Similarly, for the planned ASRs in TCW, the traffic due to the Project would contribute to less than $2\mu\text{g}/\text{m}^3$ in terms of annual NO_2 . For the existing ASRs in the vicinity of TCW, the traffic due to the Project would contribute to less than $1\mu\text{g}/\text{m}^3$ in terms of annual NO_2 .

3.3 Noise Impact

3.3.1 Introduction

3.3.1.1 Potential noise impacts associated with the construction and operational phases of the project have been assessed in accordance with the criteria and guidelines as stated in the requirements given in Section 3.4.2 and Appendix C of the EIA Study Brief, as well as Annex 5 and Annex 13 of the TM-EIAO.

3.3.1.2 Impacts from construction airborne and groundborne noise, road traffic noise, fixed noise, aircraft noise, rail airborne and groundborne noise, helicopter noise and marine traffic noise have been quantitatively determined with relevant models and calculations.

3.3.1.3 In fact, the design of the new town has proactively located certain commercial buildings between residential buildings and NLH and the railway line to provide noise screening. This has helped to avoid traffic noise impacts from NLH and rail noise as much as practicable at the outset.

3.3.2 Construction Airborne Noise

3.3.2.1 Potential construction airborne noise impacts would be caused by various construction activities including reclamation for the PDA at TCE and Road P1 extension, site clearance and formation activities for TCE and TCW, construction of service reservoirs, revitalization works along the channelized section of Tung Chung Stream, internal roads, superstructure, etc.

3.3.2.2 Construction noise assessment has concluded that the unmitigated construction noise impacts would exceed the noise criteria at some existing and planned Noise Sensitive Receivers (NSRs). A package of noise mitigation measures such as good site practices, movable noise barriers, full enclosure, quiet plants and working sequence have therefore been proposed to mitigate construction noise impacts. Assessment results indicate that, with the implementation of the above mitigation measures, all NSRs including residential premises and

schools during both normal and examination periods would comply with the stipulated noise criterion. For TCE, the construction noise impacts would be 50 – 74dB(A) and 65dB(A) for planned residential uses and educational institutions respectively. For TCW, the construction noise impacts would be 75dB(A) for planned residential uses. For the existing noise sensitive receivers, the construction noise impacts would be 56 – 75dB(A) and 65dB(A) for residential uses and educational institutions respectively. Similar to the committed noise sensitive receivers, the construction noise impacts would be 65 – 75dB(A) and 65dB(A) for residential uses and educational institutions respectively. Adverse construction airborne noise impact is not anticipated.

3.3.3 Construction Groundborne Noise

3.3.3.1 The extension of the existing Tung Chung Line to the proposed Tung Chung West Station is expected to be constructed by the use of Tunnel Boring Machine (TBM), which would generate groundborne noise. Assessment results suggest that, given the separation distance between the new railway extension and the planned NSRs, the vibration generation by typical TBM operation would cause groundborne noise impacts of 38 – 40dB(A) at planned residential uses, which would not exceed the respective noise criterion. Adverse construction groundborne noise impact is not anticipated.

3.3.3.2 The proposed railway stations at TCE and TCW and its associated railway system are a Designated Project under Item A.2 of Schedule 2 of TM-EIAO. A separate study would be conducted by the future rail operator to fulfil all the statutory requirements and procedures under the EIAO.

3.3.4 Road Traffic Noise

3.3.4.1 The road traffic from both existing and planned roads would generate road traffic noise that would have impacts on the planned and existing NSRs. Existing roads that have been included in the assessment include North Lantau Highway, Ying Hei Road, Yu Tung Road, Tung Chung Road and planned roads under TCNTE including those internal roads inside Tung Chung East, Tung Chung West and Road P1.

3.3.4.2 Assessment results suggest that, for the scenario without mitigation measures, the predicted road noise levels at some of the planned noise sensitive receivers including residential uses and educational institutions inside TCE and TCW would exceed the respective noise criteria. The use of noise mitigation measures have therefore been explored, including 1) approximately 270m long noise barriers (height

ranges from 5m to 5m with 3m cantilever arm at 45°) along some road sections or boundary walls within development sites; 2) application of approximately 530m long low noise road surfacing materials on some road sections; and 3) suitable treatment on end walls, arranging noise tolerant portions of buildings in internal layout design and architectural fins in some buildings. With all the proposed mitigation measures in place, the façade noise levels at all the planned sensitive receivers would comply with the respective noise criteria. A summary of the predicted road traffic noise impacts is given below.

Table 3.3: Summary of predicted road traffic noise impacts

Uses	Predicted Overall L ₁₀ 1hr, dB(A)	Criterion, L ₁₀ 1hr dB(A)
TCE		
Residential	27 – 70	70
Educational Institutions	37 – 65	65
TCW		
Residential	45 – 70	70

Note: Total length of noise barriers is approximately 270m. Total length of low noise road surface material is approximately 530m.

3.3.4.3 The noise level from project roads would comply with the respective noise criteria and the project road contribution to overall noise level would not be negligible. Hence, traffic noise impact due to the project is insignificant after implementing the proposed mitigation measures.

3.3.5 Fixed Noise

3.3.5.1 A number of facilities have been recommended to support the operation of the proposed new town. Some of these facilities are fixed noise sources that would have potential noise impacts on NSRs. These noise sources include planned salt water pumping station / sewage pumping station / pumping station, fire station, Chung Mun Road sewage pumping station, electric substation, public transport interchange. Other than these planned noise sources, fixed noise sources from boatyard maintenance area, sports ground, ventilation shafts for the railway stations at TCE and TCW and planned Third Runway of Hong Kong International Airport would also contribute to noise environment.

3.3.5.2 In order to ensure that the noise impacts from these fixed noise source would comply with the respective noise criteria, their maximum allowable sound power level have been derived. These sound power levels are 67 – 88dB(A) for salt water pumping station / sewage pumping station / pumping station, 97dB(A) for fire station, 81dB(A) for Chung Mun Road sewage pumping station, 96dB(A) for electric substation, 82 – 91dB(A) for public transport interchange and 103dB(A) for boatyard maintenance area. For sports ground, measured Sound

Pressure Level has been made reference to the approved EIA Report for Main Arena of the 2008 Olympic Equestrian Event (AEIAR-097/2006) and the predicted noise levels at NSRs are within respective noise criterion. The detailed design of these plant rooms etc. shall ensure that sufficient sound attenuators are appropriately incorporated into the design such that the maximum allowed sound power can be achieved. Adverse fixed noise impact is therefore not anticipated.

3.3.6 Aircraft Noise

3.3.6.1 The approved 3RS EIA (AEIAR-185/2014) has predicted the NEF noise contours for different years. According to its findings, the NEF25 noise contour in Year 2021 will encroach onto the part of the reclamation boundary of TCE. However, the predicted NEF 25 contours would be shifted away from TCE boundary upon the full commissioning of the 3RS, currently planned for 2023 as stated in the 3RS EIA.

3.3.6.2 Since the population intake for the portion of TCE that are within the Year 2021 NEF 25 noise contour would be beyond Year 2023, adverse aircraft noise impacts on the planned sensitive receivers are not anticipated and hence mitigation measures are not required. If the operational year of the 3RS would need to be shifted beyond the programme stated in the 3RS EIA or the Project is developed in advance of operation of the 3RS of HKIA, the Project Proponent of this Project shall conduct a review on the dates of population intake so as to ensure that all the NSRs within TCE would not be adversely affected by aircraft noise. Moreover, without implementation of the 3RS project of the HKIA, it is noted that part of the proposed TCE reclamation on the seaward side would fall within the NEF 25 contour based on the current operation of HKIA. In that case, the planning of TCE which envisages a mix of residential and commercial development would need to be reviewed.

3.3.6.3 For TCW, the development boundary will be away from the predicted NEF 25 contours for all the operation modes for airport including the existing two runway system and the 3RS. Adverse aircraft noise impact is therefore not anticipated.

3.3.7 Rail Noise

3.3.7.1 As stated in **Section 3.3.3.2**, the railway stations at TCE and TCW and its associated railway system is a Designated Project under Item A.2 of Schedule 2 of TM-EIAO. A separate study would therefore be

conducted by the future rail operator to fulfil all the statutory requirements and procedures under the EIAO.

3.3.7.2 Nevertheless, the current assessment has considered the cumulative railway noise impacts for the planned NSRs within TCE during different phases of the implementation. According to current planning, the commercial buildings that are strategically located between the Phase 1 residential buildings and TCL & AEL would be in place prior to the Phases 1 & 2 population intake. Assessment results indicate that noise mitigation measures would be required, in the form of facade with no openable windows and architectural fin. With these mitigation measures in place, the predicted noise impacts at all the NSRs would be in the range of 40 – 60dB(A), which comply with respective statutory noise criteria.

3.3.7.3 Similarly, the commercial buildings that are strategically located between Phases 3 & 4 residential buildings and TCL & AEL would be in place prior to the Phases 3 & 4 population intake. Assessment results indicate that noise mitigation measures would be required for TCL, in the form of semi-noise enclosures covering part of the TCL track tentatively subject to further review under a separate study to be conducted by future rail operator. With these tentative mitigation measures in place, the predicted noise impacts at all the NSRs would be in the range of 29 – 58dB(A), which comply with respective statutory noise criteria and hence adverse rail noise impact is not anticipated.

3.3.7.4 For operational groundborne noise, based on the vibration source term established on site, the predicted groundborne noise impact would be in the range of 34 – 44 dB(A) which comply with respective statutory noise criteria and hence adverse impact is not anticipated.

3.3.8 Helicopter Noise

3.3.8.1 The helicopters being operated by both Government Flying Services and a commercial company would be using the airspace in the vicinity of Tung Chung East and Tung Chung West. An assessment has been conducted based on the noise source term for helicopters and flying route. According to the assessment results, the predicted helicopter noise level at planned NSRs will be within the statutory noise criterion.

3.3.9 Marine Traffic Noise

3.3.9.1 Potential marine traffic noise sources that would have impacts on the proposed development include the existing ferry commuting between Tuen Mun, public Pier in Tung Chung, Sha Lo Wan and Tai O, and the proposed marina at TCE. The predicted marine traffic noise impact from those noise sources would be in the range of 39 – 48dB(A) during

daytime and evening periods and 39 – 44dB(A) during nighttime period and are below the respective background noise levels at various NSRs and hence adverse marine traffic noise impact is not anticipated.

3.4 Water Quality

3.4.1 Introduction

3.4.1.1 In accordance with the EIA study brief, the study area for the water quality impact assessment covers the North Western, North Western Supplementary and Western Buffer Water Control Zones (WCZ). Water sensitive receivers (WSRs) such as cooling seawater intakes, Water Supplies Department (WSD) flushing water intakes, bathing beaches, coral communities, fishery sensitive areas, and ecologically sensitive areas that might be affected by the project were identified.

3.4.1.2 The criteria used for evaluating water quality impacts follow the TM-EIAO and Water Quality Objectives (WQO) for the North Western, North Western Supplementary and Western Buffer WCZs. Other local and international criteria were also adopted where applicable.

3.4.1.3 Quantitative assessments have been performed for both the construction and operation phases of the Project. The model covers the study area and includes the Pearl River and the Dangan Channel. Concurrent projects for the construction and operation phases were identified and incorporated into the assessment for cumulative impact where appropriate.

3.4.2 Construction Phase

3.4.2.1 While reclamation in TCW has been removed to avoid water quality impacts as much as practicable, reclamation works at TCE is still required. Potential key sources of water quality impact during the construction phase include land formation works in TCE and Road P1, construction of new seawall, stone column installation. It should be noted that potential construction phase water quality impacts associated with the proposed works have already been substantially reduced by the adoption of non-dredged reclamation methods for land formation and reclamation filling works within a leading seawall of about 200m. Other than reclamation works, the construction work in both TCE and TCW would involve construction site runoff and drainage; sewage effluent from construction workforce.

3.4.2.2 A quantitative assessment of potential water quality impacts associated with marine construction works has also been conducted, taking into account the critical periods for Suspended Sediment (SS) release.

Other activities that could affect water quality during construction are primarily land-based and were assessed qualitatively.

3.4.2.3 Assessment results show that with the application of about 200m leading edge of partially completed seawall prior to marine filling activities and the implementation of mitigation measures (in the form of silt curtains and silt screens where applicable), there will be no exceedance of the SS criteria at any WSR due to the construction activities. The predicted maximum concentration of suspended solids at the representative WSRs for scenario of Tung Chung project only is summarized in **Table 3.4**. However, when taking into account of the SS release from concurrent projects, cumulative exceedance is predicted at few WSRs near the Brothers Islands. For example, the predicted maximum concentration of suspended solids at Marine Parks at the Brothers Islands and Tai Mo To (Dolphin Habitat) is 5.77mg/L and 2.78 mg/L; at Coral Communities at the Brothers Islands is 7.41 mg/L and 4.34 mg/L for dry and wet seasons respectively. Nevertheless, the exceedance are primarily due to the conservative assumptions for the concurrent projects rather than due to the contributions from the Tung Chung project. Those conservative assumptions are based on the maximum allowable SS release rates of the relevant concurrent project. However, based on the information from the project proponent of CMPs, the actual SS release rates of East Shau Chau CMPs are much lower than the maximum allowable release rates. Therefore, adverse residual water quality impacts due to the project are not anticipated.

Table 3.4: Summary of predicted maximum concentration of suspended solids in depth averaged at the representative WSRs (construction phase scenario for Tung Chung project only)

WSR	Modelling Result of Max Suspended Solids (mg/L)		Suspended Solids Criteria (mg/L)		Compliance to Suspended Solids Criteria
	Dry Season	Wet Season	Dry Season	Wet Season	
Tung Chung Estuary	0.37	0.01	9.0	5.7	Yes
Tai Ho Wan Inlet (outside)	0.23	1.11	3.9	2.6	Yes
Marine Parks at the Brothers Islands and Tai Mo To (Dolphin Habitat)	0.01	0.23	3.9	2.6	Yes
Coral Communities at the Brothers Islands	0.00	0.09	3.9	2.6	Yes

3.4.2.4 A sensitivity scenario has also been conducted to review the situation that the operational year of the 3RS would be shifted beyond the programme stated in the 3RS EIA. Results indicate that, given the separation between the 3RS and the Tung Chung New Town Extension, even under the worst case scenario, the construction of 3RS would not cause significant cumulative impacts on the water sensitive receivers in

Tung Chung Bay, and vice versa, the construction activities in Tung Chung would also not cause significant water quality impacts on the sensitive receivers near the 3RS. By comparison of the concurrent scenario and the above sensitivity scenario, exceedance at coral communities at the Brothers Islands (5.50 mg/L and 3.90 mg/L for dry and wet seasons respectively) is due to the conservative SS release assumption in concurrent projects. Non exceedance at Marine Parks of Brothers Islands is due to the hydrodynamics change without the landform of 3RS reclamation.

3.4.2.5 Other construction activities include bridge works at Tung Chung Stream, construction work of sewage pumping stations, fresh water and salt water services reservoirs, water management facilities and polder scheme, proposed marina and groundwater and runoff for tunnel works. With the implementation of good site practices and the recommended mitigation measures to minimise potential water quality impacts, these construction activities, as well as general construction site drainage and sewage effluent from the construction workforce, are not anticipated to result in significant water quality impacts.

3.4.2.6 In view of the above assessment findings, it is concluded that no adverse residual water quality impacts are anticipated during the construction phase of the project.

3.4.3 Operational Phase

3.4.3.1 The potential key sources of water quality impact during the operational phase include changes in hydrodynamics as a result of the reclaimed land in TCE and Road P1 and the increase of sewage amount and increase of pollution load from surface runoff.

3.4.3.2 For the reclamation in TCE and Road P1, quantitative assessments for ‘with project’ and ‘without project’ scenarios were undertaken for the assessment year of Year 2030 which represents the worst case for pollution loading, taking into account other planned and committed concurrent projects in the study area. The findings show that despite minor exceedance in total inorganic nitrogen (TIN) at some WSRs, these were attributed from the background concentration but not attributed to the Project. The predicted water quality in annual mean of depth averaged at the representative WSRs is summarized in below table. Therefore, implementation of the project would not result in adverse hydrodynamic and water quality changes in the study area.

Table 3.5: Summary of predicted water quality in annual mean of depth averaged at the representative WSRs (operational phase ‘with project’ scenario)

WQO Criteria (Annual mean)	Dissolved Oxygen(mg/L)	Total Inorganic Nitrogen(mg/L)	Unionized Ammonia (mg/L)	Compliance to WQO
WSR	≥ 4	≤ 0.5	≤ 0.021	
Tung Chung Estuary	8.3	0.28	0.004	Yes
Tai Ho Wan Inlet (outside)	7.2	0.35	0.006	Yes

3.4.3.3 The assessment has also demonstrated that the proposed reclamation works would not cause significant change in the water quality at the water sensitive receivers including the estuary of Tung Chung Stream and inside Tai O Bay.

3.4.3.4 In order to protect the water quality of Tung Chung Stream, Tai Ho Wan and other neighbouring water body, all the sewage pumping stations serving the TCE and TCW will be designed with appropriate design to avoid the need for emergency discharge. For the surface runoff from TCW, enhancement measures such as provision of stormwater attenuation and treatment ponds, dry weather flow interception at the existing villages have been recommended to protect the water quality in Tung Chung Stream.

3.5 Sewerage and Sewage Treatment Implications

3.5.1.1 The TCNTE project will generate a large amount of sewage flow which will be taken up by proposed sewers, sewage pumping stations (SPSs) within TCE and TCW developments. Sewage generated by TCNTE will be discharged to the Siu Ho Wan Sewage Treatment Works (SHWSTW) for treatment.

3.5.1.2 Two SPSs are proposed within the TCE, where the intake population will occur in two stages, namely “interim” from Year 2023 to 2026 and “ultimate” from Year 2027 to 2030. Interim stage will be taken up by one proposed SPS within TCE with twin rising mains delivering flow directly to the Tung Chung Sewage Pumping Station (TCSPS). During ultimate stage, all flow from TCE will be diverted away from TCSPS and toward the other SPSs within TCE with twin rising mains delivering flow directly to SHWSTW. All rising mains will be concrete encased to avoid risk of pipe bursting.

3.5.1.3 Three new SPSs are proposed within the TCW and the existing Chung Mun Road Sewage Pumping Station (CMRSPS) would be upgraded. Flow generated by a portion of TCW development will be diverted by sewers toward the upgraded CMRSPS, which will deliver flow by twin rising mains directly to one new SPS nearby the eastern tributary of

Tung Chung Stream. Two other new SPSs are proposed nearby the West Tung Chung Stream which will also deliver flow by twin rising mains to the SPS nearby the East Tung Chung Stream. The SPS at East Tung Chung Stream will then deliver flow by twin rising mains directly to the TCSPS. All rising mains will be concrete encased to avoid risk of pipe bursting.

3.5.1.4 Taking into account the ecological sensitivity of the Tung Chung Stream and Tung Chung Bay, several enhanced mitigation measures are proposed at these SPSs in TCE and TCW so as to eliminate the risk of pump failure, rising main failure and power failure during emergency situations. Each SPS will be fitted with a) 100% standby pumping capacity within each SPS, with spare pump up to 50% pumping capacity stockpiled in each SPS for any emergency use; b) twin rising mains; c) dual-feed power supply; d) emergency storage facilities up to 6-hours ADWF capacity; and e) emergency communication mechanism amongst relevant government departments. These measures were considered to be appropriate for TCE and TCW. Considering the respective risks of pump, rising mains and power failure and the adequacy of these mitigation measures, it is considered that emergency discharge is not expected, and thus no adverse impact on water quality or ecology due to emergency discharge is anticipated.

3.5.1.5 The issues of septicity in rising mains, odour and noise impacts have been studied, and adequate measures are proposed to mitigate these impacts.

3.5.1.6 In order to cope with the projected sewage flows in the catchment, EPD has arranged with DSD to fit out the TCSPS to its designed maximum handling capacity (3,680 l/s) by 2023; and to fit out the remainder of the treatment units at the SHWSTW to its designed maximum handling capacity (180,000 m³/day) by 2024.

3.6 Waste Management Implications

3.6.1 Introduction

3.6.1.1 The types of waste that would be generated during the construction and operation phases of the project have been identified. The potential environmental impacts that may result from these waste materials have been assessed in accordance with Section 3.4.5 and Appendix F of the EIA study brief as well as the criteria and guidelines outlined in Annex 7 and Annex 15 respectively of the TM-EIAO.

3.6.2 Construction Phase

3.6.2.1 Potential waste management implications from the generation of waste during the construction phase have been evaluated. Strategic mitigation measures, including the opportunity for on-site sorting, reusing C&D materials, etc., are devised to minimise the surplus materials to be disposed. Recommendations have been made for implementation by the Contractor during the construction period to minimise waste generation and off-site disposal of. The estimated amount of different types of wastes to be generated during construction phase is summarised in following table.

Table 3.6: Estimated quantity of different types of wastes to be generated during construction phase

Activities	Quantity of waste to be generated (m ³)								
	Top soil ^[1]	Inert soft C&D material ^[2]	Rock ^[3]	Artificial hard material ^[4]	Non-inert C&D material ^[5]	Vegetation ^[6]	Chemical waste	General refuse	Floating Refuse
Reclamation	0	0	0	0	0	0	A few hundred litres per month	3,659 tonnes	11.5 m ³ per year
Site clearance	42,800	0	0	300	0	38,000			
Site formation	0	744,800	157,000	0	0	0			
Constuction of new buildings and structures	0	0	0	241,000	60500	0			

Notes:

- [1] "Top soil" is assumed to be "inert" C&D materials.
- [2] "Inert soft C&D material" includes, but not limited to, excavated soil.
- [3] "Rock" includes all grade rock.
- [4] "Artificial hard material" includes, but not limited to, broken concrete, asphalt, bitumen and granular materials, etc.
- [5] "Non-inert C&D material" includes, but not limited to, bamboo, timber, paper and plastic, etc.
- [6] Vegetation is non-inert C&D material.

3.6.3 Operation Phase

3.6.3.1 The types of waste that would be generated during the operational phase have also been assessed. Recommendations have been made to ensure proper treatment, handling and disposal of these wastes. The following table summarizes estimated quantities of municipal solid waste (MSW) during operational phase.

Table 3.7: Estimated quantities of municipal solid waste (MSW) during operational phase (to the nearest 10m³)

PDA	Planned Population	Estimated MSW Generated	Estimated MSW to be Recycled	Estimated MSW Required Disposal
TCE	118,900	250tpd	100tpd	150tpd
TCW	25,500	50tpd	20tpd	30tpd
Total	144,400	300tpd	120tpd	180tpd

3.7 Land Contamination

3.7.1 Introduction

3.7.1.1 The potential land contamination issues associated with the project have been assessed by following the guidelines in Sections 3.1 and 3.2 of Annex 19 of the TM-EIAO as specified in Section 3.4.6 of the EIA study brief. In accordance with the requirement set out in Appendix G of the EIA study brief, a Contamination Assessment Plan (CAP) was prepared for the project and endorsed by EPD in June 2015.

3.7.1.2 Desktop study and site reconnaissance surveys were conducted to determine the past and present land uses, including potentially contaminative uses, within or in the vicinity of the project area. Other relevant information was also collected from various government departments.

3.7.2 Potential Impact

3.7.2.1 This land contamination assessment examined the potential contaminative land use within the PDAs and the works areas for the associated infrastructures. The assessment involved desktop review, site surveys and the proposed environmental site investigation (SI).

3.7.2.2 Since the potentially contaminated sites are located in private land lots, SI is unlikely to be carried out at this stage. In addition, as the sites are still in operation, it is considered not suitable to carry out the SI at this stage as the on-going activities would make the assessment result obsolete.

- 3.7.2.3** In view of this, further site visit at these potentially contaminated sites are proposed once future development of these sites are confirmed and that site access is available in order to identify the need for SI for any additional hot spots as a result of the on-going land contaminating activities.
- 3.7.2.4** In addition, re-appraisal would be required for the other surveyed sites, other remaining areas of the PDAs and the works areas for the associated infrastructures to address any change in land use that may give rise to potential land contamination issues.
- 3.7.2.5** Findings of the further site visit at the potentially contaminated sites and the re-appraisal will be presented in a supplementary CAP. Upon approval of the supplementary CAP and completion of the SI works, a Contamination Assessment Report (CAR) would be prepared to present findings of the SI works. If contamination has been identified, a Remediation Action Plan (RAP) would be prepared to recommend specific remediation measures. Upon completion of the remediation works, if any, a Remediation Report (RR) would also be prepared to demonstrate that the clean-up works are adequate. The CAR, RAP and RR would be submitted to EPD for approval prior to commencement of any construction /development works.

3.8 Ecology

- 3.8.1.1** The present Project will involve development in Tung Chung Valley and reclamation, and will cause both terrestrial and marine ecological impacts. Ecological baseline was established by both literature review and field surveys, with the ecological survey programmes covering from 2012 to 2015, to fulfil the EIA SB.
- 3.8.1.2** Within the 500m terrestrial ecology assessment area, key terrestrial ecological resources include a number of recognised sites of conservation importance (Country Park, SSSIs) and important habitats such as Tai Ho Stream and Wong Lung Hang, but mostly are outside the PDAs. However sections of Tung Chung Stream and some Fung Shui Woods are within the TCW PDA.
- 3.8.1.3** TCW-PDA is located to the west of Tung Chung New Town and extending to Tung Chung Valley which contains some habitats of ecological value such as Tung Chung Stream and Fung Shui Woods. The proposed service reservoirs are outside the TCW-PDA but is located close to Country Park and Wong Lung Hang EIS.
- 3.8.1.4** Approaches for avoiding and minimisation of impacts have been considered. No development or channelization of Tung Chung Stream

is proposed and buffer zones of 20-30m are provided for protection. A lot of areas inside Tung Chung Valley have been preserved by non-development zoning on the RODP such as CA, CPA, GB, AGR, especially those with higher ecological values such as Fung Shui Woods, Fong Yuen area.

3.8.1.5 Most habitats to be lost, such as urbanised/disturbed and orchard, are of low ecological value. The potential impact of loss of woodland is considered as moderate. Small areas of fringe of Fung Shui woods (about 0.2ha) will be inevitable affected due to flood protection works for villages and road widening given the space constraints (**Table 3.10**), but the final loss might be further minimised during the later stage of the layout plan refinements. Although the ecological value of orchard was ranked as low, the potential impact loss of this type of habitat was considered minor to moderate due to the large area affected (about 18.11ha). The potential impacts due to loss of the other types of habitats were all considered minor or insignificant. The service reservoirs will not encroach Wong Lung Hang EIS or Lantau North (Extension) Country Park. A summary of the estimated habitat loss is given in the following table.

Table 3.8: Summary of estimated habitat loss

Habitat	Estimated Area Sizes (ha)			
	RODP at TCW	RODP at TCE	Road P1 (Tung Chung - Tai Ho Section)	Others elements (service reservoirs and sewer)
Abandoned Agricultural Land (dry)	4.77	\	\	\
Abandoned Agricultural Land (wet)	1.68	\	\	\
Active Agricultural Land (dry)	1.92	\	\	\
Fung Shui Wood	0.20	\	\	\
Orchard	18.11	\	\	\
Plantation	0.85	\	\	1.09
Secondary Woodland (Mature)	0.76	\	\	0.09
Secondary Woodland (Young)	4.54	\	\	0.33
Shrubland / Grassland	3.19	\	\	2.42
Urbanised / Disturbed	10.79	5.0	About 10 ha mainly works areas in NLH	2.67
Watercourse	0.16 (210m)	\	\	\
Artificial Seawall	\	2.3 km	1.5 km	\
Coastal waters (water column)	\	120.5	8.6	\

Habitat	Estimated Area Sizes (ha)			
	RODP at TCW	RODP at TCE	Road P1 (Tung Chung - Tai Ho Section)	Others elements (service reservoirs and sewer)
Coastal waters (subtidal soft bottom seabed)	\	132	13	\
Coastal waters (temporary marine works area)	\	Approximately 55		\

3.8.1.6 In order to minimize the potential impact due to habitat loss and site formation, a number of mitigation measures will be implemented. Compensation woodland planting of total area of 11ha will be provided and in advance planting will be explored. Planting list will include tree species targeting to mitigate the loss of Fung Shui Wood and Orchard by ecological functions. Plant species of conservation importance will be retained or transplanted as far as possible in public works, and private residential/commercial developments inside TCV-1 before site formation commence. Capture-and-translocation exercise for amphibians of conservation importance including Romer's Tree Frog and Chinese Bullfrog will be implemented in the TCW PDA at areas with sightings, including public works near the eastern branch of Tung Chung Stream and private residential/commercial developments inside TCV-1 and TCV-5 before site formation commences.

3.8.1.7 Revitalization of the existing channelised section of Tung Chung Stream will be provided with that section together with the riparian zone in Fong Yuen area to be zoned for a future River Park, which will be designed and managed by government. As an enhancement measure, planting will also be provided on the future polders. Sustainable Urban Drainage System (SUDS) will also be provided as enhancement measure.

3.8.1.8 Regarding the marine ecological impact, no reclamation or development of intertidal habitats is proposed in Tung Chung Bay, and thus there will be no direct impact on Tung Chung Bay or San Tau Beach SSSI. TCE-PDA is located to the north of Tung Chung New Town over coastal waters. Together with the Road P1, proposed reclamation will cause marine habitat loss, but the area is of low importance to Chinese White Dolphin. The construction and operation of the Project would still cause certain marine habitat loss. Due to the inclined seawalls, the actual loss of coastal waters habitat (water column and subtidal soft-bottom seabed) will be larger than the sizes on RODP. About 145 ha of seabed will be lost due to the 129.1 ha of reclamation (measured at the High Water Mark level) from both TCE

PDA and Road P1. The impact is considered Minor to Moderate. During the construction phase, there will be another 55 ha of temporary marine habitat loss due to the marine works area for an about 6 year duration. The existing artificial seawall of Tung Chung New Town of 2.3km and a section of seawall from Tung Chung New Town to Siu Ho Wan MTR Depot of 1.5 km will be lost during the construction of the TCE PDA and Road P1 (Tung Chung - Tai Ho Section). The potential impact due to loss of seawall is ranked as Insignificant. It should be noted that there will be 3.3km of new seawall in the TCE PDA and 1.8 km in the Road P1 (Tung Chung - Tai Ho Section) after completion of the Project.

- 3.8.1.9** The potential disturbance on CWD due to the work-related vessel traffic flow during construction phase is considered Minor to Moderate, while the potential disturbance due to the marina traffic during operational phase is considered as Insignificant.
- 3.8.1.10** Assessment of construction phase and operational phase indirect impacts related to water quality has adopted water quality modelling results which have taken into account concurrent projects. The magnitudes of the water quality related impacts range from Insignificant to Minor. Occasional exceedance are mostly caused by either contributions from concurrent projects or the high background level. Mitigation measures for construction phase water quality impacts have been proposed under water quality assessment and during the operational no significant water quality impact phase is anticipated.
- 3.8.1.11** Approaches for avoiding and minimisation of impacts have also been considered for marine ecology. As the reclamation in Tung Chung Bay for TCW PDA has been removed, and thus the total marine habitat loss has been much reduced. Non-development zoning on the RODP has been provided along a large section of Tung Chung Bay coastline such CPA as buffer zone and the low disturbance RO/DO. There will be no emergency discharge from any sewage pumping stations, design/measures will be implemented to enhance the safety of the sewage pumping stations. Eco-shoreline will be provided on the future reclamation seawalls as mitigation for loss of general marine waters habitat, to provide better ecological functions when compared with the traditional artificial seawall. Measures to reduce the construction phase marine traffic, including using larger-sized barges, land transportation, and also reuse of C&D materials, have been recommended as mitigation. Works Vessel Travel Route Plan is also required for the present Project prior to commencement of construction, in which constraints, speed

regulations, and good site practices will be taken into account, and will follow all requirements of existing legislation.

3.8.1.12 For cumulative impacts, most of the concurrent projects would not be relevant to terrestrial ecology due to the distance or nature of the projects. The present Project will only contribute a small proportion of the cumulative marine habitat loss among all concurrent projects in the Western Hong Kong waters. The loss of 145 ha marine habitats from the present Project would be about 8.5 % of the anticipated 1,700 ha cumulative marine habitat loss. For potential cumulative disturbance impacts from works vessels, the overlap of marine traffic with concurrent projects would be small and, with the mitigation measures proposed to reduce marine traffic volume, the potential cumulative impact would be acceptable. It is not expected that other concurrent projects would propose marina in the areas close to the TCE PDA, and therefore it is unlikely there will be cumulative impact from the marina marine traffic during operation phase.

3.8.1.13 The assessment has indicated that the potential temporary impacts on the proposed The Brothers Marine Park from the present Project during construction phase would not be severe and additional measures have been recommended to protect its functions as Chinese White Dolphin habitats, while the potential impacts in operational phase would not be significant. As such, the functions and quality of the proposed The Brothers Marine Park would not be affected by the present Project.

3.8.1.14 The residual loss on terrestrial ecology would be habitats of low ecological value. Adverse residual terrestrial impact is not anticipated from the present Project. Permanent loss of about 145 ha of marine habitats of low CWD use and low ecological importance would constitute the residual the residual impact for marine ecology, with the implementation of mitigation measures, significant impacts from the present Project on dolphins is not likely, and the residual impact is considered acceptable. The operational phase hydrodynamic modelling works has also taken into account concurrent projects, and the results indicated no significant water quality impact during the operational phase is anticipated. Adverse residual marine impact is not anticipated from the present Project.

3.9 Fisheries

3.9.1.1 The present Project will involve reclamation and cause fisheries impacts. Fisheries baseline was established by literature review, and supplemented with field verification surveys conducted in 2013.

- 3.9.1.2** The assessment area of the present study covers the waters in North Lantau and sites of fisheries importance identified include fishing ground, important spawning ground between Lung Kwu Chau and the Brothers, embayment along the coast of North Lantau, ARs in Sha Chau and Lung Kwu Chau Marine Park and the proposed The Brothers Marine Park, and Ma Wan Fish Culture Zone.
- 3.9.1.3** Approaches for avoiding and minimisation of impacts have been considered. During the EIA study, the original reclamation in Tung Chung Bay for TCW PDA has been removed, and thus the total reclamation size, and also fishing ground loss, has been much reduced.
- 3.9.1.4** The proposed reclamations are located in areas of low fisheries production. And the number of fishing vessels utilized the reclaimed areas is not high and dominated by small-sized vessels. The reclaimed areas are also away from other sites of fisheries importance. The nearest mariculture site is Ma Wan FCZ, which is about 10 km from the Project Area.
- 3.9.1.5** The construction and operation of the Project would cause certain fishing ground loss. During the construction phase, a 200 ha of marine works area will be established, and the marine works area is not available for fishing operations for an about 6 year duration from 2017 to 2023. During the operation phase, there will be inevitable permanent losses of fishing grounds due to the reclamation footprint and the marine waters within the future marina. A total of 149.2 ha fishing ground will be permanently lost. The impact is considered Minor during both construction and operation phases given the loss area is a minor proportion compared with the available fishing ground in Hong Kong waters and the loss area is not of high fisheries production rate. Eco-shoreline design will be provided on the future reclamation seawalls as mitigation on marine ecology. But it is expected that fisheries species in North Lantau will also be benefited by the enhanced ecological functions.
- 3.9.1.6** Fishing vessels originally operated in the loss area will need to shift their operation locations. As the number of fishing vessels utilized this area is not high and alternative operation locations/areas are available, the impact is considered Minor during both construction and operation phases.
- 3.9.1.7** As fishing vessels in this area are dominated by small fishing vessels which are more flexible in their operations, the potential disturbance on fishing operations due to the work-related vessel traffic flow during construction phase is considered **Minor**, while the potential disturbance due to the marina traffic during operational phase is considered as

Insignificant. Measures to reduce the marine traffic, including using larger-sized barges, land transportation, and also reuse of C&D materials, and also land transportation of materials, have been recommended as mitigation for ecology, and could further reduce the potential disturbance impacts on fishing operations.

- 3.9.1.8** Assessment of construction phase and operational phase indirect impacts related to water quality has adopted water quality modelling results which have taken into account concurrent projects. The magnitudes of the water quality related impacts range from Insignificant to Minor. Occasional exceedance are mostly caused by either contributions from concurrent projects or the high background level. Mitigation measures for construction phase water quality impacts have been proposed under water quality assessment and during the operational phase no adverse water quality impact phase is anticipated.
- 3.9.1.9** For the protection of fisheries resources, there will be no emergency discharge from any sewerage pumping stations in TCE PDA and TCW PDA, and measures will be implemented to enhance the safety of the sewage pumping stations.
- 3.9.1.10** For cumulative impacts, the present Project would only be a smaller contributor among all concurrent projects on the cumulative fishing ground loss. The loss of 149.2 ha fishing ground from the present Project would be about 8.2 % of the anticipated 1,800 ha cumulative permanent fishing ground loss, while there will be temporary loss of 1,592 ha fishing grounds due to marine works areas of the present Project and 3RS during construction phase.
- 3.9.1.11** For potential cumulative disturbance impacts from works vessels, the overlap of marine traffic with concurrent projects would be small and with the mitigation measures proposed to reduce part of marine traffic volume, the potential cumulative disturbance impact on fishing activities during construction phase would be acceptable. It is not expected that other concurrent projects would propose marina in the areas close to the TCE PDA, and therefore it is unlikely there will be cumulative disturbance impact on fishing activities from the marina marine traffic during operation phase.
- 3.9.1.12** Permanent loss of about 149.2ha of fishing ground of low production rate would constitute the residual impact. Due to low to moderate number of fishing vessels and the limited fisheries production affected, the residual impact is considered acceptable. The operational phase hydrodynamic modelling works has also taken into account concurrent projects, and the results indicated no adverse water quality impact during the operational phase is anticipated. Adverse residual fisheries

impact and water quality impact are not anticipated from the present Project. Additionally, with the implementation of good site practices and the recommended mitigation measures to minimise potential water quality impacts, construction activities as well as general construction site drainage and sewage effluent from the construction workforce and other concurrent projects, are not anticipated to result in significant water quality impacts.

3.10 Landscape and Visual

3.10.1 Introduction

3.10.1.1 A landscape and visual impact assessment has been carried out in accordance with Section 3.4.12 and Appendix H of the EIA study brief, and Annexes 10 and 18 of the TM-EIAO. The current relevant planning and development control framework was reviewed. Since the majority of the proposed PDA is not covered by the approved Tung Chung Town Centre Area OZP No. S/I-TCTC/20, only very limited area in the OZP will be changed. The proposed Tung Chung New Town Extension and associated works follows the planning intentions in principle, and there is no conflict with the relevant planning and development control framework.

3.10.1.2 The main sources of impacts on existing landscape and visually sensitive receivers were identified. These include reclamation of land for formation of TCE and Road P1 and construction of a marina at TCE, development at TCE and TCW including high-rise building construction and small-scale structures such as sewage pumping stations and stormwater attenuation and treatment ponds; construction of two service reservoirs; de-channelization of a section of Tung Chung Stream for environmental enhancement; and construction of a cycle track network and cycle park. It should be noted that impacts have already been avoided or minimised as part of the project design. For example, non-dredged land reclamation method is proposed for TCE; CPA and CA are proposed along Tung Chung Stream, and areas of Fung Shui Woods are zoned as “GB” or “CA” as much as possible to preserve the existing landscape resources.

3.10.1.3 Within the landscape and visual impact assessment study area, a total of 15 major Landscape Resources (LR), 13 major landscape character areas (LCAs) and 45 representative Visual Sensitive Receivers (VSRs) were identified and may be affected by the development. In addition, a broad-brush tree and vegetation survey was carried out to determine, in broad terms, the potential impacts on existing trees.

Broad Brush and Vegetation Survey Result

3.10.1.4 Vegetation types identified within the assessment area included secondary woodland, Fung Shui Woods, plantation, shrubland and grassland, agricultural lands (active agricultural land, and abandoned agricultural land regenerated into grassland or freshwater marshes), urbanized/disturbed/wasteland, watercourse, mangroves, reedbed, rocky shore, mudflat, seawall, and coastal waters. A total of 496 plant species were recorded, 335 of which are native species. Ten plant species considered of conservation importance were recorded during the ecological field survey: *Aquilaria sinensis*, *Pavetta hongkongensis*, *Cibotium barometz*, *Gmelina chinensis*, *Diospyros vaccinioides*, *Ligustrum punctifolium*, *Uvaria calamistrata*, *Rhododendron simsii*, *Corydalis racemosa*, *Zostera japonica* and *Halophila ovalis*. Regarding the layout of the RODP, most of the affected protected species are located at TCW within the LR of agricultural land near Tung Chung Bay area. However, the broad brush survey suggests that about 78% of protected vegetation within the assessment area can be preserved.

3.10.1.5 In addition, the broad brush tree survey suggests that about 30% of the trees within the boundary of RODP could be preserved. Regarding the development layout of TCW-PDA, most of the tree preservation are within the LR of Secondary Woodland, Plantation, Shrublands and Grasslands. Those LRs are outside the comprehensive development boundary, and well preserved as green buffer for the future residents. Almost 70% of trees within the RODP boundary are affected, which are within the LR Agricultural Land. A large scale of Agricultural land at TCW-PDA will be affected by sites designated for residential areas and landscape area with stormwater attenuation and treatment ponds. Moreover, the Fung Shui Woods will be zoned as “GB” or “CA” or “OU”, a negligible extent of Fung Shui Woods (0.20ha) will be affected by the RODP of TCW for consideration of flood risk control and road safety, for example the Fung Shui Woods near Shek Mun Kap, Sheung Ling Pei and Ngau Au. Trees and vegetation located at the Mangrove and Reedbed areas will not be affected by the RODP of TCW as the area will be zoned as CPA.

3.10.1.6 A detailed Tree Felling Application process will be carried out at a later detailed design stage, to finalize the proposed treatment to trees (to be felled, transplanted or retained) and allocate compensatory planting locations such as available open space, parks and streetscape in compliance with DEVB TCW 10/2013 Tree Preservation. In addition, for private developments with a lease containing tree preservation clause, compliance should be made to Practice Note Issue No. 7/2007.

No registered Old and Valuable Trees (OVT) were recorded throughout the tree survey process. Nevertheless, seven (7) numbers of Potentially Registrable OVTs have been identified at Tung Chung Valley. These Potentially Registrable OVTs would be affected by construction works unavoidably, and should be preserved with due efforts.

3.10.2 Construction Phase

3.10.2.1 Based on the impact assessment findings, mitigation measures covering all relevant landscape and visual aspects are proposed to be implemented during construction. These include optimising construction works areas and providing temporary landscape on temporary construction; providing screen hoarding; minimising topographical changes; preserving Potentially Registrable OVTs, and rare and protected vegetation; transplanting affected trees; adopting non-dredge method for reclamation, protecting natural rivers and streams; preserving natural coastlines; providing natural rock material/ planting for artificial seawall; landscaping on slope; landscape treatment on channelized watercourses; and light control.

3.10.2.2 After implementing the recommended mitigation measures, all LRs and LCAs are either anticipated to experience residual impacts of moderate to slight significance, or they are anticipated to be unaffected by the proposed development, with the exception of the following:

Landscape Resources

- The coastal waters are anticipated to experience impacts of substantial significance as an area of 124 ha in TCE will be transformed from a natural LR to an artificial development by reclamation
- The agricultural land in TCW is anticipated to experience impacts of substantial significance as a lot of farmland and orchards will be developed into residential development
- The secondary woodland near Ma Wan Hill in TCW is anticipated to experience impacts of substantial significance as this natural LR will be transformed into residential development.

Landscape Character Areas

- Inshore water landscape is anticipated to experience a residual impact of substantial significance due to visible marine construction activity and the loss of 124 ha of this LCA.
- Miscellaneous rural fringe landscape, which comprises mostly farmland in Tung Chung Valley, is anticipated to experience a residual impact of substantial significance as it will be changed into residential development with a built and artificial character.

- A medium extent of coastal upland and hillside landscape in Ma Wan Hill area is anticipated to experience a residual impact of substantial significance as it will be changed into residential development.

3.10.2.3 With implementation of the mitigation measures, most VSRs are either anticipated to experience residual impacts of slight/moderate or slight significance, with some of the VSRs anticipated to experience insignificant impacts by the proposed development of TCE and TCW during construction phase, except the following VSRs:

- Visitors of Tung Chung North Waterfront Area in the existing reclamation land of TCE, and future recreational/occupational users of Topside Development at HKBCF island are anticipated to experience a large magnitude of visual change due to a close view of the reclamation works of TCE, and it would result in an impact of substantial significance. The adverse residual impacts during construction would be reduced to moderate/substantial level since the substantial loss of open sea view cannot be mitigated effectively.
- Residents of Yat Tung Estate, villages near Yuen Tan Temple, villages near Shek Lau Po and residents near Wong Ka Wai are anticipated to experience a large magnitude of visual change, and combined with their high sensitivity, it would result in an impact of substantial significance. With effective mitigation measures, the residual impact would be reduced to moderate level during the construction stage.
- Hikers/visitors of Scenic Hill facing east, visitors of Planned Open Space at Ma Wan Hill, hikers along 360 Rescue Trail and Passengers/ drivers of Ngong Ping 360 Cable Car are anticipated to experience a large magnitude of visual change with their medium sensitivity, resulting in an impact of substantial significance for their direct view to the development. With effective mitigation measures, the residual impact would be reduced to moderate level during the construction stage.
- Hikers/visitors of Scenic Hill facing west and visitors of Tung Chung Stream are anticipated to experience an intermediate magnitude of visual change with their medium sensitivity, resulting in an impact of moderate significance. The residual impacts during the construction stage would remain as moderate even with the implementation of mitigation measures for their direct and close view to the development.

3.10.3 Operation Phase

3.10.3.1 Based on the impact assessment findings, mitigation measures covering all relevant landscape and visual aspects are proposed to be implemented during the operation phase. These include compensatory tree planting, woodland restoration, screen planting, roadside planting, aesthetic design of built development; maximising greening on structures, noise barrier design; landscape treatment for polders &

stormwater attenuation and treatment ponds, landscaping on slopes, landscape treatment on channelized watercourses, and light control.

3.10.3.2 The residual landscape impacts on LRs and LCAs after the implementation of mitigation measures during the operation phase were assessed. All LRs and LCAs are anticipated to either experience residual impacts of moderate to insubstantial significance, or be unaffected by the proposed development. The residual impacts on coastal waters in TCE would remain moderate throughout the operation phase due to the permanent loss of approx. 124ha of coastal waters. Nevertheless, there remains a much larger area of coastal waters of North Lantau that will be unaffected by the development and that will be available in the operation phase as an on-going landscape resource. Apart from that, the residual impacts on miscellaneous rural fringe landscape in TCE would be substantial in the operation phase due to the permanent character change from naturalistic and rural to artificial, but could be reduced to moderate eventually with relevant mitigation measures.

3.10.3.3 The overall visual character in Tung Chung area would be significantly changed by the proposed development after the construction, all the recommended mitigation measures would not be able to alleviate the fundamental change in character. While, in terms of effectiveness of mitigation measures, it is considered that for visual amenity purpose, improving the appearance of new urban infrastructures together with landscape planting or screening measures, and lighting control would help to alleviate the adverse visual impacts from the new urban development and enhance the compatibility with the existing Tung Chung Town Centre. With implementation of the recommended mitigation measures, most VSRs are either anticipated to experience residual impacts of slight/moderate or slight significance by the proposed development of TCE and TCW at Operation Day 1, except that visitors of Tung Chung North Waterfront Area in the existing reclamation land of TCE, and future recreational/occupational users of Topside Development at HKBCF island are anticipated to experience residual impacts of moderate significance. It is considered that the residual adverse visual impacts would be slight/moderate to insignificant by Year 10 of the operation phase when the mitigation measures have matured and taken effect.

3.10.3.4 In accordance with the criteria and guidelines for evaluating and assessing impacts as stated in Annex 10 and 18 of the TM-EIAO, it is considered that the overall residual landscape and visual impacts of the proposed development are acceptable with mitigation during the construction and operation phases.

3.11 Cultural Heritage

3.11.1 Introduction

3.11.1.1 As required under Section 3.4.10 of the EIA study brief, a cultural heritage impact assessment has been conducted. This includes a marine archaeological investigation (MAI), an archaeological impact assessment and a built heritage impact assessment, to evaluate the impacts on known or potential cultural heritage resources in the study area. The cultural heritage impact assessment follows the requirements of Annexes 10 and 19 of the TM-EIAO, while the requirements for the MAI are also set out in Appendix K of the EIA study brief.

3.11.2 Terrestrial Archaeology

3.11.2.1 An Archaeological Impact Assessment (AIA) has been conducted for both the TCE and TCW developments. Since TCE is on reclaimed land, there are no potential for terrestrial archaeology. For TCW, the baseline conditions have been established by first reviewing literature information relating to the geological characteristics of Tung Chung Bay, historical aerial photos, Sites of Archaeological Interest etc. There are 4 Sites of Archaeological Interest within the boundary of TCW, including the Fu Tei Wan Kiln (relocated to Tung Chung), Ma Wan Chung, Sha Tsui Tau and Tung Chung Game Board Carving.

3.11.2.2 A proposal for Terrestrial Archaeological Survey was prepared and submitted to AMO in November 2013. A total of 22 test pits and 61 auger holes was proposed at or near to the development areas within TCW in the survey. The survey proposal was subsequently approved by AMO and the survey was conducted in 13 January to 24 May 2014. The survey results were there analyzed together with the literature information to form the baseline conditions.

3.11.2.3 According to the latest design, Fu Tei Wan Kiln (relocated to Tung Chung) and Tung Chung Game Board Carving Sites of Archaeological Interest would be avoided. For the rest of the development areas within TCW, the archaeological potential has been evaluated based on the baseline conditions established, and hence the impacts and mitigation measures are assessed and recommended accordingly. Rescue excavations/ survey-cum-rescue excavations/ further surveys/ watching briefs have been recommended as the mitigation measures for particular development clusters. The archaeologist to be appointed by the respective project proponent or respective developer shall apply for a licence to conduct the rescue excavations/ survey-cum-rescue excavations/ further surveys/ watching briefs under the Antiquities and

Monuments Ordinance (Cap.53). An archaeological action plan detailing the scope and methodology of the archaeological work shall be submitted to the AMO for agreement prior to applying for a licence. The project proponent or respective developer shall implement the archaeological mitigation measures in prior agreement with the AMO before the commencement of any proposed works.

3.11.2.4 Pursuant to the Antiquities and Monuments Ordinance, the construction contractor should inform the AMO immediately in case of discovery of antiquities or supposed antiquities in the course of soil excavation works in construction stage.

3.11.3 Marine Archaeology

3.11.3.1 A Marine Archaeological Investigation (MAI) has been conducted for both the TCE and TCW developments. Since TCW is on existing land, there are no potential for marine archaeology. For TCE, the baseline conditions have been established by first reviewing historical information relating to Tung Chung. Previous MAIs for other projects in the vicinity of Tung Chung have also been reviewed. The geophysical surveys in those previous MAIs have covered all the seabed area of TCE where boat access was possible. According to those survey results, there are no archaeological remains in the areas surveyed. For those areas where a combination of rocky and shallow shoreline had prevented survey boat access, a proposal for diver survey had been proposed. The Marine Diver Survey Proposal had been submitted to AMO in September 2012 and the Licence to Excavate and Search for Antiquities was granted by AMO in October 2012. The survey was subsequently conducted in November 2012 and no marine archaeological resources were identified during the diver survey. Adverse impacts on marine archaeology are therefore not anticipated and mitigation measures are not required.

3.11.4 Built Heritage

3.11.4.1 The literature review conducted for the AIA had also collated relevant information on Declared Monuments and Graded Historical Buildings. A field survey was also conducted for built heritage to identify other built heritage resources. Results indicate that there is one Declared Monument within the boundary of TCW (ie the Tung Chung Battery). Besides, there are 2 Graded Historic Buildings including Hau Wong Temple and Entrance Gate at Shek Mun Kap and number of other

resources including shrines, village houses, ancestral halls, stone bridges, temples etc within the boundary of TCW.

3.11.4.2 According to the latest RODP, all these identified built heritage resources within TCW are located within land lot with proposed landuses of District Open Space (DO), Village Development Area (V), Institution and Community (IC), Coastal Protection Area (CPA), Conservation Area (CA), Agricultural (AGR) and Green Belt (GB) in which large scale development is not proposed. Adverse impacts on these built heritage is not anticipated and thus no further action or mitigation is required.