



THE GOVERNMENT OF THE HONG KONG
SPECIAL ADMINISTRATIVE REGION
DRAINAGE SERVICES DEPARTMENT

**Agreement No. CE54/2019(DS)
Revitalisation of Tai Wai Nullah and Fo Tan Nullah –
Investigation**

Revitalisation of Tai Wai Nullah

**Environmental Impact Assessment Report
Volume 1 – Main Text**

AECOM Asia Co. Ltd.

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1 INTRODUCTION

1.1 Project Background

- 1.1.1.1 In the Policy Address 2015, the Government set out the intention to adopt the concept of revitalising water bodies in large-scale drainage improvement works and planning drainage networks for the new development areas. The concept of revitalising water bodies is aimed at promoting greening, biodiversity, beautification and water friendliness in addition to achieving efficient drainage, with a view to building sustainable drainage facilities and providing a better living environment.
- 1.1.1.2 Drainage Services Department (DSD) commissioned AECOM Asia Company Limited (AECOM) in December 2015 to undertake the feasibility study on “Study on Revitalisation of Water Bodies” under Agreement No. CE 28/2015 (DS). The Study identified during the process of selection that Fo Tan Nullah and Tai Wai Nullah are of high revitalisation potential and therefore were recommended for detailed investigation and proposing revitalisation schemes for implementation, taken into account their unique features and constraints.
- 1.1.1.3 In April 2020, AECOM was commissioned by DSD to undertake Agreement No. CE54/2019 (DS) – “Revitalisation of Tai Wai Nullah and Fo Tan Nullah – Investigation” (hereafter referred to as “the Assignment”) to revitalise the existing Tai Wai Nullah (TWN) and Fo Tan Nullah (FTN) with an aim to enhance their ecological value, provide a greener environment, promote water friendliness and improve the community environment. The Assignment also include provision of dry weather flow interceptors to improve the water quality. As part of the Assignment, an Environmental Impact Assessment (EIA) study under the Environmental Impact Assessment Ordinance (EIAO) is required for the proposed works to TWN and FTN, respectively. This EIA Report covers the EIA study for Revitalisation of TWN (hereafter referred to as “the Project”).
- 1.1.1.4 Consultants engaged by DSD will carry out the detailed design and construction supervision of the Project base on this EIA Report in the next stage of the Project. DSD will operate and maintain the completed works.

1.2 Designated Projects under EIAO

- 1.2.1.1 The proposed revitalisation of TWN is classified as designated project (DP) by virtue of Item I.1(b)(ii), Part I, Schedule 2 of the EIAO – “a drainage channel or river training and diversion works which discharges or discharge into an area which is less than 300 m from the nearest boundary of an existing or planned site of cultural heritage”.
- 1.2.1.2 Project Profile for Revitalisation of TWN (No. PP-586/2019) was submitted to the Environmental Protection Department (EPD) on 31 July 2019 for application for an EIA study brief under section 5(1)(a) of the EIAO. The EIA Study Brief for the Revitalisation of TWN (No. ESB-320/2019) was issued on 11 September 2019 under the EIAO.

1.3 Purpose of the EIA Study

- 1.3.1.1 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 and associated works that will take place concurrently. This information will contribute to decisions by the Director of Environmental Protection on:
- (a) the overall acceptability of any adverse environmental consequences that are likely to arise as a result of the Project;
 - (b) the conditions and requirements for the detailed design, construction and operation of the Project to mitigate against adverse environmental consequences wherever practicable; and
 - (c) the acceptability of residual impacts after the proposed mitigation measures are implemented.

1.4 Objectives of this EIA Study

1.4.1.1 The objectives of the EIA study as stated in the EIA Study Brief (No. ESB-320/2019) are as follows:

- (a) to describe the Project and associated works together with the requirements and environmental benefits for carrying out the proposed Project;
- (b) to identify and describe the elements of the community and environment likely to be affected by the Project and/or likely to cause adverse impacts to the Project, including both the natural and man-made environment and the associated environmental constraints;
- (c) to provide information on the consideration of alternative options of the design, layout, scale and extent of the Project and the construction methods with a view to avoiding or minimising potential environmental impacts to environmentally sensitive areas and sensitive uses; to compare the environmental benefits and dis-benefits of different options; to provide reasons for selecting the preferred option(s) and to describe the part environmental factors played in the selection of preferred option(s);
- (d) to identify and quantify emission sources (including air quality, noise and water quality, etc. as appropriate) and determine the significance of impacts on sensitive receivers and potential affected uses;
- (e) to identify and quantify potential waste management issues and impacts arising as a result of the construction and operation activities of the Project;
- (f) to identify and quantify contaminated land within any project area for development works, and to propose measures to avoid disposal in the first instance;
- (g) to identify, assess and quantify any potential ecological and fisheries impacts arising from the Project, including potential losses or damage to flora, fauna and natural habitats; and to propose measures to mitigate these impacts;
- (h) to identify any potential landscape and visual impacts and to propose measures to mitigate these impacts;
- (i) identify any negative impacts on cultural heritage and to propose measures to mitigate these impacts;
- (j) to propose the provision of infrastructure or mitigation measures so as to minimise pollution, environmental disturbance and nuisance during construction and operation of the Project;
- (k) to investigate the feasibility, effectiveness and implications of the proposed mitigation measures;
- (l) to identify, predict and evaluate the residual environmental impacts (i.e. after practicable mitigation) and the cumulative effects expected to arise during the construction and operation phases of the Project in relation to the sensitive receivers and potential affected uses;
- (m) to identify, assess and specify methods, measures and standards, to be included in the detailed design, construction and operation of the Project which are necessary to mitigate these residual environmental impacts and cumulative effects and reduce them to acceptable levels;
- (n) to design and specify the environmental monitoring and audit requirements; and
- (o) to identify any additional studies necessary to implement the mitigation measures of monitoring and proposals recommended in the EIA report.

1.5 Structure of the EIA Report

1.5.1.1 The background of the Project, purpose and objectives of this Report are introduced in this section. A description of the Project and details of options consideration are provided in **Section 2**. **Sections 3 to 12** detail the results of the environmental impact assessment of each key subject area, covering relevant legislation, environmental conditions, assessment criteria, methodology, assessment findings and proposed mitigation measures.

1.5.1.2 **Sections 3 to 12** are outlined as follows:

- Section 3: Air Quality Impact
- Section 4: Noise Impact
- Section 5: Water Quality Impact
- Section 6: Waste Management Implications
- Section 7: Land Contamination
- Section 8: Sewerage and Sewage Treatment Implications
- Section 9: Ecological Impact (Terrestrial and Marine)
- Section 10: Fisheries Impact
- Section 11: Cultural Heritage Impact
- Section 12: Landscape and Visual Impacts

1.5.1.3 An outline of the requirements for the Environmental Monitoring and Audit (EM&A) programme is presented in **Section 13**. The EM&A programme is presented in detail in a separate EM&A Manual. A detailed implementation schedule of the recommended mitigation measures is provided in **Section 14**. A summary of environmental outcomes and conclusions is presented in **Section 15**.

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2 PROJECT DESCRIPTION

2.1 Purposes and Objectives of the Project

2.1.1.1 The purposes and objectives of the Project are to revitalise the existing Tai Wai Nullah (TWN) with the aim of enhancing the ecological value of TWN, providing a greener environment, promoting water friendliness and improving the community environment. The Project also includes provision of dry weather flow interceptors to improve the water quality.

2.2 Project Site Location and Site History

2.2.1.1 The Project site is located at the centre of Tai Wai District and covers the existing TWN. TWN is an old concrete-lined nullah of approximately 2 km long and 40 m wide. It is one of the three main tributaries of Shing Mun River. It originates from Needle Hill and flows in the southeast direction towards Shing Mun River. **Figure 2.1** illustrates the location plan of the Project.

2.2.1.2 The Project site is mainly surrounded by residential developments. The current zonings of the Project site under the Approved Sha Tin Outline Zoning Plan (OZP) No. S/ST/36 include "Industrial" ("I"), "Green Belt" ("GB"), "Comprehensive Development Area" ("CDA"), "Other Specified Uses" ("OU"), "Residential (Group A)" ("R(A)"), "Residential (Group B)" ("R(B)"), "Village Type Development" ("V"), and "Government, Institution or Community" ("G/IC").

2.3 Project Scope and Design

2.3.1.1 The Project comprises the following key components:

- (a) beautification of the existing nullah (approximately 2 km long and 40 m wide) by re-surfacing, greening and modification of channel bed;
- (b) provision of approximately 3 km walkways along the nullah and associated stairs and access ramps;
- (c) provision of a Dry Weather Flow Interceptor (DWFI) system;
- (d) provision of features for ecological enhancement and sustainable drainage system, and two underground water pumps installed near mid-stream of TWN and underground water pipes for associated water retention and supplement;
- (e) construction of viewing decks and revamp of existing footbridges/bridges;
- (f) revamp / provision of footpaths, railings, pavilions, amenity areas and public open spaces along the nullah and on the nullah bed, as well as the associated UV disinfection system for water play features;
- (g) improvement / modification of existing planters; and
- (h) associated works including landscaping, utility works, etc.

2.3.1.2 General layout of the Project is shown in **Figure 2.2** and details of the design scheme are illustrated in **Appendix 2.1**. The details of the design of the revitalisation works would be subject to changes at the detailed design stage, including actual alignment of the low flow channel and dimensions of proposed above-ground structures (e.g. viewing decks, revamp of existing footbridges/bridges, revamp/provision of footpaths, pavilions (in form of sheltered benches / seating) and visitor facilities for amenity areas (e.g. riparian walkway, UV disinfection system, toilet and management office), would be subject to detailed design stage.

2.3.1.3 Subsequent to the issue of the EIA Study Brief (No. ESB-320/2019), underground water pumps installed near mid-stream of TWN (beneath Shing Mun Tunnel Road by the bankside) and underground water pipes (mainly housed within the DWFI system) have been proposed to support the provision of ecological enhancement features in the nullah in view of the insufficient baseflow in TWN (**Section 2.5.1.9** refers). Under the latest revitalisation design, an UV disinfection system has also been proposed for water play features to be provided in riparian amenity areas (fully separated from waterbody of TWN) to promote water friendliness. Furthermore, the Project boundary has been altered to cover modification of channel bed and bank downstream of TWN's broad-crested weir at its confluence with Shing Mun River near Man Lai Court, with an aim to improve the existing excessive accumulation of silts brought by tidal influence due to uneven surface and flat gradient of the existing channel in front of the broad-crested weir; the areas near the cul-de-sac of Heung Fan Liu Road due to construction site constraints; and mid-stream near Shing Mun Tunnel Road for overall planning of the mid-

stream riparian public open space. In accordance with Clause 6.2 of the EIA Study Brief, it has been checked if there would be any key changes in the scope of the Project mentioned in Section 1.2 of the EIA Study Brief and in Project Profile (No. PP-586/2019). Confirmation has been sought in writing on whether or not the scope of issues covered by the EIA Study Brief can still cover the key changes, and the additional issues, if any, that the EIA report must also address. It was demonstrated that these changes would not fundamentally alter the key scope of the EIA Study Brief, the scope of issues could still be covered by EIA SB and hence no fresh EIA SB would be required (**Appendix 2.3** refers).

2.3.2 Construction Activities

2.3.2.1 The scope of the abovementioned key components involves the following construction works elements:

Channel Bed Modification

- Excavation works
- Re-surfacing and greening of the nullah
- Construction of energy dissipation structures at upstream section

Improvement of Existing Walkways and Riparian Public Open Spaces

- Construction of viewing deck / pavilion, renovation of existing footbridges
- Construction of staircases and access ramps
- Construction of riparian walkway, water play features and UV disinfection system, and visitor's facilities (toilet and management office)
- Demolition of existing footbridge

Construction of Dry Weather Flow Interceptor System

- Connection works of DWFI system to the existing sewerage system; and
- Construction of DWFI channel along both sides of the nullah bed.

Landscaping and Miscellaneous Works

- Landscaping / greening of the bankside along the nullah; and
- Utility works.

Desilting at Downstream Tidal Zone

- Desilting at downstream tidal zone.

Construction of Mid-stream Underground Water Pumping Facilities for Ecological Enhancement-Associated Water Retention and Supplement

- Construction of underground pumping facilities (mid-stream underground water pumps and waterpipe along the nullah) for water supplement.

2.3.3 Operational Activities

2.3.3.1 During the operational phase, similar to the existing practices, regular maintenance works for the drainage and sewerage systems along TWN, including desilting along the nullah and minor maintenance to the DWFI system, would be carried out by the DSD to remove excessive silts, debris and any obstructions to safeguard the hydraulic capacity of the nullah. Maintenance desilting of the nullah would tentatively be carried out on an annual basis during dry season (November to March) when the water flow is low, except during emergency situations where the accumulated silt would adversely affect the hydraulic capacity of the nullah or where flooding risk is imminent, or when complaints on environmental nuisance associated with the accumulated silt are received. Minor maintenance to DWFI system would only be undertaken on an as-needed basis and frequent maintenance (i.e. monthly) would not be required. The maintenance practices and frequency would be similar to the existing maintenance works undertaken by the DSD.

2.3.3.2 The operation of the two proposed underground water pumps near mid-stream of TWN southeast to Pok Ngar Villa (one duty and one standby) will be controlled by a level detector installed at the modified stilling basin (to be deepened and expanded as detailed in **Section**

2.5.1.9) at upstream of TWN. Water flowing from the low flow channel will be collected in a wet well by gravity through a screened inlet pipe installed at the low flow channel. The water will then be pumped upstream to the modified stilling basin through pressurised underground pipes. The on-duty pump will not operate during night-time (i.e. 2300 – 0700 hours). The stored water in the basin will be naturally discharged for recharging environmental flow in the nullah.

2.4 The Need of the Project

2.4.1 Environmental Benefits of the Project

Water Quality Improvement and Promotion of Water Friendliness

- 2.4.1.1 Due to ageing drainage systems and possible expedient connection made in the past, polluted discharges from the existing drainage outlets along TWN are observed at present. Complaints and concerns from the public, including Sha Tin District Council (STDC) and local stakeholders, on the long-standing water quality and odour nuisance of TWN, particular at the confluence of TWN and Shing Mun River area near Man Lai Court, were received (**Section 2.9** refers). With the implementation of the proposed DWFI system and treatment wetlands, the existing polluted dry weather flows from the drainage outlets along TWN will either be intercepted and discharged to the existing sewerage system via gravity mains (i.e. no DWFI pumping station required) for conveying to Shatin Sewage Treatment Works for treatment by the DWFI system, or be discharged into the treatment wetlands installed at drainage outlets for in-situ polishing. Furthermore, with the modification of channel bed downstream of TWN's low flow channel near its confluence with Shing Mun River near Man Lai Court, the excessive accumulation of silts brought by tidal influence caused by uneven surface and flat gradient of the existing channel in front of the broad-crested weir would be greatly reduced. With the abovementioned designs, the water quality and hygiene within the nullah would be improved and odour nuisance to the resident nearby would be alleviated.
- 2.4.1.2 As detailed in **Table 2.1**, after the revitalisation works, similar to the existing condition, the nullah bed of the engineering channel of TWN would be dry most of the time during non-rainy days, except for the low flow channel in the middle. While the main water body of TWN, i.e. the low flow channel, is not suitable to be opened up for public access / physical contact due to safety reasons, the improvement of water quality and riverside environment of the nullah due to the Project would enhance user experience and hence promoting water friendliness culture. In order to allow public to better enjoy the view of the revitalised waterscape and ecological enhancement features (e.g. treatment wetland), construction / modification of footbridges / walkways and public open spaces is proposed along the nullah. The riparian areas (nullah bed of the engineering channel of TWN outside of the low flow channel) of midstream TWN near Pok Ngar Villa would also be opened for public access and be transformed into a public open space with accesses with stepped seats, riparian walkways and other community amenities [including water play features (fully separated from the water body of TWN)] to promote water-friendliness. The riparian walkway and amenity areas will be properly designed to restrict public access / physical contact to the water body of TWN in order to ensure the public safety (e.g. elevated walkway design, fencing, provision of warnings / signage etc.). Channel management system, rain detection and safety system and flood warning will also be adopted and to be managed by DSD and access to the riparian walkway and amenity areas [provided with water play features] will be closed under extreme weather conditions.
- 2.4.1.3 Freshwater discharge from the existing drainage outlet of the nullah near Pok Ngar Villa, which receives mainly clean river flow from upstream natural hillside catchment north to Peak One, will be partially intercepted and conveyed to the proposed UV disinfection system for treatment prior to be used in the water play features (e.g. water spouts and fountains). Based on the preliminary design, no additional stormwater collection facilities would be required for the conveyance of freshwater supply for the proposed water play features. DSD Practice Note (PN) No. 3/2021 "Guidelines on Design for Revitalisation of River Channel" lays out the Water Quality Goals (WQGs) for primary contact recreation (type 3 designated use) at revitalised river channel, i.e. fulfilling the existing Water Quality Objectives (WQOs) adopted for respective water control zone (WCZ), i.e. Tolo Harbour and Channel WCZ (**Section 5** refers), *E. coli* not exceeding 180 cfu/100 mL (annual geometric mean) (same as the relevant WQO

for bathing beach) and having no objectionable odour. A more stringent treatment standard will be adopted for the water supply for the proposed water play features that in addition to fulfilling the relevant WQGs for type 3 designated use, *E. coli* bacteria should be non-detectable (in cfu/100 mL, calculated as the geometric mean of all samples collected in one calendar year) in the treated water. There would also be provision of proper signage and deployment of specific management personnel to ensure safe and appropriate usage of the water play features. The water play features will be closed when the disinfection system is not under normal operation, under maintenance or when the treatment standard as specified in the post-revitalisation water quality monitoring programme established and implemented by DSD is not complied with (**Section 5** refers). The detailed designs of the UV disinfection system and water play features would be conducted in the next stage of the Project in consultation with relevant Government authorities and reference would be made to other existing water play features in Hong Kong (e.g. splash pads, water cascade facilities, water jets and spray grounds etc.).

- 2.4.1.4 The riparian walkway and amenity areas would be properly designed to restrict public access / physical contact to the water body, i.e. the low flow channel, and to ensure public safety (e.g. elevated walkway design, fencing, provision of warnings / signage, deployment of specific management personnel etc.). In particular, it should be noted that neither the water from the revitalised nullah with improved water quality or the water play features utilising treated freshwater shall be used for human or animal consumption, bathing or showering, food preparation / washing. Channel management system, as well as rain detection, safety and flood warning system (e.g. water level sensor at the low flow channel) will be adopted and managed by the DSD and access to the riparian walkway and amenity areas [provided with water play features] will be closed in case of foreseeable flooding at the nullah bed or under extreme weather conditions.

Greening Enhancement

- 2.4.1.5 The existing concrete nullah of TWN will be resurfaced with layer of vegetation, which will enhance both the aesthetic and ecological values of TWN. Greening of the nullah and along its banksides, such as provision of emergent wetland planting (e.g. reed and other aquatic herbs), mangroves, climbing plants, tree and / or grasscrete etc, will be provided. The existing mature trees growing by the bankside along the nullah will be retained, and additional tree planting will be provided along the nullah. The existing planters will also be modified to beautify the footpath along TWN.

Ecological Enhancement

- 2.4.1.6 The existing TWN is of low ecological value in view of its concrete-lined channel bed and bank, as well as its limited baseflow, especially in dry season (i.e. from November to March). With the proposed modification of the existing stilling basin (part of channel bed modification works) and the underground water pumps installed by the bankside near mid-stream of TWN for associated water retention and supplement, the following ecological features will be incorporated into the nullah to improve and create aquatic and terrestrial habitats, enhancing its ecological values:

- Reprofilling of the low flow channel and construction of in-stream weirs to create a meandering alignment along the nullah to mimic natural stream pattern where practicable, providing a series of microhabitats for wildlife in surrounding areas;
- Provision of DWFI system to improve water quality and hence support ecological enhancement;
- Provision of treatment wetlands (artificial wetland created to mimic processes in natural wetland ecosystems involving vegetation, soils, and their associated microbes through engineering design) at selected drainage outlets along TWN to remove pollutants and to improve stormwater quality (in terms of biochemical oxygen demand, ammonia, total suspended solids, total phosphorus, and pathogens), which can also serve as greening and ecological enhancement measures. General constructed wetland system of smaller scale for aesthetic and ecological enhancement purposes is also proposed;
- Greening of the nullah and along its banksides, such as provision of emergent wetland planting (e.g. reed and other aquatic herbs), mangroves, climbing plants, tree and / or grasscrete;

- Incorporation of planting designed to attract wildlife species (e.g. native host plant species for butterflies) during revamp of public open space along TWN;
- Provision of nest boxes / hunting perch for wildlife (e.g. birds) along TWN; and
- Modification of channel bank and existing vehicular access at downstream section of TWN into a mix of stepped terrace and slope at water edge to enhance foraging / pre-roost habitats for waterbirds (e.g. ardeids).

2.4.2 Scenario with the Project

2.4.2.1 With the implementation of the Project, over 70,000 m² of concrete-lined channel space would be transformed into green spaces to promote greening of the local environment and the ecological value of existing TWN would be enhanced with the incorporation of the ecological features as described in **Section 2.4.1.6**. Furthermore, the introduction of the DWFI system and treatment wetlands to intercept/polish the existing polluted discharges at the drainage outlets along TWN, as well as modification of channel bed downstream of TWN's broad-crested weir at its confluence with Shing Mun River near Man Lai Court to minimise excessive accumulation of silts brought by tidal influence, would improve the water quality and odour issues associated with the current polluted discharges to the nullah and with excessive siltation at downstream TWN. In order to facilitate the public to better enjoy the view of the revitalised waterscape and ecological enhancement features (e.g. treatment wetland) as well as to promote water-friendliness, certain locations of the nullah bed of TWN will be transformed into a green open space that can be accessed by the public with provision of riparian walkway and amenity areas for public enjoyment. There will be multiple large entrance points with stepped seats and decked platforms on nullah bed that can provide communal spaces for recreation and leisure activities to promote water friendliness (e.g. riparian walkway, sightseeing of greening and ecological enhancement features, water play features equipped with UV disinfection system) at midstream of TWN. Cantilevered viewing decks / sheltered walkway are also proposed by the bankside in the upstream section. No environmental disbenefits would be envisaged from the proposed revitalisation works.

2.4.3 Scenario without the Project

2.4.3.1 TWN flows through a number of large housing estates and the district's major commercial and industrial areas. During non-rainy days, the nullah bed of the engineering channel of TWN is dry most of the time, except for the low flow channel in the middle that contains mainly dry weather flows carrying some polluted discharges. Over 70,000 m² of channel space has been left unused at present. In addition, the cracked and stained concrete-lined channel shows little sign of aquatic or terrestrial life.

2.4.3.2 Without the Project, TWN would remain as a concrete channel with little aesthetic, ecological and social values, and would occupy the vast amount of space only serving a single purpose of flood conveyance. In addition, the opportunity of resolving the existing water quality and odour issues due to the polluted discharges and excessive siltation would also be negated.

2.5 Consideration of Different Development Options

2.5.1.1 Various options in regard to the extent of DWFI system, flood prevention, water retention and replenish methods, and ecological enhancement designs have been considered with a view to optimising the revitalisation design of TWN in order to enhance the ecological value of the nullah, provide a greener environment, promote water friendliness and improve the community environment whilst avoiding, minimising and mitigating any potential adverse environmental impacts of the Project.

Extent of DWFI System

2.5.1.2 Drainage outlets with polluted discharges were identified between Sections 1 to 5 of TWN (**Section 2.6.2** and **Figure 2.2** refer) through the pollution source identification survey conducted under this Project. Environmental implications of the following three options regarding the extent of DWFI system for the Project have been considered with a view to striking a balance between water quality improvement and ecological enhancement in the nullah.

- Option 1 (No Interception) refers to the existing condition where all dry weather flows are discharged to the nullah directly without interception or treatment;
- Option 2 (Full Interception) refers to a full-scale DWFI system that intercepts the dry weather flows from all the drainage outlets identified with polluted discharges along the nullah within part of Section 1 (from north of Tsuen Nam Road near Tai Wai Soccer Pitch) to Section 5 of TWN. Section 6 of TWN is connected to WSD's facilities that expedient connection/misconnection or significant polluted surface runoff due to the nature of the catchment area would be unlikely. Likewise, part of Section 1 (south to Tsuen Nam Road) of the nullah is subject to tidal influence with the outlets being submerged mostly in water that the discharges cannot be intercepted by the instream DWFI system. DWFI system is hence not considered for the part of Section 1 (south to Tsuen Nam Road) and Section 6 of the nullah.
- Option 3 (Partial Interception) refers to a more site-specific design which takes into account of the water quality condition of each outlet to provide DWFI system only to some drainage outlets with highly polluted discharges (e.g. from expedient connection) and to construct treatment wetlands at remaining outlets for in-situ polishing of the less polluted discharges (e.g. outlets connected to the urban roadside drainage system). The water treatment efficiency of the treatment wetlands would be highly dependent on their sizes and retention time of the influent (which is associated with steadiness of water flow at the nullah). Similar to Option 2, DWFI system would be provided along the nullah within part of Section 1 (from north of Tsuen Nam Road near Tai Wai Soccer Pitch) to Section 5 and not be required for outlets in part of Section 1 (south to Tsuen Nam Road) and Section 6 of the nullah.

2.5.1.3 Environmental considerations of each option and the implications of each option on the revitalisation design are summarised in **Table 2.1**.

Table 2.1 Comparison of Alternative Extent of DWFI System

Design Considered	Environmental Benefits	Environmental Disbenefits	Implications on Revitalisation Design
Option 1 – No Interception	<ul style="list-style-type: none"> • No diversion of additional pollutant loads to the existing sewerage system 	<ul style="list-style-type: none"> • Existing water quality and odour issues due to polluted discharges from drainage outlets along TWN would remain unresolved 	<ul style="list-style-type: none"> • Poor water quality of TWN due to polluted discharges is undesirable for ecological enhancement, promotion of water friendliness or improvement of community environment and hence not considered
Option 2 – Full Interception of polluted discharges from drainage outlets to DWFI system only	<ul style="list-style-type: none"> • Improvement to existing water quality and odour issues by intercepting all dry weather flows from the drainage outlets identified with polluted discharges along the nullah within part of Section 1 (from north of Tsuen Nam Road near Tai Wai Soccer Pitch) to Section 5 of TWN 	<ul style="list-style-type: none"> • Increase pollutant loads to the existing sewerage system (comparatively more than Option 3) 	<ul style="list-style-type: none"> • Polluted discharges would be fully eliminated to improve water quality of TWN through DWFI system. • Baseflow of nullah would be reduced and may not be able to support aquatic habitat / wetland creation for greening and ecological enhancement. • Additional water retention and replenish facilities are required to provide sufficient baseflow for in-stream ecological enhancement
Option 3 – Partial Interception of polluted discharges from drainage outlets to DWFI system	<ul style="list-style-type: none"> • Improvement to water quality and odour issue by intercepting polluted dry weather flows from some of drainage outlets identified with highly polluted discharges by DWFI and along the nullah within part 	<ul style="list-style-type: none"> • Increase pollutant loads to the existing sewerage system (comparatively less than Option 2) 	<ul style="list-style-type: none"> • Polluted discharges would be fully eliminated by DWFI system or polished by treatment wetlands. • Baseflow of TWN would be reduced, while to a smaller extent than Option 2 – Full Interception, still may not be able

Design Considered	Environmental Benefits	Environmental Disbenefits	Implications on Revitalisation Design
and provision of treatment wetlands for the less polluted discharges (Preferred)	<p>of Section 1 (from north of Tsuen Nam Road near Tai Wai Soccer Pitch) to Section 5 of TWN.</p> <ul style="list-style-type: none"> Provision of treatment wetlands to the drainage outlets along the nullah within part of Section 1 (from north of Tsuen Nam Road near Tai Wai Soccer Pitch) to Section 5 of TWN for in-situ polishing of the less polluted discharge can improve water quality and odour issues whilst serving as ecological enhancement and greening 		<p>to support aquatic habitat / wetland creation.</p> <ul style="list-style-type: none"> Additional water retention and replenish method is required to provide sufficient baseflow for in-stream ecological enhancement

2.5.1.4 Considering the TWN has sufficient space with gentle gradient and hence comparatively slower flow velocity, sufficient sizes of treatment wetlands could be provided and adequate retention time of influent for pollutant removal could be achieved. As such, provision of treatment wetlands at drainage outlets would be effective in polishing the remaining non-intercepted polluted discharges.

2.5.1.5 As compared to Option 2, Option 3 not only would improve the water quality and resolve the odour problem of TWN with partial interception of the highly polluted discharges by DWF1 system and provision of treatment wetland for polishing the remaining non-intercepted polluted discharges, it also would minimise the addition of pollutant loads to the existing sewerage system and enhance the ecological values of TWN by providing additional wetland habitats for wildlife. Hence, it is selected as the preferred option.

Water Retention and Replenish Methods and Ecological Enhancement Designs

2.5.1.6 While the water quality of TWN could be significantly improved with the proposed partial interception of the highly polluted discharges by DWF1 system, the limited baseflow of the nullah would be further reduced that would constrain the in-channel ecological enhancement designs. As such, water retention and replenish methods have been explored to retain and supplement water to the nullah in order to provide sufficient water flow to support a healthy aquatic habitat in the channel.

2.5.1.7 With the provision of treatment wetland for in-situ polishing of non-intercepted flow with less polluted discharges as discussed in **Section 2.5.1.4**, the polished flow could serve as a part of the environmental flow to sustain the ecological function of the flora and fauna and habitat present within the revitalised TWN.

2.5.1.8 In-stream fixed weirs would be incorporated in the reprofiled low flow channel to retain water depth for aquatic habitats. In natural streams, rocks and boulders service as natural 'weir' to maintain water depth and create microhabitats. Apart from the revitalisation works, TWN would remain its primary function for flood discharge that loose natural substrates can be easily washed away and cause damages and debris to the downstream area. Fixed weirs are therefore proposed to resemble the function of natural weirs. By impounding floodwater or environmental flows, weirs are particularly useful in the dry channels to retain water for a longer period, which could promote plant growth and aquatic species survival in such an otherwise dry environment.

2.5.1.9 The existing stilling basin at upstream of TWN [40m (W) x 45m (L) x 1m (D)], which has served to store water during storm events and to recharge the flow in the nullah on dry days, would be deepened and expanded during channel bed modification to increase the water storage capacity while maintaining sufficient water depth for the wetland development in the modified basin [40m (W) x 45m (L) x 3.4m (D) + 30m (W) x 55m (L) x 1.5m (D)]. In view of the limited

and inconsistent baseflow, especially in dry season, underground water pumps are proposed to be constructed near mid-stream section of TWN downstream of Pok Ngar Villa to pump water to the modified stilling basin for replenishing as detailed in **Section 2.3.3.2**. The stored water in the basin sourced from the stormwater from upstream TWN and mid-stream underground water pumps can be used for recharging environmental flow in the nullah, which can help maintain a healthy aquatic habitat and support the proposed emergent wetland planting for in-channel greening and ecological enhancement to mimicking the biodiversity of a natural stream environment and creating an aesthetically pleasing landscape.

- 2.5.1.10 As detailed in **Table 2.3**, in response to public comments received, construction of energy dissipation structures (e.g. baffle blocks) is also proposed in the upstream section of TWN immediately downstream to WSD's facilities to protect the downstream aquatic organisms from being washed away due to comparatively high flow rate of water discharged from Lower Shing Mun Reservoir.

Minimisation of Siltation in Downstream Tai Wai Nullah

- 2.5.1.11 With the proposed DWFI system and treatment wetlands, the existing polluted dry weather flows from the drainage outlets along TWN would be intercepted/polished and the associated water quality issues and odour nuisance to the nearby resident would be improved. Apart from the environmental nuisance caused by polluted discharges from drainage outlets along the nullah, excessive accumulation of silts brought by tidal influence due to uneven surface and flat gradient of the existing channel in front of the broad-crested weir at downstream TWN near its confluence with Shing Mun River near Man Lai Court was observed to cause environmental nuisance to nearby residents. In order to tackle this existing issue, modification of channel bed downstream of TWN's broad-crested weir has been incorporated into the revitalisation design to minimise the deposition of excessive silt and resolve the associated environmental nuisance.
- 2.5.1.12 Taking advantage of the modification of channel bed downstream of TWN's broad-crested weir at its confluence with Shing Mun River near Man Lai Court, part of the existing concrete vehicular access at the nullah bank would be reconstructed into a mix of stepped terrace and slope with greenings (e.g. planter, grasscrete) at water edge to create foraging / pre-roost habitats for waterbirds (e.g. ardeids) and to enhance greening, whilst maintaining the necessary emergency access function of the existing vehicular track.

2.6 Consideration of Alternative Construction Methods and Sequences of Works

2.6.1 Construction Methods

- 2.6.1.1 The proposed revitalisation works would be constructed by traditional open-cut and in-situ concreting method that mainly involve site clearance, soil excavation, sheet-piling, bore piling, formwork, concreting, backfilling, and reinstatement. Desilting works at downstream tidal zone would be carried out at the commencement and prior to the completion of the construction works to remove the silting accumulated at the nullah, in addition to the routine maintenance desilting works undertaken by DSD along TWN and by CEDD along Shing Mun River under existing arrangement. Environmental considerations of various construction methods for the installation of DWFI system are discussed as follows.

Dry Weather Flow Interceptor System

- 2.6.1.2 There are two approaches for the DWFI system construction, including conventional cast in-situ construction method and pre-cast structure. The major parts of the DWFI system are u-channel and pipe system cast-in with the concrete blocks at nullah wall for stabilisation. The concrete mass is generally 1 m wide and 1 m deep.
- 2.6.1.3 In-situ concrete casting could induce environmental impacts such as construction noise, dust and water quality, yet it is expected that the duration and extent of the impacts would be temporary and localised and could be mitigated by proper measures during the construction phase. While the pre-cast structure is constructed in fabrication yard away from the Project site that its production could cause less environmental nuisance to the surroundings, the concrete mass should fit the shape of existing nullah wall and the size of the drainage outlets, which vary along the nullah that on-site modification to the pre-cast structure is inevitable due to the actual site constraints. Utilisation of powered mechanical equipment (PME) such as breaker would be required that the environmental impacts for both approaches would be

similar. Alternatively, if a new precast structure is decided to be adopted instead of on-site modification, detailed and prolonged coordination between different parties including structural, architectural, etc. would be required that the whole construction period might be prolonged and would result in generation of additional construction waste from the abandoned precast structure and disturbance/nuisance from the repeated loading and unloading activities / trial installation of concrete mass. Furthermore, off-site precast units are considered not practical nor cost effective due to site constraints with limited accessibility, which hinders the transportation of the precast units.

- 2.6.1.4 Considering that the traditional cast in-situ construction method could allow more flexibility for on-site alteration and is the most straightforward method for this Project, prolonged construction duration and repeated construction activities would be avoided and hence reduce potential disturbance/nuisance to the environment and local public, the construction method of in-situ construction of DWFI system is considered more suitable and practical and is adopted.

2.6.2 Construction Extent and Sequence

- 2.6.2.1 The Project site will be divided into six sections to be constructed in sequence starting from downstream TWN (**Figure 2.2** and **Appendix 2.2** refer) to reduce the construction impacts on nearby sensitive receivers comparing with constructing simultaneously in adjoining sections. The construction works along the nullah within each section would last for approximately 1 year and will not be undertaken at the entire section at the same time.
- 2.6.2.2 For each section, the construction works within the nullah, including nullah bed modification (including construction of energy dissipation structures), construction of DWFI system along the nullah, underground water pipes along the nullah, construction of riparian walkway and amenity areas, and desilting works at downstream tidal zone (**Appendix 2.1** refers), will only be undertaken during dry season to reduce the potential water quality impacts due to surface run-off. To further reduce the water quality impacts, the excavation in the nullah will be carried out in an enclosed area surrounded by concrete blocks, sandbag barriers or other appropriate physical barriers. Likewise, other construction works outside the nullah such as walkway improvement will be scheduled to avoid overlapping with works within the nullah to avoid heavy construction activities concentrating in a certain area over any period.

2.7 Construction Programme

- 2.7.1.1 The construction works are tentatively scheduled to commence in Q1 2024 for completion in Q4 2029. A tentative construction programme for the Project is provided in **Appendix 2.2**. This programme provides the basis for the assessments presented in the EIA Report.

2.8 Concurrent Projects

- 2.8.1.1 **Table 2.2** summarises the potential concurrent projects within 500 m from the Project boundary and the designated project "Revitalisation of Fo Tan Nullah" which is under the same Assignment that involves construction works within or near Shing Mun River and its tributaries, which may contribute to the cumulative environmental impacts during construction and / or operational phase. Indicative locations of these concurrent projects are shown in **Figure 2.3**.

Table 2.2 Potential Interfacing Projects

Project	Tentative Construction Programme	Potential Cumulative Impacts
Revised Trunk Road T4 in Sha Tin	Q4 2023 – Q3 2028	<p>The footprint of Revised Trunk Road T4, which involves mainly road network construction and modification works for connecting Shing Mun Tunnel Road and Tsing Sha Highway in the northwest with Sha Tin Road, would partly overlap with the Project in mid-stream TWN (near Pok Ngar Villa and north of Tsing Sha Highway). Based on the approved EIA of Revised Trunk Road T4 in Sha Tin (AEIAR-231/2021).</p> <p>During construction phase, in view that the most dusty and noisy construction works of the Revised Trunk Road T4 within the site area of overlapping with this Project would be the foundation works for the Revised Trunk Road T4 viaducts, the tentative construction programme and works at the interface area between the two projects could be arranged efficiently, e.g. scheduling works to be carried out during dry season, through close liaison between DSD's and CEDD's contractors of this Project and the concurrent project respectively in order to avoid construction works of respective works contracts to be carried out concurrently at the same interfacing areas and CEDD has agreed to include this requirement in the respective works contract. Cumulative construction environmental impacts, such as air quality, noise and water quality impacts upon the downstream water body have been taken into account in this EIA Study and can be minimised with such arrangement in place.</p> <p>This concurrent project would also involve construction of bridge piers within Shing Mun River from November 2023 to September 2025. Potential cumulative water quality and ecological impacts to downstream areas in Shing Mun River Channel and Tolo Harbour during construction phase have also been taken into account in this EIA Study.</p> <p>During operational phase, the key issues of the operation of the concurrent project are non-point source surface runoff from new impervious areas as well as the potential hydrodynamic and water quality impact on Shing Mun River due to the installation of permanent structures. Potential cumulative water quality impacts from these two projects have been taken into account in this EIA Study.</p>
Drainage Improvement Works in Sha Tin and Sai Kung (proposed box culverts in Chui Tin Street)	Q2 2026 - 2031	<p>Drainage improvement works are proposed in various locations in Sha Tin and Sai Kung under Drainage Improvement Works in Sha Tin and Sai Kung.</p> <p>Based on the latest available information, the box culverts proposed in Chui Tin Street under this</p>

Project	Tentative Construction Programme	Potential Cumulative Impacts
		concurrent project would fall partly within the 500m assessment area of this EIA Study, while no detailed construction programme of the concerned box culvert was available at time of the preparation of this EIA Report. During the detailed design stage, the contractor of this Project should be requested to closely liaise the contractors of this potential concurrent DSD project in planning the interfacing works properly to minimise the potential cumulative impacts by avoiding/minimising repeated and concurrent construction works.
Revitalisation of Fo Tan Nullah	Q1 2024 – Q4 2029	<p>TWN is situated at approximate 2.7 km from FTN. Although the construction programmes of the two projects are very similar, given the large separation distance between the two concurrent revitalisation works of FTN and TWN, insignificant cumulative construction phase air quality and noise impacts would be expected. Potential cumulative water quality and ecological impacts to downstream areas in Shing Mun River Channel and Tolo Harbour during construction phase have been taken into account in this EIA Study.</p> <p>Both the Project and Revitalisation of FTN would improve water quality and hygiene of the two nullahs that no unacceptable cumulative operational phase impact would be anticipated. The cumulative sewerage impact from the proposed DWFI system of the Project and Revitalisation of FTN have been taken into account in this EIA Study.</p>
Joint-user complex at Tsuen Nam Road, Tai Wai	2024 – 2030	<p>The proposed Joint-user complex at Tsuen Nam Road, Tai Wai falls within the 500m assessment area of this EIA.</p> <p>Based on the latest available information, the site would be redeveloped for multi-purpose uses (residential use and community facilities) and is tentatively planned to be occupied in 2030. No detailed construction programme of the concurrent project was available at time of the preparation of this EIA Report. Nonetheless, relevant cumulative environmental impacts, such as noise and water quality have been taken into account in this EIA Study.</p>

2.9 Public Consultation

2.9.1.1 Consultation exercise carried out include:

- Meeting with Sha Tin District Council in June and July 2018, March 2021
- Meeting with Mei Lam Estate in August 2018;
- Meeting with Sha Tin District Council Health and Environmental Committee in March 2019;
- Meeting with Green Groups in July 2020 and July 2022;

- A series of public engagement exercises (e.g. interviews, workshops and surveys) through the use of Design Thinking Approach between December 2020 to August 2021.

2.9.1.2 During the public inspection period of the Project Profile submitted for the Application of EIA Study Brief (No. PP-586/2019) in 2019, comments received were largely in favour of the Project, in particular, the proposed DWFI system and ecological enhancement are considered to be beneficial to the community. Members of the Sha Tin District Council, general public and green groups are supportive of the Project. Key findings and concerns obtained from public inspection period of the Project Profile and the public consultation meetings, as well as follow up actions taken are summarised in **Table 2.3**.

Table 2.3 Summary of Public Concerns and Follow-up Actions

Key Concerns	Follow-up Actions
Water quality issues and odour nuisance	<p>DWFI system and treatment wetland are proposed to intercept / polish polluted dry weather flows that are discharged from drainage outlets along both sides of TWN. Modification of channel bed downstream of TWN's broad-crested weir at its confluence with Shing Mun River near Man Lai Court to minimise the deposition of the silt brought by tidal influence due to uneven surface and flat gradient of the existing channel in front of the broad-crested weir is also proposed. With the abovementioned designs, the water quality and hygiene within the nullah would be improved and odour nuisance to the resident nearby would be alleviated.</p>
Promotion of water friendliness, access to nullah and public safety	<p>After revitalisation works, during non-rainy days, similar to the existing condition, the nullah bed of the engineering channel of TWN would be dry most of the time, except for the low flow channel in the middle. The main water body of TWN, i.e. the low flow channel, is considered not suitable for public access, physical contact / recreational uses for safety reasons. However, with the improved water quality, there is an opportunity to enhance user experience along TWN and hence promoting water friendliness culture. In order to facilitate public to better enjoy the view of the revitalised waterscape and ecological enhancement features (e.g. treatment wetland) as well as promote water-friendliness, certain locations of the nullah bed of TWN will be transformed into a green space with provision of riparian walkway and amenity areas to allow public access for enjoyment . There will be multiple large entrance points with stepped seats and decked platforms on nullah bed that can provide communal spaces for recreation and leisure activities to promote water friendliness (e.g. riparian walkway, sightseeing of greening and ecological enhancement features, water play features equipped with UV disinfection system) at midstream of TWN. Cantilevered viewing decks / sheltered walkway are also proposed by the bankside in the upstream section.</p> <p>Since TWN would continue its primary function for flood discharge, channel management system, and rain detection and safety system will be adopted and to be managed by DSD to ensure the public safety at the riparian walkway and amenity areas. Maintenance / operation practices will make reference to guidelines and considerations on safety and risk management, flood control, water quality, and leisure and amenity as stipulated in DSD PN No. 3/2021. A flood warning system would be developed which can provide the earliest warning for approaching storms and anticipated flooding, allowing sufficient time for individuals to evacuate in a safe and orderly manner. The access points into the nullah bed will be carefully planned with some access being designated for emergency use only (for instance emergency access stairs is proposed along the Mei Lam Estate boundary with openings along the existing parapet walls) to reduce the nuisance induced by the public access on nearby residents.</p>

Key Concerns	Follow-up Actions
<p>Insufficient baseflow to support proposed ecological enhancement</p>	<p>As detailed in Sections 2.5.1.6 to Section 2.5.1.10, water retention and replenish methods including construction of in-stream fixed weirs, modification and expansion of existing upstream stilling basin, provision of treatment wetland for in-situ polishing of flow with less polluted discharges instead of full interception by DWFI system, construction of underground water pumps, would be incorporated in the revitalisation design in order to maintain sufficient baseflow to support a healthy aquatic habitat and in-channel ecological enhancement.</p> <p>In order to prevent channel bed erosion and to protect the downstream aquatic organisms from being washed away due to flow from Lower Shing Mun Reservoir, energy dissipation structures (e.g. baffle blocks) are proposed in the upstream section of TWN immediately downstream of the Reservoir.</p> <p>Other ecological enhancement features along bankside and public open space along TWN (e.g. thematic greening along banksides and public open space, provision of nest boxes / hunting perch for wildlife) will also be installed to promote ecological connectivity.</p>
<p>Avoidance and minimisation of impacts to roosting ardeids</p>	<p>Ardeid night roost was recorded along Shing Mun River nearby the Project, including the mature trees alongside Man Lai Court and Sha Tin Government Secondary School (Section 9 refers). The ardeid night roosting sites in vicinity of the Project have been avoided when considering the revitalisation design.</p> <p>There are existing mature trees along FTN on pedestrian road within the Project site. Although these tree species are not of conservation importance, the tree specimens are mature with good foliage and tree crown that can potentially provide habitat for fauna species or serve as ardeid night roosts. These mature trees will therefore be retained under the revitalisation design.</p> <p>Under the revitalisation design, existing concrete channel bank and existing vehicular access at downstream section of TWN would also be modified into a mix of stepped terrace and slope at water edge to enhance foraging / pre-roost habitats for waterbirds (e.g. ardeids).</p> <p>No construction works within the nullah in Section 1 (channel bed modification and desilting at downstream tidal zone) should be undertaken from 16:30 to 07:30 during dry season (October to March) and from 17:00 to 07:00 during wet season (April to September) in order to minimise the potential disturbance to pre-roosting / night-roosting ardeids. Likewise, no construction works with PME should be undertaken within 100m from any night roost should be undertaken from 16:30 to 07:30 during dry season (October to March) and from 17:00 to 07:00 during wet season (April to September) to avoid disturbance for all work sections 1 – 6 of TWN.</p>

3 AIR QUALITY IMPACT

3.1 Introduction

3.1.1.1 This section presents the assessment on potential air quality impacts arising from construction and operation of the Project, which has been conducted in accordance with the criteria and guidelines as stated in Section 1 of Annex 4 and Annex 12 of the *Technical Memorandum on Environmental Impact Assessment Process* (EIAO-TM) as well as the requirements given in Clause 3.4.4 and Appendix B of the EIA Study Brief (No. ESB-320/2019).

3.2 Environmental Legislations, Standards and Guidelines

3.2.1.1 The relevant legislations, standards and guidelines applicable to the present study for the assessment of air quality impacts include:

- *Air Pollution Control Ordinance* (APCO) (Cap. 311) - this provides the power for controlling air pollutants from a variety of stationary and mobile sources and encompasses a number of Air Quality Objectives (AQOs);
- Air Pollution Control (Construction Dust) Regulation;
- Air Pollution Control (Non-road Mobile Machinery) (Emission) Regulation;
- Air Pollution Control (Fuel Restriction) Regulation; and
- Environmental Impact Assessment Ordinance (EIAO) (Cap. 499), EIAO-TM, Annex 4 and Annex 12.

Air Quality Objectives

3.2.1.2 The new set of AQOs which came into effect on 1 January 2022, is tabulated in **Table 3.1**.

Table 3.1 New Hong Kong Air Quality Objectives

Pollutant	Averaging Time	Concentration Limit, $\mu\text{g}/\text{m}^3$ [1]	No. of Exceedances Allowed per Year
Fine Suspended Particulates (PM _{2.5} / FSP) [3]	24-hour	50	18 [5]
	Annual [2]	25	Not applicable
Respirable Suspended Particulates (PM ₁₀ / RSP) [4]	24-hour	100	9
	Annual [2]	50	Not applicable
Sulphur Dioxide (SO ₂)	10-minute	500	3
	24-hour	50	3
Nitrogen Dioxide (NO ₂)	1-hour	200	18
	Annual [2]	40	Not applicable
Photochemical Oxidants [as Ozone (O ₃)]	8-hour	160	9
Carbon Monoxide (CO)	1-hour	30,000	0
	8-hour	10,000	0
Lead (Pb)	Annual [2]	0.5	Not applicable

Notes:

- [1] All measurements of the concentration of gaseous air pollutants, i.e., sulphur dioxide, nitrogen dioxide, ozone and carbon monoxide, are to be adjusted to a reference temperature of 293 Kelvin and a reference pressure of 101.325 kilopascal.
- [2] Arithmetic mean.
- [3] "Fine suspended particulates" means suspended particles in air with a nominal aerodynamic diameter of 2.5 μm or less.
- [4] "Respirable suspended particulates" means suspended particles in air with a nominal aerodynamic diameter of 10 μm or less.
- [5] Under the new AQOs, the number of exceedances allowed per year for daily FSP is 35 times. However, for new government projects, the number of exceedances allowed per year for daily FSP is 18 times only.

Air Pollution Control (Construction Dust) Regulation

- 3.2.1.3 With reference to the *Air Pollution Control (Construction Dust) Regulation*, it specifies processes that require special dust control. The Contractors are required to inform the EPD and adopt proper dust suppression measures while carrying out “Notifiable Works” (which requires prior notification by the *Regulation*) and “Regulatory Works” to meet the requirements as defined under the *Regulation*.

Air Pollution Control (Non-road Mobile Machinery) (Emission) Regulation

- 3.2.1.4 The *Air Pollution Control (Non-road Mobile Machinery) (Emission) Regulation* comes into operation on 1 June 2015. Under the *Regulation*, non-road mobile machinery (NRMMS), except those exempted, are required to comply with the prescribed emission standards. From 1 September 2015, all regulated machines sold or leased for use in Hong Kong must be approved or exempted with a proper label in a prescribed format issued by EPD. Starting from 1 December 2015, only approved or exempted NRMMS with a proper label are allowed to be used in specified activities and locations including construction sites. The Contractor is required to ensure the adopted machines or non-road vehicle under the Project could meet the prescribed emission standards and requirement.

Air Pollution Control (Fuel Restriction) Regulation

- 3.2.1.5 *Air Pollution Control (Fuel Restriction) Regulations* should also be complied with an aim to prohibit the use of high sulphur content solid and liquid fuel for commercial and industrial appliances. The Project site is located within the “Sha Tin Fuel Restriction Area” under the *Air Pollution Control (Fuel Restriction) Regulations*. Except for construction site or during emergency, only gaseous fuel is allowed to be used in the Sha Tin Fuel Restriction Area. For any fuel-using equipment that is used or operated in construction site or during emergency in Sha Tin Fuel Restriction Area, Ultra Low Sulphur Diesel (ULSD) is practically the liquid fuel to be used.

EIAO-TM

- 3.2.1.6 Annex 4 of *EIAO-TM* stipulates that hourly Total Suspended Particulate (TSP) level should not exceed 500µg/m³ measured at 298 K and 101.325 kPa (one atmosphere) for the construction dust impact assessment. It also stipulates that the odour level at air sensitive receiver should meet 5 odour units based on an averaging time of 5 seconds for odour prediction assessment.
- 3.2.1.7 Guidelines for conducting air quality assessment are stipulated in Annex 12 of *EIAO-TM*, including the determination of air sensitive receivers (ASRs), the assessment methodology, baseline study and impact prediction and assessment.

3.3 Description of Environment

- 3.3.1.1 The Project is to revitalise the existing Tai Wai Nullah (TWN) with an aim to enhance the ecological value of the nullah, provide a greener environment, promote water friendliness and improve the community environment. The potential construction phase air quality impacts from the Project would likely be dust impacts, gaseous emissions from Powered Mechanical Equipment (PMEs), and potential odour emission from excavated / desilted materials during excavation works at nullah bed /desilting works at downstream tidal zone; while the potential operational phase air quality impacts from the Project would likely be potential odour emission from desilted materials during maintenance desilting works.
- 3.3.1.2 The Project site covers the existing TWN, which is approximately 2 kilometres (km) long and 40 metres (m) wide, located at the centre of Tai Wai District and is mainly surrounded by residential developments as illustrated in **Figure 3.1**.
- 3.3.1.3 The dominant existing air emission source within 500m assessment area from the Project area is vehicular emission from Shing Mun Tunnel Road, Tai Po Road (Tai Wai), Tsing Sha Highway, Mei Tin Road, Heung Fan Liu Street and Pik Tin Street, as well as emission from Fu Shan Crematorium. Within the 500m assessment area, four chimneys were identified from Fu Shan Crematorium at the time of the assessment. As the emission from Fu Shan Crematorium is controlled under the specified process (SP) licence, no adverse air quality impact arising from this SP is anticipated.

3.3.1.4 The nearest EPD general air quality monitoring station to the Project area is situated at Sha Tin Government Secondary School. The recent 5-year (between 2016 and 2020) concentrations of air pollutants measured at the monitoring station relevant to the Project, including Fine Suspended Particulates (FSP), Respirable Suspended Particulates (RSP), Sulphur Dioxide (SO₂) and Nitrogen Dioxide (NO₂), were extracted and are summarised in **Table 3.2**. It is observed that the maximum 24-hour average FSP concentrations and the 10th highest 24-hour average FSP concentrations in the latest 5 years complied with the prevailing AQO. For RSP, non-compliance of the maximum 24-hour average concentrations were noted in Year 2016 to Year 2018 but the 10th highest values in Years 2016 to 2020 all complied with the prevailing AQO. Both annual average FSP and RSP concentrations, 10-minutes and 24-hour average SO₂, hourly and annual average NO₂ complied with prevailing AQOs. In general, the results showed that there was a decreasing trend in the pollutants levels in the past 5 years.

Table 3.2 Average Concentrations of Pollutants in the Recent Five Years (Year 2016 – 2020) at Sha Tin EPD Air Quality Monitoring Station

Pollutant	Averaging Time	Previous AQO ^[1]	Data Summary	Year ^[2]				
				2016	2017	2018	2019	2020
Fine Suspended Particulates (FSP)	24-hr	75 (9)	Max.	62	90	70	64	56
			10th Max.	44	54	40	39	32
			No. of Exceedance(s)	0	1	0	0	0
	Annual	35	-	20	21	19	17	15
Respirable Suspended Particulates (RSP)	24-hr	100 (9)	Max.	102	103	102	97	71
			10th Max.	66	72	65	60	54
			No. of Exceedance(s)	2	1	1	0	0
	Annual	50	-	29	31	32	28	25
Sulphur Dioxide (SO ₂)	10-min	500 (3)	Max.	83	73	80	35	36
			4th Max.	67	53	76	27	31
			24-hr	125 (3)	Max.	17	17	20
4th Max.	16	16			16	12	13	
No. of Exceedance(s)	0	0			0	0	0	
Nitrogen Dioxide (NO ₂)	1-hr	200 (18)	Max.	176	178	198	185	183
			19th Max.	137	144	149	150	136
			No. of Exceedance(s)	0	0	0	0	0
	Annual	40	-	38	34	35	32	28

Notes:

- [1] Previous AQOs, which is put in force since 1 January 2014, are referenced to evaluate past air quality conditions. Values in () mean the number of exceedances allowed per year.
- [2] Bolded values mean exceedance of the AQOs.
- [3] All concentration units are in microgram per cubic metre (µg/m³).

3.3.1.5 Apart from the air quality monitoring data, EPD has released a set of background air quality levels extracted from “Pollutants in the Atmosphere and their Transport over Hong Kong” (PATH) model (PATH v2.1) in July 2021. The PATH model Year 2025 data of the assessment area are summarised in **Table 3.3** below. The 19th highest 24-hour and annual average concentrations of FSP would comply with the new AQOs, and all other pollutants level would also comply with the new AQOs.

Table 3.3 Background Air Pollutants in Year 2025 Extracted from the PATH Model (PATH v2.1)

Pollutant	Averaging Time	Prevailing AQO ^[1]	Data Summary	PATH-2020 Grid in Year 2025 ^{[2][5]}					
				39,39	39,40	40,39	40,40	41,39	41,40
Fine Suspended Particulates (FSP) ^[4]	24-hr	50 (18)	Max.	69	67	70	67	67	68
			19th Max.	33	34	33	33	32	33
			No. of Exceedance(s)	7	7	7	7	6	7
	Annual	25	-	14	15	14	14	14	14
Respirable Suspended Particulates (RSP) ^[3]	24-hr	100 (9)	Max.	84	83	86	83	83	84
			10th Max.	62	62	61	62	62	61
			No. of Exceedance(s)	0	0	0	0	0	0
	Annual	50	-	26	27	26	26	26	26
Sulphur Dioxide (SO ₂)	10-min	500 (3)	Max.	54	55	47	55	45	47
			4th Max.	54	55	47	55	45	47
			No. of Exceedance(s)	0	0	0	0	0	0

Pollutant	Averaging Time	Prevailing AQO ^[1]	Data Summary	PATH-2020 Grid in Year 2025 ^{[2][5]}					
				39,39	39,40	40,39	40,40	41,39	41,40
	24-hr	50 (3)	Max.	16	16	15	15	14	15
			4th Max.	10	10	10	10	10	10
			No. of Exceedance(s)	0	0	0	0	0	0
Nitrogen Dioxide (NO ₂)	1-hr	200 (18)	Max	139	140	143	147	144	149
			19th Max.	96	95	95	89	93	93
			No. of Exceedance(s)	0	0	0	0	0	0
	Annual	40	-	16	15	17	15	17	17

Notes:

[1] New AQOs, which came into effect on 1 January 2022, are referenced to evaluate background air quality conditions. Values in () mean the number of exceedances allowed per year.

[2] **Bolded** values mean exceedance of the AQOs.

[3] Annual FSP concentration is adjusted by adding 3.5 µg/m³ with reference to Guidelines on Choice of Models and Model Parameters.

[4] 10th highest daily and annual RSP concentration is adjusted by adding 11.0 µg/m³ and 10.3 µg/m³ respectively with reference to "Guidelines on Choice of Models and Model Parameters".

[5] All concentration units are in microgram per cubic metre (µg/m³).

3.4 Identification of Air Sensitive Receivers

3.4.1.1 In accordance with Clause 3.4.4.2 of the EIA Study Brief, the assessment area is defined by a distance of 500m from the boundary of the Project boundary as illustrated in **Figure 3.1**.

3.4.1.2 For identification of the representative ASRs within the assessment area that would likely be affected by the potential impacts from the Project, a review has been conducted based on relevant available information including topographic maps, Outline Zoning Plans (OZPs) (such as the Approved Shatin OZP No. S/ST/36) and other published plans in the vicinity of the Project site. The representative ASRs are identified and summarised in **Table 3.4**.

Table 3.4 Representative Air Sensitive Receivers

ASR	Description	Land Use	No. of Storeys	Approximate Horizontal Distance from the Nearest Site Boundary (m)
<i>Existing Air Sensitive Receivers</i>				
A1	Temporary Accommodations	Residential	2	5
A2	Heung Fan Liu New Village	Residential	3	47
A3	Mei Tin Estate	Residential	40	21
A4	Granville Garden	Residential	28	15
A5	Mei Ying Court	Residential	27	16
A6	Park View Garden	Residential	27	27
A7	Tai Wai New Village	Residential	3	148
A8	Pui Kiu College	Educational Institution	7	235
A9	Mei Pak Court	Residential	32	20
A10	May Shing Court	Residential	35	11
A11	Mei Lam Commercial Centre	Shopping centre	3	6
A12	Peak One	Residential	6-15	164
A13	Peak House	Residential	3	58
A14	Village Houses at Tung Lo Wan Hill Road	Residential	3	172
A15	TWGHs Tsoi Wing Sing Primary School	Educational Institution	7	13
A16	Buddhist Wong Wan Tin College	Educational Institution	6	30
A17	The Great Hill	Residential	11	145

ASR	Description	Land Use	No. of Storeys	Approximate Horizontal Distance from the Nearest Site Boundary (m)
A18	Tung Lo Wan Village	Residential	3	96
A19	Low-rise Residential Developments at Tai Wai	Residential	3-5	14
A20	TWGHs Sin Chu Wan Primary School	Educational Institution	7	20
A21	Tai Wai Soccer Pitch	Recreational	-	15
A22	Industrial Buildings at Tai Wai	Industrial	7-11	16
A23	Tai Wai Playground	Recreational	-	11
A24	Man Lai Court	Residential	20	5
A25	Caritas Lok Jun School	Educational Institution	5	80
A26	Sha Tin (Tai Wai) Clinic	Clinic	2	320
A27	Ng Yuk Secondary School	Educational Institution	7	132
A28	San Tin Wai	Residential	3	157
A29	Che Kung Temple	Place of Public Worship	2	60
A30	Koon Ngam Ching Yuen	Place of Public Worship	1	166
<i>Planned Air Sensitive Receivers</i>				
AP1	Planned Comprehensive Development Area Next to Tai Wai Station	Residential	-	44
AP2	Joint-user Complex at Tsuen Nam Road, Tai Wai	Residential and institutional uses	-	11

3.5 Identification of Environmental Impacts

3.5.1 Construction Phase

3.5.1.1 The construction of the Project would commence in Q1 2024 and complete by Q4 2029. Referring to the tentative construction programme in **Appendix 2.2** and general layout plan in **Figure 2.2**, the Project site would be divided into six work sections for construction, Section 1 to Section 6. The locations of the six work sections are indicated in **Figure 3.1**. The main construction tasks of the Project include:

- A. Channel bed modification for Section 1 to 6;
- B. Improvement of existing walkways such as construction of viewing deck/pavilion, renovation of existing footbridges for Section 1 to 5 and demolition of existing footbridge in Sections 3 and 5, as well as improvement of riparian public open spaces (including construction of riparian walkway, water play features and UV Disinfection System, and visitor facilities) in Sections 2 to 4;
- C. Construction of dry weather flow interceptor (DWFI) system along the nullah and associated connection works to existing sewerage system for Section 1 (from north of Tsuen Nam Road near Tai Wai Soccer Pitch) to 5 & underground pumping facilities (including underground water pumps, water pipes, wet well and valve chamber) in Section 3 and underground water pipes (mainly housed within the DWFI system and to be constructed alongside construction of DWFI system) for Sections 3 to 6 for ecological enhancement associated water retention and supplement
- D. Landscape works along the bankside of nullah and utility works for Section 1 to 5
- E. Desilting at downstream tidal zone for Section 1

- 3.5.1.2 The construction works will be carried out section by section, from the downstream to upstream of each work section. Desilting works at downstream tidal zone would be conducted at the commencement and prior to the completion of the construction works to remove the silting accumulated at the nullah. Based on the preliminary engineering design, the maximum size of the active construction works area at any one time would not be longer than 100m along the nullah at each work area.
- 3.5.1.3 Construction dust is the major concern during construction of the Project. Fugitive dust generated from various construction activities, including excavation, demolition of existing footbridge, backfilling, and wind erosion of the excavated areas and stockpiles, would be major dusty activities which would impose potential dust impact on the air sensitive receivers in the vicinity.
- 3.5.1.4 The operation of powered mechanical equipment (PMEs) within the construction area and the construction vehicles for the transportation of materials would contribute to the gaseous emissions to the surrounding air.
- 3.5.1.5 Potential odour emission may be generated during the desilting works at downstream tidal zone/excavation of nullah bed and the transfer and disposal of desilted/excavated materials.

3.5.2 Operational Phase

- 3.5.2.1 The purpose of the Project is to revitalise the existing concrete-lined TWN into a green space to connect the community with nature. The beautification and vegetating of the existing nullah would bring positive influence on the surrounding environment. In view of the Project nature, adverse air quality impact due to the operation of the Project is not anticipated. With the implementation of DWFI system under the Project and treatment wetlands, the existing dry weather flows from drainage outlets along TWN would either be intercepted and diverted to the existing sewerage system for conveying to Shatin Sewage Treatment Works for treatment by the DWFI system, or be discharged into the treatment wetlands installed at drainage outlets for in-situ polishing. Furthermore, with the modification of channel bed downstream of TWN's low flow channel near its confluence with Shing Mun River near Man Lai Court, the excessive accumulation of silt brought by tidal influence due to the flat and uneven nullah bed in front of the broad-crested weir would be greatly reduced. With the abovementioned designs, it is expected that the odour nuisance of TWN would be alleviated due to the operation of the Project.
- 3.5.2.2 Similar to the existing practices by, regular maintenance works for the drainage and sewerage systems along TWN, including maintenance desilting at the nullah and minor maintenance to the DWFI system, would be carried out by the DSD to remove excessive silts, debris and obstruction to safeguard the hydraulic capacity of the nullah would be required. Maintenance desilting of the nullah would be carried out on an annual basis during dry season (November to March) when the water flow is low, except during emergency situations where the accumulated silt would adversely affect the hydraulic capacity of the nullah or where flooding risk is imminent, or when complaints on environmental nuisance associated with the accumulated silt are received. Minor maintenance to DWFI system would only be undertaken on an as-needed basis and frequent maintenance (i.e. monthly) would not be required. The maintenance practices and frequency would be similar to the existing maintenance works undertaken by the DSD. Minor odour impact from maintenance desilting works may arise, yet not concerning and would be well-controlled through good site practices.

3.6 Prediction and Evaluation of Environmental Impacts

3.6.1 Construction Phase

Fugitive Dust

- 3.6.1.1 The Project will be constructed in sections by sections. The construction works at the nullah will be divided into six sections and the construction activities will not be undertaken at the entire work site at the same time. The construction tasks for each work section would be completed before commencement of the similar construction tasks at another work section. As mentioned in **Section 3.5.1.2**, the maximum size of the active construction work area at any one time would not be longer than 100m along the nullah at each work area. Hence, the active exposed work site would be limited.

- 3.6.1.2 Various construction activities, including excavation, backfilling, material handling and wind erosion of the excavated areas and stockpiles would be the main sources of fugitive dust. The production of concrete would be conducted with the use of a concrete lorry mixer, therefore, adverse dust impact is not anticipated.
- 3.6.1.3 Referring to construction programme in **Appendix 2.2**, the construction duration at each work section is summarised in **Table 3.5**. The dusty works including the excavation works for the nullah bed per work section and demolition of two existing footbridges in Sections 3 and 5 would each only last for 1 month.

Table 3.5 Construction Duration at Each Work Section

ID	Main Construction Tasks	Main Construction Elements	Construction Duration at Work Section (month)					
			1	2	3	4	5	6
A-1	Channel Bed	Excavation	1	1	1	1	1	1
A-2	Modification	Re-surfacing and Greening of the Nullah	3	5	5	5	5	5
A-3		Construction of Energy Dissipation Structures at Upstream Section	-	-	-	-	-	2
B-1	Improvement of Existing Walkways and Riparian	Construction of Viewing Deck / Pavilion / Footbridges	1	3	3	3	3	-
B-2		Construction of Staircases and Ramps	2	3	3	3	3	-
B-3	Public Open Spaces	Construction of UV Disinfection System, Water Play Features, Toilet, and Management Office	-	3	3	3	-	-
B-4		Demolition of Existing Footbridge	-	-	1	-	1	-
C-1	Construction of Dry Weather Flow	Connection Work to the Existing Sewerage System	2	-	-	-	-	-
C-2	Interceptor & Recirculation	Construction of Dry Weather Flow Intercepting Channel and Pipe Laying along the Nullah	3	5	5	5	5	5
C-3	Pumping Facilities	Pumping Facilities & associated E&M Works	-	-	3	-	-	-
D-1	Landscaping and Miscellaneous	Landscaping / Greening of the Bankside along the Nullah	1	7	7	7	7	-
D-2		Utility Works	2	5	5	5	5	-
E-1	Desilting	Desilting at Downstream Tidal Zone	5	-	-	-	-	-

- 3.6.1.4 Due to the small amount of C&D materials to be disposed of off-site, the dust generated from construction vehicles for materials handling would generally be limited within the work areas. In accordance with the preliminary engineering information, for the inert C&D materials, it is proposed to dispose at Tseung Kwan O Area 137 Fill Bank for beneficial reuse in other projects via Lung Cheung Road and Kwun Tong Road or other approved PFRF. It is estimated that an average of about 1 truck trip per day would be required to dispose these materials off-site. For non-inert C&D materials, it is planned to deliver to NENT landfill via Tate's Cairn Highway, Territories Circular Road and Po Shek Wu Road or other approved landfills. It is estimated that an average of about 1 truck trip per day would be required. Considering the limited number of dump truck in operation together with tarpaulin covering of these dump trucks and washing the vehicle wheel and body before leaving the construction site, dust nuisance during transportation of the C&D materials would not be anticipated.
- 3.6.1.5 Given that the construction works of the Project would be of small-scale and confined in a smaller work area, small influence zone would be expected. With proper and effective implementation of good site practices and mitigation measures stipulated in the Air Pollution Control (Construction Dust) Regulation, dust emission from the construction works would be well controlled and minimised. No adverse construction dust impacts from the Project would therefore be anticipated.

Operation of PMEs

- 3.6.1.6 The fuel combustion from the use of PMEs during construction works could be a potential source of air pollutants such as PM, NO₂, SO₂ and CO. To improve air quality, Air Pollution Control (Fuel Restriction) Regulation and Air Pollution control (Non-road Mobile Machinery) (Emission) Regulation are introduced to regulate SO₂ emissions from commercial and industrial processes, and emissions from machines and non-road vehicles respectively. In

addition, all construction plants are required to use ultra-low-sulphur diesel (ULSD) (defined as diesel fuel containing not more than 0.005% sulphur by weight) as stipulated in Environment, Transport and Works Bureau Technical Circular (ETWB-TC(W)) No. 19/2005 on Environmental Management on Construction Sites.

- 3.6.1.7 The number and type of PMEs to be used on site for each main construction task under Sections 1 to 6 are presented in **Appendix 4.6**. According to the preliminary engineering design, while there would be several sub-group construction works under each main construction task, the construction periods of these sub-group works would not be overlapped. Therefore, the PMEs of each sub-group works/construction sequence would not be operated concurrently. Based on the construction programme presented in **Appendix 2.2** and the plant inventory attached in **Appendix 4.6**, there would be up to 4 concurrent construction tasks within 500m assessment for all work section - i.e. "Construction of Viewing Deck / Pavilion, Renovation of Existing Footbridges" (Group B-1), "Construction of Staircases and Ramps" (Group B-2) "Landscaping / Greening of the Bankside along the Nullah" (Group D-1) and "Utility Works" (Group D-2) for Sections 2 to 5 (limited to one month at each section), as well as "Construction of Staircases and Ramps" (Group B-2), "Pumping Facilities & associated E&M Works (Group C-3), "Landscaping / Greening of the Bankside along the Nullah" (Group D-1) and "Utility Works" (Group D-2) for Section 3 (limited to two months). There would be at most a total of 13 nos. NRMM in operation during the concurrent tasks. As the works are divided into small sections, the potential air quality impacts would be limited. With proper and effective implementation of the good practices as stated in the regulations, no significant dust and gaseous emission impacts from the use of PME would be anticipated.

Odour

- 3.6.1.8 Desilting works at downstream tidal zone would tentatively be undertaken at the commencement and prior to the completion of the construction works respectively to remove the accumulated silting and debris at the nullah. Each desilting works at downstream tidal would last for two months and is estimated to produce about 1,000m³ of desilted materials. Potential odour nuisance would be expected during desilting works. However, the desilted materials will be contained in watertight container on-site immediately and be transported off-site by trucks for disposal of at strategic landfill within one day. Therefore, the odour emissions are likely to be minimal and localised at a short duration.
- 3.6.1.9 Excavation of materials at the nullah bed at each work section will be carried out separately and the excavation on each work section would be last for one month. Potential odour nuisance might be resulted from these construction activities and transportation of these materials for disposal. However, the excavated materials would be well covered on-site with tarpaulin and located away from ASRs as far as possible and would be removed off-site as soon as possible within 24 hours. No adverse odour impact would be anticipated with the implementation of mitigation measures as stipulated in **Section 3.7**.
- 3.6.1.10 The desilted materials and excavated materials from the nullah bed would be enclosed during trucking, therefore, very minor odour nuisance would be expected during transportation of these materials for disposal.

Cumulative impacts from concurrent projects

- 3.6.1.11 As presented in **Section 2.8**, there are three concurrent projects which would potentially overlap with the construction of the Project is identified within the 500m assessment area, including (i) planned box culverts in Chui Tin Street under Drainage Improvement Works in Sha Tin and Sai Kung, (ii) Revised Trunk Road T4 and (iii) Joint-user complex at Tsuen Nam Road, Tai Wai. Based on the construction programme of the Project, the cumulative impacts from these concurrent projects have been considered.
- 3.6.1.12 The footprint of the planned box culverts in Chui Tin Street under "Drainage Improvement Works in Sha Tin and Sai Kung", which is scheduled to construct in 2023-2031, would partly overlap with the Project in the eastern end of the Project site at Shing Mun River Channel. Consider the comparatively small scale of the planned box culvert and site constraints of this concurrent project (e.g. works along and across existing carriageways), it is anticipated that the box culvert would need to be constructed in small sections and there would unlikely be extensive excavation works that its environmental impacts would be localised. Likewise, consider the small and confined scale of the works area of the construction works of this

Project, the construction dust impact is expected to be limited and well controlled with proper and effective implementation of good site practices and mitigation measures stipulated in the Air Pollution Control (Construction Dust) Regulation. Nonetheless, during the detailed design stage, the contractor of this Project should be requested to closely liaise the contractors of this potential concurrent project in planning the interfacing works properly to avoid /minimise repeated and concurrent heavy construction works. With such arrangement in place, cumulative construction environmental impacts could be further minimised and no adverse cumulative dust impact would be anticipated.

- 3.6.1.13 The footprint of Revised Trunk Road T4 would partly overlap with the Project in mid-stream TWN. Consider the small and confined scale of the works area of the construction works of this Project, the construction dust impact is expected to be limited and well controlled with proper and effective implementation of good site practices and mitigation measures stipulated in the Air Pollution Control (Construction Dust) Regulation. Based on the approved EIA of Revised Trunk Road T4 in Sha Tin (AEIAR-231/2021), in view that the most dusty construction works of the Revised Trunk Road T4 within the site area of overlapping with this Project would be the foundation works for the Revised Trunk Road T4 viaducts, the tentative construction programme and works at the interface area between the two projects could be arranged efficiently, e.g. scheduling works to be carried out during dry season, through close liaison between DSD's and CEDD's contractors of this Project and the concurrent project respectively in order to avoid construction works of respective works contracts to be carried out concurrently at the same interfacing areas and CEDD has agreed to include this requirement in the respective works contract. With such arrangement in place, cumulative construction environmental impacts, could be minimised.
- 3.6.1.14 For the "Joint-user complex at Tsuen Nam Road, Tai Wai", it is to build a joint-user complex at the existing site of the Tai Wai Playground at Tsuen Nam Road, Tai Wai to provide community facilities and public housing. The construction works are expected to commence in 2024 for completion in 2030 at the earliest but no detailed construction programme of the project is available at time of the preparation of this EIA Report. Consider the small and confined scale of the works area of the construction works of this Project, the construction dust impact is expected to be limited and well controlled with proper and effective implementation of good site practices and mitigation measures stipulated in the Air Pollution Control (Construction Dust) Regulation. During the detailed design stage, the contractor of this Project should be requested to closely liaise the contractors of this potential concurrent project in planning the interfacing works properly to minimise the potential cumulative impacts by avoiding/minimising repeated and concurrent heavy construction works.

3.6.2 Operational Phase

- 3.6.2.1 As mentioned in **Section 3.5.2.2**, similar to the existing practices by the DSD, regular maintenance works for the drainage and sewerage systems along TWN, including maintenance desilting at the nullah and minor maintenance to the DWF1 system, to remove excessive silts, debris and obstruction to safeguard the hydraulic capacity of the nullah would be required. Maintenance desilting of the nullah should be carried out on an annual basis during dry season (November to March) when the water flow is low, except during emergency situations where the accumulated silt would adversely affect the hydraulic capacity of the nullah or where flooding risk is imminent, or when complaints on environmental nuisance associated with the accumulated silt are received. Moderate siltation would generally be allowed to accumulate, and removal of excess silt would be carried out at locations where it would impede water flow. Maintenance works would also be undertaken for the DWF1 system on an as-needed basis and frequent maintenance (i.e. monthly) would not be required. The maintenance practices and frequency would be similar to the existing maintenance works undertaken by the DSD. Such small-scale maintenance would require only light mechanical equipment such as a small loader and/or a small crane truck. Hand-held equipment would be used for vegetation removal. Therefore, adverse impacts from dust and gaseous emission are not expected.
- 3.6.2.2 While the odour nuisance of TWN is anticipated to be alleviated with the implementation of DWF1 system under the Project and treatment wetlands to intercept / polish the polluted discharges from drainage outlets along the nullah, as well as with the modification of channel bed downstream of TWN's low flow channel near its confluence with Shing Mun River near Man Lai Court to improve the excessive accumulation of silt brought by tidal influence due to

the flat and uneven nullah bed in front of the broad-crested weir, desilted materials from the maintenance/desilting works may be found to be odorous when exposed to air. While minor odour impact may arise from maintenance/desilting works, the desilted materials will be properly covered with tarpaulin / contained in watertight container on-site immediately and be located as far away from the ASRs as possible and be transported off-site by trucks for disposal of at strategic landfill within one day. As such, any odour impact during the maintenance would be temporary and confined to the areas of maintenance works that it would be well-controlled through good site practices described in **Section 3.7**. No adverse odour impact would be anticipated.

3.7 Mitigation of Environmental Impacts

3.7.1 Construction Phase

3.7.1.1 Sufficient dust suppression measures as stipulated under the Air Pollution Control (Construction Dust) Regulation (Cap. 311R) and good site practices such as enclosing stockpiles of sand with three-side enclosure, covering the dusty materials with clean impervious sheet, water spraying of all access roads and site areas, and good house-keeping of the site should be properly implemented in order to minimise the construction dust generation. These measures include the followings:

- a) Use of regular watering, to reduce dust emissions from exposed site surfaces and unpaved roads particularly during dry weather;
- b) Use of frequent watering in particularly dusty construction areas close to ASRs;
- c) Use of frequent watering or water sprinklers for major haul roads, material stockpiling areas and other dusty activities within the construction site;
- d) Side enclosure and covering of any aggregate or dusty material storage piles to reduce emissions. Where this is not practicable owing to frequent usage, watering should be applied to aggregate fines;
- e) For the work sites close to the ASR with a separation distance less than 5m, provide hoardings of not less than 5m high from ground level along the site boundary; for the work sites close to the ASRs with a separation distance between 5m and 10 m, provide hoardings of not less than 3.5 m high from ground level along the site boundary; for other work sites, provide hoardings of not less than 2.4 m high from ground level along the site boundary except for site entrance or exit;
- f) Open temporary stockpiles should be avoided or covered. Prevent placing dusty material storage plies near ASRs;
- g) Tarpaulin covering of all dusty vehicle loads transported to, from and between site locations;
- h) Establishment and use of vehicle wheel and body washing facilities at the exit point of the site;
- i) Imposition of speed control for vehicles on unpaved site roads. 8 km/hr is the recommended limit;
- j) Routing of vehicles and positioning of construction plants should be at the maximum possible distance from ASRs;
- k) Avoid position of material stockpiling areas, major haul roads and dusty works within the construction site close to concerned ASRs;
- l) Avoid unnecessary exposed earth; and
- m) During or after the de-bagging process, the use of cement or dry pulverised fuel ash should be conducted in a totally enclosed system or facility and effective air pollution control measures should be placed at any exits or exhaust to avoid potential air quality influence.

3.7.1.2 Guidelines stipulated in EPD's Recommended Pollution Control Clauses for Construction Contracts should be incorporated in the contract documents to abate dust impacts. The clauses include:

- The Contractor shall observe and comply with the APCO and its subsidiary regulations, particularly the Air Pollution Control (Construction Dust) Regulation.
- The Contractor shall undertake at all times to prevent dust nuisance as a result of the construction activities.

- The Contractor shall ensure that there will be adequate water supply / storage for dust suppression.
 - The Contractor shall devise and arrange methods of working and carrying out the works in such a manner so as to minimise dust impacts on the surrounding environment, and shall provide experienced personnel with suitable training to ensure that these methods are implemented.
 - Before the commencement of any work, the Contractor may be required to submit the methods of working, plant, equipment and air pollution control system to be used on the site for the Engineer inspection and approval.
- 3.7.1.3 In order to minimise the exhaust emissions from NRMMS during construction phase, the requirements as stipulated in the Air Pollution Control (Non-road Mobile Machinery) (Emission) Regulation shall be followed. The following measures are also recommended to be implemented:
- Connect construction plant and equipment to mains electricity supply and avoid use of diesel generators and diesel-powered equipment;
 - Deploy electrified NRMMS as far as practicable; and
 - Use of exempted NRMMS not allowed.
- 3.7.1.4 The odorous materials from desilting works at downstream tidal zone / excavation at nullah bed should be contained in watertight container on-site and be transported off-site by trucks for disposal of at strategic landfill within one day. The materials from excavation at nullah bed should be well covered on site with tarpaulin and placed as far away from the ASRs as possible. These odorous materials should be removed off-site for disposal as soon as possible within 24 hours to avoid any odour nuisance. During transportation, these odorous materials on the trucks should be properly covered by tarpaulin sheets to minimise the release of any potential odour.
- 3.7.2 Operational Phase**
- 3.7.2.1 The temporary stockpile of desilted materials from maintenance works should be located as far away from the ASRs as possible. The desilted materials should be properly covered with tarpaulin / contained in watertight container on-site immediately and be removed off-site within 24 hours to avoid any odour nuisance arising.
- 3.8 Evaluation of Residual Impacts**
- 3.8.1 Construction Phase**
- 3.8.1.1 With proper and effective implementation of the good site practices and mitigation measures as stipulated in relevant Regulations and proposed in **Section 3.7**, no adverse residual air quality impact would be expected.
- 3.8.2 Operational Phase**
- 3.8.2.1 The air quality impacts induced by the small-scale maintenance would be well controlled and no adverse residual impact is anticipated from the operation of the Project with the implementation of the recommended mitigation measures and good construction site practice.
- 3.9 Environmental Monitoring and Audit**
- 3.9.1.1 No adverse air quality impact due to the construction of the Project would therefore be anticipated. Nonetheless, dust monitoring is recommended near mid-stream TWN (sections 2 to 4 of TWN) during construction phase to ascertain that there would be no adverse cumulative dust impacts at the nearby sensitive receivers due to this Project and the concurrent construction with the interfacing Revised Trunk Road T4, which site area overlaps with this Project. Regular weekly site environmental audit is also recommended to ensure the implementation of recommended mitigation measures during construction phase. Details of the monitoring and audit programme are contained in a stand-alone EM&A Manual. No EM&A programme is required during operational phase.

3.10 Conclusion

- 3.10.1.1 The potential air quality impacts arising from the construction of the Project would be related to fugitive dust emissions from construction works and gaseous emissions from the use of PME, and odour nuisance from desilted / excavated materials generated during the desilting at downstream tidal zone / excavation works in the nullah. In view of the small scale of the Project, the air quality impacts would be localised and minor, and would be well controlled through the implementation of good site practices and dust suppression measures stipulated in the Air Pollution Control (Construction Dust) Regulation as well as the proposed good site practices to minimise the exhaust emissions from NRMMs and odour nuisance from handling of desilting/excavated materials. Dust monitoring and regular weekly site audit are recommended to be carried out during construction phase in order to confirm that the mitigation measures are properly implemented and are working effectively. No adverse air quality impact due to the construction of the Project would therefore be anticipated.
- 3.10.1.2 No adverse air quality impact due to the operation of the Project would be anticipated. With the implementation of DWFI system and treatment wetlands under the Project the existing dry weather flows from drainage outlets along TWN would either be intercepted and diverted to the existing sewerage system for conveying to Shatin Sewage Treatment Works for treatment by the DWFI system, or be discharged into the treatment wetlands installed at drainage outlets for in-situ polishing. Furthermore, with the modification of channel bed downstream of TWN's low flow channel near its confluence with Shing Mun River near Man Lai Court, the excessive accumulation of silt brought by tidal influence due to the flat and uneven nullah bed in front of the broad-crested weir would be greatly reduced. The odour nuisance from TWN would be alleviated as a result of the operation of the Project. Any odour emission generated from exposed desilted materials during the routine maintenance works would be temporary and confined to the areas of maintenance works that it would be well-controlled through good site practices. No adverse air quality impact due to the operation of the Project would be anticipated.

4 NOISE IMPACT

4.1 Introduction

4.1.1.1 This section presents the assessment on potential noise impacts arising from construction and operation of the Project, which has been conducted in accordance with the criteria and guidelines as stated in Annexes 5 and 13 of the *Technical Memorandum on Environmental Impact Assessment Process* (EIAO-TM) as well as the requirements given in Clause 3.4.5 and Appendix C of the EIA Study Brief (No. ESB-320/2019).

4.2 Environmental Legislations, Standards and Guidelines

4.2.1.1 Noise impacts were assessed in accordance with the criteria and methodology given in the Technical Memoranda (TMs) issued under the *Noise Control Ordinance* (Cap. 400) (NCO) and Annexes 5 and 13 in the *EIAO-TM*.

4.2.1.2 The *NCO*, and *Environmental Impact Assessment Ordinance* (Cap. 499) (EIAO) provide the statutory framework for noise control. Assessment procedures and standards are set out in the following TMs:

- EIAO-TM
- Technical Memorandum on Noise from Construction Work other than Percussive Piling (GW-TM)
- Technical Memorandum on Noise from Construction Work in Designated Areas (DA-TM)
- Technical Memorandum for the Assessment of Noise from Places Other Than Domestic Premises, Public Places or Construction Sites (IND-TM)

4.2.1.3 The *NCO* provides the statutory framework for noise control of construction work, other than percussive piling, using powered mechanical equipment (PME) between the hours of 1900 and 0700 hours or at any time on Sundays and general holiday (i.e. restricted hours). Noise control on construction activities taking place at other times is subject to the "Noise Standards for Daytime Construction Activities" in Table 1B of Annex 5 in the *EIAO-TM*. The criteria are summarised in **Table 4.1**.

Table 4.1 Daytime Construction Noise Criteria

Uses	Daytime Noise Criteria, $L_{eq, 30min}$, dB(A)
Domestic premises, hotel, hostel	75
Educational Institution	70
Educational Institution (during examination)	65

Note: The above standards apply to uses which rely on opened windows for ventilation.

4.2.1.4 Based on the currently envisaged construction programme, no work will be required in restricted hours as defined under the *NCO*. In case of any construction activities during restricted hours, it is the contractor's responsibility to ensure compliance with the Construction Noise Permit (CNP) and the relevant TMs under the *NCO*. The contractor will be required to submit CNP application to the Noise Control Authority and abide by any conditions stated in the CNP, should one be issued. Regardless of the results of construction noise impact assessment in this EIA study, the Noise Control Authority will process Construction Noise Permit (CNP) application, if necessary, based on the *NCO*, the relevant technical memoranda issued under the *NCO*, and the contemporary conditions/situations.

4.2.1.5 For the noise from fixed sources or industrial activities, the IND-TM issued under *NCO* has stipulated appropriate Acceptable Noise Levels (ANLs) on the basis of an Area Sensitivity Rating that is based on the characteristics of the area within which the NSRs are located, such as rural, village, low-density residential, or urban. The presence of "Influencing Factors" (IFs), which include the Hong Kong International Airport, industrial area or major roads with an annual average daily traffic flow in excess of 30,000, can further affect the Area Sensitivity Ratings and hence the ANL as shown in **Table 4.2**.

Table 4.2 Area Sensitivity Ratings

Type of Area Containing NSR	Degree to which NSR is Affected by Influencing Factors		
	Not Affected	Indirectly Affected	Directly Affected
(i) Rural area, including country parks or village type developments	A	B	B
(ii) Low density residential area consisting of low-rise or isolated high-rise developments	A	B	C
(iii) Urban area	B	C	C
(iv) Area other than those above	B	B	C

- 4.2.1.6 According to the *IND-TM*, the ANLs for different Area Sensitivity Ratings during different periods are given in **Table 4.3** below.

Table 4.3 Acceptable Noise Level for Fixed Noise Sources

Time Period	Acceptable Noise Level (ANL) for Different Area Sensitivity Rating ($L_{eq\ 30min}$, dB(A))		
	ASR A	ASR B	ASR C
Day (0700 to 1900 hrs)	60	65	70
Evening (1900 to 2300 hrs)	60	65	70
Night (2300 to 0700 hrs)	50	55	60

- 4.2.1.7 The Project site is not located in rural area, low density residential area or urban area. The NSRs are considered located at (ii) low density residential area and (iv) area other than those above according to **Table 4.2**. The corresponding ANLs for noise sensitive façade are listed in **Table 4.3**.
- 4.2.1.8 The assessment area for the fixed plant noise impact assessment is defined by a distance of 300 m from the boundary of the proposed fixed noise source, i.e. the underground waterpump and UV disinfection system located beneath Shing Mun Tunnel Road by the bankside of mid-stream TWN. Areas to the southeast of the proposed fixed noise sources were occupied by industrial buildings / areas zoned as "Industrial" ("I") under the Approved Sha Tin Outline Zoning Plan (OZP) No. S/ST/36. The *IND-TM* has laid down the procedures for determining ASRs for NSRs in proximity to "industrial" zone i.e. Any NSR shall, irrespective of Table 1 of *IND-TM*, be assigned an ASR of "C" if it is within 100m of a zone designated as "Industrial" or "Industrial Estate" on a statutory Outline Zoning Plan, or an ASR of "B" if it is between 100m and 250m from such a zone, except in cases where Table 1 of *IND-TM* indicates an ASR of "C". Hence, Area Sensitivity Rating is assigned as "C" to Lin Fung House (NAP14) and Shing Ho Building (NAP15); and "B" to 1 Tung Lo Wan Village (NAP13), since they are located within 100m and between 100m and 250m from "Industrial" zone respectively according to the Approved Sha Tin OZP No. S/ST/36. For the other representative noise assessment points for fixed noise sources impact assessment, they have direct line of sight to Shing Mun Tunnel Road / Tai Po Road (Shatin Section) and would be directly affected by these roads. Based on the Annual Traffic Census published by TD, the annual average daily traffic (AADT) of those roads are more than 30,000 and is considered as an Influencing Factor (IF) according to the *TM*. An Area Sensitivity Rating of "C" is hence assigned to Mei Wai House (NAP8), Mei Yeung House, Mei Lam Estate (NAP9a & NAP9b), TWGHS Tsoi Wing Sing Primary School (NAP11) and Buddhist Wong Wan Tin College (NAP12) which are located in area other than rural area, low density residential area or urban area, as well as to the Peak House (NAP10) which belongs to low density residential area consisting of low-rise developments.
- 4.2.1.9 As stipulated in Annex 5 of the *EIAO-TM*, the noise standard for planning purposes for fixed noise source are (a) 5 dB(A) below the appropriate ANL shown in Table 3 of the *IND-TM*, or (b) the prevailing background noise levels (for quiet areas with level 5 dB(A) below the ANL).

In this regard, noise surveys in the vicinity of the representative NSRs were conducted in October 2021 and November 2021 to determine the background noise levels. The survey results were compared with the ANL-5 dB(A) criteria to determine the noise criteria to be adopted in this EIA Report. Locations of noise measurement points and measured background noise levels, as well as the assessment criteria for the proposed fixed noise sources of the Project, as adopted in this EIA Report, are presented in **Appendix 4.1**.

- 4.2.1.10 In any event, the Area Sensitivity Ratings assumed in this EIA Report are for indicative assessment only. It should be noted that fixed noise sources are controlled under Section 13 of the *NCO*. At the time of investigation, the Noise Control Authority shall determine noise impact from concerned fixed noise sources on the basis of prevailing legislation and practices being in force, and taking account of contemporary conditions / situation of adjoining land uses. Nothing in this EIA Report shall bind the Noise Control Authority in the context of law enforcement against all the fixed noise sources being assessed.

4.3 Description of Environment

- 4.3.1.1 The Project site located at the existing Tai Wai Nullah. The Project site is surrounded mainly by residential developments. Referring to the findings of the site visit, the existing dominant noise source in the assessment area is traffic noise from along Shing Mun Tunnel Road, Tai Po Road (Tai Wai), Tsing Sha Highway, Mei Tin Road, Heung Fan Liu Street and Pik Tin Street. Industrial fixed plant noise in the assessment area is insignificant.

4.4 Identification of Noise Sensitive Receivers

- 4.4.1.1 In accordance with Clause 3.4.5.2 of the EIA Study Brief (No. ESB-320/2019), the construction noise assessment area is defined by a distance of 300 m from the boundary of the Project whilst the fixed noise source assessment area is defined by a distance of 300 m from the boundary of the proposed fixed plant as illustrated in **Figure 4.1**.
- 4.4.1.2 Based on the finding of the site visit and review of latest information including topographic maps, OZPs (such as the Approved Sha Tin OZP No. S/ST/36) and other published plans in the vicinity of the Project site, all existing noise sensitive receivers (NSRs) within 300m area from Project boundary have been identified as summarised in **Table 4.4** and are shown in **Figure 4.1**. Selected NSRs were identified as representative Noise Assessment Points (NAP) quantitative noise impact assessment as detailed in **Section 4.4.1.3** and **Section 4.4.1.4** and their photographs are provided in **Appendix 4.2**.

Table 4.4 Noise Sensitive Receivers and Representative Noise Assessment Points

NSR ID	Description	Land Use	No. of Storeys	NAP ID	NAP Description	Quantitative Noise Impact Assessment ^[1]	
						Construction	Operation
N1	Heung Fan Liu New Village	Residential	3	NAP1	Temporary Accommodations	Yes	No
N2	Mei Tin Estate	Residential	40	NAP2a	Mei King House, Mei Tin Estate	Yes	No
				NAP2b	Mei Chuen House, Mei Tin Estate	Yes	No
N3	Mei Ying Court	Residential	27	NAP3	Mei Ying Court	Yes	No
N4	Pui Kiu College	Educational Institution	7	-	-	No	No
N5	Tai Wai New Village	Residential	3	-	-	No	No
N6	Granville Garden	Residential	28	NAP4	Tower 1, Granville Garden	Yes	No
N7	Park View Garden	Residential	27	NAP5	Block 2, Park View Garden	Yes	No
N8	Mei Pak Court	Residential	32	NAP6	Mei Pak Court	Yes	No
N9	Mei Chung Court	Residential	27-35	-	-	No	No
N10	Free Methodist Mei Lam Primary School	Educational institution	7	-	-	No	No
N11	Lock Tao Secondary School	Educational institution	6	-	-	No	No
N12	St. Margaret's Girls' College	Educational institution	6	-	-	No	No
N13	May Shing Court	Residential	34	NAP7	Kwai Shing House, May Shing Court	Yes	No
N14	Mei Wai House	Residential	35	NAP8	Mei Wai House	Yes	Yes
N15	Mei Lam Estate	Residential	18-28	NAP9a	Mei Yeung House, Mei Lam Estate (North Façade)	Yes	Yes
				NAP9b	Mei Yeung House, Mei Lam Estate (East Façade)	Yes	Yes
N16	TWGHs Tsoi Wing Sing Primary School	Educational institution	7	NAP11	TWGHs Tsoi Wing Sing Primary School	Yes	Yes
N17	Buddhist Wong Wan Tin College	Educational institution	6	NAP12	Buddhist Wong Wan Tin College	Yes	Yes
N18	Peak One	Residential	6-15	-	-	No	No
N19	Peak House	Residential	3	NAP10	Peak House	Yes	Yes
N20	Tung Lo Wan Village Extension	Residential	3	-	-	No	No
N21	The Salvation Army Bradbury Home of Loving Kindness	Home for the aged	3	-	-	No	No
N22	The Great Hill	Residential	2-13	-	-	No	No
N23	ELCHK Living Spirit Lutheran Church	Place of Public Worship	3	-	-	No	No
N24	Lutheran Kindergarten	Educational institution	2	-	-	No	No
N25	Tung Lo Wan Village	Residential	2-4	NAP13	Tung Lo Wan Village	Yes	Yes
N26	On Ting Terrace	Residential	3	-	-	No	No
N27	Shatin Public School	Educational institution	2	-	-	No	No

NSR ID	Description	Land Use	No. of Storeys	NAP ID	NAP Description	Quantitative Noise Impact Assessment ^[1]	
						Construction	Operation
N28	The Garrison	Residential	18	-	-	No	No
N29	Glamour Garden	Residential	24	-	-	No	No
N30	Grandeur Garden	Residential	16	-	-	No	No
N31	Residential along Chik Fai Street	Residential	5	-	-	No	No
N32	Residential along Tai Wai Road	Residential	10	-	-	No	No
N33	Residential along Chik Shun Street	Residential	2-5	-	-	No	No
N34	Kwai Wai Building at Chik Chuen Street	Residential	5	-	-	No	No
N35	Residential along Chik Chuen Street	Residential	3-5	NAP14	Lin Fung House	Yes	Yes
N36	Residential along Chik Fu Street	Residential	3-5	-	-	No	No
N37	Village Houses at Tai Wai	Residential	2-3	-	-	No	No
N38	Residential along Shing Ho Road	Residential	3	-	-	No	No
N39	Shing Ho Building	Residential	3	NAP15	Shing Ho Building	Yes	Yes
N40	TWGHs Sin Chu Wan Primary School	Educational institution	7	NAP16	TWGHs Sin Chu Wan Primary School	Yes	No
N41	Residential along Chik Fuk Street	Residential	4-5	-	-	No	No
N42	Sun Chui Estate	Residential	18-28	-	-	No	No
N43	San Tin Wai	Residential	3	-	-	No	No
N44	Che Kung Temple	Place of Public Worship	2	-	-	No	No
N45	Richmond Villa	Residential	3	-	-	No	No
N46	Lei Uk Tsuen	Residential	2-3	-	-	No	No
N47	Man Lai Court	Residential	20	NAP17	Man Lai Court	Yes	No
N48	Caritas Lok Jun School	Educational Institution	5	-	-	No	No
N49	Immaculate Heart of Mary School	Educational Institution	5	-	-	No	No
N50	Caritas Lok Jun School Hostel	Residential	3	-	-	No	No
N51	Caritas Institute of Community Education	Educational Institution	7	-	-	No	No
N52	St. Alfred's Church	Place of Public Worship	3	-	-	No	No
N53	Sha Tin Government Secondary School	Educational Institution	5	-	-	No	No
<i>Planned Noise Sensitive Receivers</i>							
NP1	Planned Comprehensive Development Area Next to Tai Wai Station	Residential	44	NAP18	Planned Comprehensive Development Area Next to Tai Wai Station	Yes	No

Note:

[1] The first layer of NSRs would provide acoustic shielding to those receivers at further distance behind. The predicted noise levels at the first layer of NSRs which rely on opened windows for ventilation represent the worst-case scenario, and therefore representative Noise Assessment Points (NAPs) at these NSRs were selected for quantitative noise impact assessment as detailed in **Section 4.4.1.3** and **Section 4.4.1.4**.

Construction Noise Impact

4.4.1.3 The construction noise criteria set in Annex 5 in the EIAO-TM only apply on uses which rely on opened windows for ventilation. The first layer of NSRs would provide acoustic shielding to those receivers at further distance behind. The predicted noise levels at the first layer of NSRs which rely on opened windows for ventilation represent the worst-case scenario, and therefore representative Noise Assessment Points (NAPs) at these NSRs were selected for construction noise impact assessment. The identified representative NAPs are summarised in **Table 4.5** and their locations are shown in **Figure 4.1**.

Table 4.5 Identified Representative Noise Assessment Points for Construction Noise Impact Assessment

NAP ID	Description	Land Use	No. of Storeys	Location of Selected Assessment Point	Approximate Horizontal Distance from the Nearest Site Boundary (m)	Daytime Noise Criterion (L _{eq, 30 mins} , dB(A)) ^[1]
NAP1	Temporary Accommodations	Residential	2	G/F	5	75
NAP2a	Mei King House, Mei Tin Estate	Residential	40	G/F	21	75
NAP2b	Mei Chuen House, Mei Tin Estate	Residential	40	G/F	21	75
NAP3	Mei Ying Court	Residential	27	G/F	20	75
NAP4	Tower 1, Granville Garden	Residential	28	G/F	15	75
NAP5	Block 2, Park View Garden	Residential	27	G/F	27	75
NAP6	Mei Pak Court	Residential	32	G/F	24	75
NAP7	Kwai Shing House, May Shing Court	Residential	35	G/F	11	75
NAP8	Mei Wai House	Residential	35	G/F	18	75
NAP9a	Mei Yeung House, Mei Lam Estate (North Façade)	Residential	20	G/F	17	75
NAP9b	Mei Yeung House, Mei Lam Estate (East Façade)	Residential	20	G/F	29	75
NAP10	Peak House	Residential	3	G/F	58	75
NAP11	TWGHs Tsoi Wing Sing Primary School	Educational Institution	7	G/F	13	70/65
NAP12	Buddhist Wong Wan Tin College	Educational Institution	6	G/F	27	70/65
NAP13	Tung Lo Wan Village	Residential	3	G/F	96	75
NAP14	Lin Fung House	Residential	3	G/F	14	75
NAP15	Shing Ho Building	Residential	5	G/F	15	75
NAP16	TWGHs Sin Chu Wan Primary School	Educational Institution	7	G/F	21	70/65
NAP17	Man Lai Court	Residential	20	G/F	5	75
NAP18	Planned Comprehensive Development Area Next to Tai Wai Station	Residential	-	G/F	44	75

Note:

[1] EIAO-TM noise criteria adopted: 75 dB(A) for residential dwelling; 70 dB(A) during normal school days / 65 dB(A) during examination period for educational institution.

Operation Noise Impact

4.4.1.4 The first layer of NSRs would provide acoustic shielding to those receivers at further distance behind. The predicted noise levels at the first layer of NSRs which rely on opened windows for ventilation represent the worst-case scenario, and therefore representative NAPs at these NSRs were selected for fixed noise sources impact assessment. The identified representative NAPs are summarised in **Table 4.6** and their locations are shown in **Figure 4.1**.

Table 4.6 Identified Representative Noise Assessment Points for Fixed Noise Sources Impact Assessment

NAP ID	Description	Land Use	No. of Storeys	Location of Selected Assessment Point	Approximate Horizontal Distance from Nearest Boundary (m)		Daytime & Evening Noise Criteria, dB(A) [1]
					UV Disinfection System	Underground Water Pumps	
NAP8	Mei Wai House	Residential	35	G/F	202	277	55
NAP9a	Mei Yeung House, Mei Lam Estate (North Façade)	Residential	20	G/F	136	200	55
NAP9b	Mei Yeung House, Mei Lam Estate (East Façade)	Residential	20	G/F	117	176	55
NAP10	Peak House	Residential	3	G/F	116	116	50
NAP11	TWGHs Tsoi Wing Sing Primary School	Educational Institution	7	G/F	58	114	55
NAP12	Buddhist Wong Wan Tin College	Educational Institution	6	G/F	70	87	55
NAP13	Tung Lo Wan Village	Residential	3	G/F	209	139	50
NAP14	Lin Fung House	Residential	3	G/F	197	138	55
NAP15	Shing Ho Building	Residential	3	G/F	263	201	55

Note:

- [1] The proposed UV disinfection system and underground water pumps would not operate during night-time (2300 – 0700 hours). Daytime / Evening criterion is therefore adopted.

4.5 Identification of Environmental Impacts**4.5.1 Construction Phase**

4.5.1.1 The main construction tasks of the Project include:

- (A) Channel bed modification for Sections 1 to 6;
- (B) Improvement of existing walkways such as construction of viewing deck/pavilion, renovation of existing footbridges for Section 1 to 5 and demolition of existing footbridge in Sections 3 and 5, as well as improvement of riparian public open spaces (including construction of riparian walkway, water play features and UV Disinfection System, and visitor facilities) in Sections 2 to 4;
- (C) Construction of dry weather flow interceptor (DWFI) system along the nullah and associated connection works to existing sewerage system for Sections 1 (from north of Tsuen Nam Road near Tai Wai Soccer Pitch) to 5 & underground pumping facilities (including underground water pumps, water pipes, wet well and valve chamber) in Section 3 and underground water pipes (mainly housed within the DWFI system and to be constructed alongside construction of DWFI system) for Sections 3 to 6 for ecological enhancement associated water retention and supplement
- (D) Landscape works along nullah bank and utility works for Sections 1 to 5
- (E) Desilting at downstream tidal zone for Section 1

4.5.1.2 The tentative construction programme, locations of the works of the Project as defined in the EIA and plant inventory provided by the Project Engineer for the construction noise impact assessment are presented in **Appendix 2.2**, **Appendix 4.2** and **Appendix 4.3** respectively. The feasibility and practicability of the plants adopted and their details for the assessment have been confirmed by the Project Engineer. Referring to construction programme, the Project site would be divided into six work sections, Section 1 to Section 6. The construction works will be carried out section by section, from the downstream to upstream of each work section. Based on the preliminary engineering design, the maximum size of the active construction works area at any one time would not be longer than 100m along the nullah at each work section. The construction tasks (A) to (D) would be undertaken on almost all work sections and completed before commencement of the similar construction tasks at another work section. The desilting works at downstream tidal

zone (Task E) would be carried out at Work Section 1 only. Therefore, the area of active work site is limited.

4.5.1.3 Potential source of noise impact arising from the construction of the Project would be the use of PME for various construction activities. No marine transportation of construction materials and waste is required. Based on the currently envisaged construction programme, works using PME during restricted hours (i.e. the hours from 1900 to 0700 hours or at any time on a general holiday) or percussive piling works would not be required. Excavation and lateral support (ELS) which would involve sheet-piling works would be required (**Appendix 4.3** refers). The PME required for sheet-piling has been included in the plant inventory for the construction noise impact assessment. Only impacts from daytime general construction activities have been assessed in this EIA Report. As only limited sheet-piling works would be involved in construction phase of the Project, potential ground-borne construction noise impact would not be anticipated.

4.5.1.4 Referring to **Table 2.2**, the planned box culverts proposed in Chui Tin Street under "Drainage Improvement Works in Sha Tin and Sai Kung", "Revised Trunk Road T4 in Sha Tin" and "Joint-user complex at Tsuen Nam Road, Tai Wai" would be located within 300m assessment area of this Project. Representative NSRs located within 300m assessment area of these concurrent projects include NAP8 to NAP18 for "Revised Trunk Road T4 in Sha Tin"; NAP14 to NAP18 for "Joint-user complex at Tsuen Nam Road, Tai Wai"; and NAP17 and NAP18 for the planned box culverts proposed in Chui Tin Street under "Drainage Improvement Works in Sha Tin and Sai Kung". Potential cumulative construction noise may be anticipated at these NSRs.

4.5.2 Operational Phase

4.5.2.1 During operational phase, fixed plant noise from the operation of the proposed underground waterpump and UV disinfection system located beneath Shing Mun Tunnel Road by the bankside of mid-stream TWN would be the major source of noise impacts based on the current design as described in **Section 2.3**.

4.6 Assessment Methodology

4.6.1 Construction Phase

4.6.1.1 The methodology for the construction noise impact assessment follows the procedures outlined in the *GW-TM*. The general approach is summarised below:

- Identify representative NSRs which would most likely be affected by the noise from the construction work;
- Determine the items of PME for each discrete construction activity, based on available information or agreed plant inventories;
- Assign sound power levels (SWLs) to the proposed PME according to the *GW-TM* or other sources;
- Calculate distance attenuation and screening effects to NSRs from notional noise source;
- Predict construction noise levels at NSRs in the absence of any mitigation measures;
- Consider cumulative impact from concurrent projects within 300 m of the NSRs, if any; and
- Compare the cumulative construction noise level against the corresponding noise criterion and propose suitable mitigation measures where necessary.

4.6.1.2 The assessment of construction noise was undertaken based on standard acoustic principles. SWLs of equipment were taken from Table 3 of the *GW-TM* and "Sound power levels of other commonly used PME" issued by EPD. Where no relevant SWL can be found in the *GW-TM* and other PME, reference is made to the information relating to Quality Powered Mechanical Equipment (QPME) available at EPD's website or PME specification published by equipment manufacturer. Groups of PME were assigned for various construction activities of the proposed Project. The Project Proponent has confirmed that the proposed plant inventories as being practical and adequate for completing the works within the scheduled timeframe.

4.6.1.3 The assessment was undertaken based on the assumption that all items of construction equipment would be located at a notional noise source point or probable source position where specific activity is to be performed. Referring to the preliminary engineering design, under each main construction task, only one sub-plant / sub-group in a construction task will be operating at the same time. The sound pressure level (SPL) of each construction task has been calculated, depending on the number of plant items involved, utilisation rate and the distance from the NSR. A positive 3 dB(A) façade correction has been added to the predicted noise levels to account for the façade effect at each assessment point. The noise levels at the NSRs have then been predicted by adding up the SPLs of all concurrent construction tasks from the Project and other concurrent projects identified during the EIA study within the 300m assessment area.

4.6.1.4 The unmitigated construction noise impacts at the identified NSRs have been predicted accordingly. Practicable direct noise mitigation measures including the use of quieter equipment, movable noise barriers and quieter alternative methods have been considered if exceedance of relevant noise standards is predicted. Appropriate correction factors for barrier effect have been adopted in accordance with Section 2.10 of the GW-TM. In cases where the mitigated noise levels still exceed the relevant criteria, the duration of noise exceedance would be estimated.

4.6.2 Operational Phase

4.6.2.1 During operational phase, fixed plant noise impact would arise from the operation of the underground waterpump and UV disinfection system located beneath Shing Mun Tunnel Road by the bankside of mid-stream TWN. The fixed plant noise impact was assessed in accordance with the IND-TM. The distance attenuation was estimated using the standard acoustic equation and a positive 3 dB(A) façade correction was added to the predicted noise levels to account for the façade effect at each noise assessment point.

4.6.2.2 Based on the current design information, the proposed underground water pumps (one on-duty and one standby) would be housed in an underground valve chamber and wet well. The on-duty equipment would not operate during night-time (i.e. 2300 – 0700 hours). The second pump will be served as a stand-by pump in case of pump fail / maintenance. The SWL of the fixed plants were referenced to engineering design information and manufacture's catalogue of plants of equivalent / similar specifications. The fixed plant / equipment inventory of the design at the time of preparation of this EIA is presented in **Appendix 4.5**. The equipment inventory has been confirmed with the Project Engineer. The noise performance of the proposed fixed plants would be reviewed during detailed design stage with due regard to the characteristics of tonality, impulsiveness and intermittency. If the noise exhibits characteristics of tonality, intermittency or impulsiveness during the detailed design or the commissioning of the plant, the SWL should be reduced in accordance with the recommendation given in Section 3.3 of IND-TM to ensure noise compliance at the NSRs. As the submersible pumps would be housed inside underground valve chamber and wet well below the nullah bed, a noise reduction of 20 dB(A) was applied to the noise levels generated by the equipment.

4.6.2.3 For the proposed UV disinfection system, since detailed design information and noise specification have yet to be confirmed, the maximum permissible noise emission levels (Max SWL), taking into account cumulative noise levels from the proposed underground water pumps, were determined for future detailed design of the fixed plant to ensure compliance with the relevant noise criteria. It is assumed that all the fixed plant within the same location would be operated simultaneously for the worst-case scenario. A positive 3 dB(A) is added to the predicted noise levels at the NSRs due to the façade effect. The following standard acoustic formula was used for calculating the Max SWL of the fixed plant.

$$SPL = \text{Max SWL} - DC + FC - BC + TC$$

Where:

SPL	Sound Pressure Level, in dB(A)
Max SWL	Maximum Permissible SWL, in dB(A)
DC	Distance Attenuation, in dB(A) (i.e. $20\log D + 8$ [where D is the distance in metres])
FC	Façade Correction, in dB(A) (i.e. 3 dB(A))
BC	Barrier Correction, in dB(A)
TC	Tonal correction, in dB(A)

4.6.2.4 If the noise exhibits characteristics of tonality, intermittency or impulsiveness during the detailed design or the commissioning of the plant, the SWL should be reduced in accordance with the recommendation given in Section 3.3 of IND-TM to ensure noise compliance at the NSRs.

4.7 Prediction and Evaluation of Environmental Impacts

4.7.1 Construction Phase

4.7.1.1 Under unmitigated scenario, exceedances of the construction noise criteria for residential uses and educational institution during daytime would be predicted. Details of the unmitigated construction noise assessment are presented in **Appendix 4.4** with the results summarised in **Table 4.7**.

Table 4.7 Summary of Unmitigated Construction Noise Levels

NAP ID	Description	Land Use	Daytime Noise Criterion, $L_{eq, 30 mins}$ dB(A) [1]	Predicted Unmitigated Maximum Construction Noise Levels, $L_{eq, 30 mins}$ dB(A) [2]	Max. Noise Exceedance, dB(A) [3]
NAP1	Temporary Accommodations	Residential	75	84	9
NAP2a	Mei King House, Mei Tin Estate	Residential	75	87	12
NAP2b	Mei Chuen House, Mei Tin Estate	Residential	75	87	12
NAP3	Mei Ying Court	Residential	75	86	11
NAP4	Tower 1, Granville Garden	Residential	75	88	13
NAP5	Block 2, Park View Garden	Residential	75	85	10
NAP6	Mei Pak Court	Residential	75	84	9
NAP7	Kwai Shing House, May Shing Court	Residential	75	83	8
NAP8	Mei Wai House	Residential	75	86	11
NAP9a	Mei Yeung House, Mei Lam Estate (North Façade)	Residential	75	90	15
NAP9b	Mei Yeung House, Mei Lam Estate (East Façade)	Residential	75	84	9
NAP10	Peak House	Residential	75	74	0
NAP11	TWGHs Tsoi Wing Sing Primary School	Educational Institution	70/65	82	12 / 17
NAP12	Buddhist Wong Wan Tin College	Educational Institution	70/65	81	11 / 16
NAP13	Tung Lo Wan Village	Residential	75	71	0
NAP14	Lin Fung House	Residential	75	82	7
NAP15	Shing Ho Building	Residential	75	82	7
NAP16	TWGHs Sin Chu Wan Primary School	Educational Institution	70/65	83	13 / 18
NAP17	Man Lai Court	Residential	75	85	10
NAP18	Planned Comprehensive Development Area Next to Tai Wai Station	Residential	75	76	1

Note:

- [1] EIAO-TM noise criteria adopted: 75 dB(A) for residential dwelling; 70 dB(A) during normal school days / 65 dB(A) during examination period for educational institution.
- [2] **Bolded** values indicate exceedance of EIAO-TM noise criteria of 75 dB(A) for residential dwellings, or 70 dB(A) for educational institution during normal school days; while underlined value indicates exceedance of EIAO-TM noise criteria of 65 dB(A) for educational institution during examination period.
- [3] For educational institution, "maximum noise exceedance for general school day / maximum noise exceedance during examination period".

4.7.1.2 The unmitigated maximum construction noise levels at the identified representative NSRs would range from 71 – 90 dB(A). Except for NAP10 and NAP13, all NAPs would exceed the relevant EIAO-TM daytime construction noise criteria. Mitigation measures are therefore required to alleviate the adverse construction noise impact from this Project.

4.7.1.3 The total number of dwellings, classrooms and other noise sensitive receivers that would be exposed to noise impacts exceeding the criteria set in Annex 5 in the EIAO-TM were evaluated and it is estimated that a total of about 4,622 dwellings and 74 classrooms will be exposed to construction noise impact exceeding the relevant criteria set in Annex 5 in the EIAO-TM under unmitigated scenario.

4.7.2 Operational Phase

4.7.2.1 The fixed plant noise levels from the normal operation of the proposed underground water pumps (i.e. operation of one duty pump only) installed near mid-stream of TWN were predicted by adopting the methodology in **Section 4.6.2**. The predicted fixed plant noise levels under unmitigated scenario are summarised in **Table 4.8** with details of the calculations given in **Appendix 4.5**.

Table 4.8 Summary of Predicted Fixed Plant Noise Levels from the Proposed Underground Pumps without Mitigation Measures

NAP ID	Description	Daytime / Evening Criterion, dB(A)	Predicted Fixed Plant Noise Level, $L_{eq\ 30-min}$ dB(A)
NAP8	Mei Wai House	55	11
NAP9a	Mei Yeung House, Mei Lam Estate (North Façade)	55	14
NAP9b	Mei Yeung House, Mei Lam Estate (East Façade)	55	15
NAP10	Peak House	50	19
NAP11	TWGHs Tsoi Wing Sing Primary School	55	19
NAP12	Buddhist Wong Wan Tin College	55	21
NAP13	Tung Lo Wan Village	50	17
NAP14	Lin Fung House	55	17
NAP15	Shing Ho Building	55	14

Note:

[1] The proposed underground water pumps would not operate during night-time (2300 – 0700 hours). Daytime / Evening criterion is therefore adopted.

4.7.2.2 For the proposed UV disinfection system, since detailed design information and noise specification have yet to be confirmed, the maximum permissible noise emission levels, taking into account cumulative noise levels from the proposed underground water pumps, were determined for future detailed design of the fixed plant to ensure compliance with the relevant noise criteria by adopting the methodology in **Section 4.6.2**. Same as the proposed underground water pumps, the proposed UV disinfection system would not operate during night-time (2300 – 0700 hours) and hence daytime / evening criterion is therefore adopted. The maximum permissible sound power levels (SWL) of the fixed noise sources of the Project for daytime / evening time have been presented in **Appendix 4.5**. Given that the proposed fixed plants are properly designed to meet the maximum permissible sound power level [i.e. 95 dB(A) for the fixed plants of the UV disinfection system], no adverse fixed plant noise impact would be anticipated.

4.8 Mitigation of Adverse Environmental Impacts

4.8.1 Construction Phase

4.8.1.1 The results of the construction noise assessment indicate that there would be exceedance of the construction noise criteria at most of NAPs in the absence of any mitigation measures. The various mitigation options listed below have thus been considered:

- Good site practices;

- Use of quality powered mechanical equipment (QPME) / quieter construction method; and
- Adoption of movable noise barriers / noise insulation fabric / noise enclosure

Good Site Practices

4.8.1.2 Although the noise mitigation effects are not easily quantifiable, and the benefits may vary with site conditions and operating conditions, good site practices are easy to implement and do not impact upon the works schedule. The site practices listed below should be followed during construction works:

- Only well-maintained PME to be operated on-site and should be serviced regularly during construction works;
- Silencers or mufflers on construction equipment should be utilised (if appropriate) and should be properly maintained during construction;
- Mobile plant, if any, should be sited as far away from NSRs as possible;
- Machines and plant (such as trucks) that may be in intermittent use should be shut down between work periods or should be throttled down to a minimum;
- Plant known to emit noise strongly in one direction should, wherever possible, be orientated to direct noise away from the nearby NSRs; and
- Material stockpiles and other structures should be effectively utilised, wherever practicable, in screening noise from on-site construction activities.

Use of QPME / Quieter Construction Method

4.8.1.3 The use of QPME is considered a practicable means to mitigate the construction noise impact. QPME is defined as a PME having actual SWL lower than the value specified in the *GW-TM*. The type of QPME adopted in this assessment is for reference only. The contractors may adopt alternative QPME as long as it can be demonstrated that they would not result in construction noise impacts worse than those predicted in this assessment.

4.8.1.4 Quieter construction methods are also adopted, including use of road ripper for concrete breaking, use of hydraulic crusher for demolition of footbridge and silent piling by press-in method an alternative of traditional sheet piling. A sheet pile is clipped and pressed under the ground. Noise can be minimised by press-in sheet piles with drilling simultaneously for piling works at harder ground. The noise impact can also be further reduced as the piling works can be completed within the shorter duration by using this method.

4.8.1.5 For the use of QPME / quieter construction methods associated with the construction works, reference has been made to QPME list available on the EPD website, which provides the SWLs for specific QPME or PME specification published by equipment manufacturer. The SWLs of QPME adopted for the assessment are listed in **Table 4.9**.

Table 4.9 SWL of Quiet PME Adopted for Construction Noise Mitigation

Plant / Equipment	Ref Code	SWL, dB(A)
Hand-held Percussive Breaker	EPD-04329	99
Excavator/loader, wheeled/tracked	EPD-09127	99
Roller, vibratory	EPD-10387	94
Crane, mobile/barge mounted (diesel)	EPD-08825	101
Giken Piler and Power-pack	-	94 ^[1]
Concrete crusher, excavator mounted	OCUPME-008	103
Road ripper, mini robot mounted	OCUPME-026	97

Note:

[1] The SWL is reference to the approved EIA report "Tsim Sha Tsui Station Northern Subway" (AEIAR-127/2008). For the sound pressure level at 7 m from equipment, see website link below.. https://www.epd.gov.hk/epd/misc/construction_noise/contents/index.php/en/home2/quieter-construction-equipment/item/27-press-in-method.html

Use of Movable Noise Barriers / Noise Insulation Fabric / Noise Enclosure

- 4.8.1.6 Movable noise barriers that can be placed close to the construction equipment and moved along with the PME are effective for screening noise from NSRs. A typical design which has been used locally is a wooden framed barrier with a cantilevered upper portion of superficial density no less than 14 kg/m² on a skid footing with 25mm thick internal sound absorptive lining. This measure is particularly effective for low level zone of NSRs. A longer cantilevered top cover would be required to achieve screening benefits at upper floors of NSRs. The Contractor shall be responsible for the design and actual position of the movable noise barriers with due consideration given to the position and size of the PME, and the requirement of intercepting the line-of-sight from the NSRs to the PME, as well as ensuring that the barriers should have no opening and gap. The direct line-of-sight between the PME and the NSRs should be totally screened by a substantial barrier such that the PME will not be visible when viewed from any window, door or other opening in any façade of the NSR. Reference shall be made to the EPD webpage¹ for the design of noise barrier. Subject to the work arrangement in construction stage, the Contractor may propose other form of mitigation measures to achieve the full compliance. It is anticipated that properly designed noise barriers would achieve a 5 dB(A) reduction for mobile PME and a 10 dB(A) reduction for static PME. Acoustic mat with surface mass of not less than 7kg/m² would be used for plant items such as piler and a 10 dB(A) noise reduction is anticipated. The use of full enclosure has been considered in this assessment to shelter relatively static plant including ventilation fan. This type of enclosure is expected to provide approximately 15 dB(A) noise reduction.
- 4.8.1.7 The use of movable noise barrier for various items of PME adopted for noise assessment and typical arrangement for typical noise barrier arrangement for mobile PME are detailed in **Appendix 4.6**. The feasibility and practicability of the proposed provision of typical and cantilevered movable noise barriers / noise insulation fabric / noise enclosure have been confirmed by the Project Engineer.

Mitigated Construction Noise Levels

- 4.8.1.8 Having taken into account the noise reduction achieved by the above-mentioned mitigation measures, the predicted noise impacts at the NAPs are summarised in **Table 4.10** and the detailed calculations are provided in **Appendix 4.7**.

Table 4.10 Summary of Mitigated Construction Noise Levels

NAP ID	Description	Land Use	Daytime Noise Criterion, L _{eq, 30 mins} , dB(A) ^[1]	Predicted Mitigated Maximum Construction Noise Levels, L _{eq, 30 mins} , dB(A) ^[2]	Predicted Mitigated Maximum Construction Noise Levels with Additional Mitigation Measure, L _{eq, 30 mins} , dB(A)
NAP1	Temporary Accommodations	Residential	75	62	NA
NAP2a	Mei King House, Mei Tin Estate	Residential	75	68	NA
NAP2b	Mei Chuen House, Mei Tin Estate	Residential	75	68	NA
NAP3	Mei Ying Court	Residential	75	67	NA
NAP4	Tower 1, Granville Garden	Residential	75	68	NA
NAP5	Block 2, Park View Garden	Residential	75	66	NA
NAP6	Mei Pak Court	Residential	75	64	NA
NAP7	Kwai Shing House, May Shing Court	Residential	75	68	NA
NAP8	Mei Wai House	Residential	75	71	NA
NAP9a	Mei Yeung House, Mei Lam Estate (North Façade)	Residential	75	71	NA

¹ https://www.epd.gov.hk/epd/misc/construction_noise/contents/index.php/en/road-works/item/74-mitigation-measures/157-construction-noise-barrier.html

NAP ID	Description	Land Use	Daytime Noise Criterion, $L_{eq, 30 \text{ mins}}, \text{dB(A)}$ [1]	Predicted Mitigated Maximum Construction Noise Levels, $L_{eq, 30 \text{ mins}}, \text{dB(A)}$ [2]	Predicted Mitigated Maximum Construction Noise Levels with Additional Mitigation Measure, $L_{eq, 30 \text{ mins}}, \text{dB(A)}$
NAP9b	Mei Yeung House, Mei Lam Estate (East Façade)	Residential	75	65	NA
NAP10	Peak House	Residential	75	55	NA
NAP11	TWGHs Tsoi Wing Sing Primary School	Educational Institution	70/65	<u>69</u>	69 (65 during examination period)
NAP12	Buddhist Wong Wan Tin College	Educational Institution	70/65	65	NA
NAP13	Tung Lo Wan Village	Residential	75	53	NA
NAP14	Lin Fung House	Residential	75	66	NA
NAP15	Shing Ho Building	Residential	75	67	NA
NAP16	TWGHs Sin Chu Wan Primary School	Educational Institution	70/65	<u>66</u>	66 (65 during examination period)
NAP17	Man Lai Court	Residential	75	64	NA
NAP18	Planned Comprehensive Development Area Next to Tai Wai Station	Residential	75	55	NA

Notes:

[1] EIAO-TM noise criteria adopted: 75 dB(A) for residential dwelling; 70 dB(A) during normal school days / 65 dB(A) during examination period for educational institution.

[2] Underlined value indicates exceedance of EIAO-TM noise criteria of 65 dB(A) for educational institution during examination period.

4.8.1.9 Based on the results in **Appendix 4.7**, the predicted construction noise levels arising from the Project at all NSRs selected for construction noise impact assessment would comply with the EIAO-TM daytime construction noise criteria, except during examination period of TWGHs Tsoi Wing Sing Primary School (NAP11) due to construction of dry weather flow intercepting channel and pipe laying along the nullah (Work Section 3, Group C-2) in November 2025 to March 2026, as well as of TWGHs Sin Chu Wan Primary School (NAP16) due to concurrent construction activities for construction of staircases and ramps (Work Section 1, Group B-2) and (connection work to the existing sewerage system (Work Section 1, Group C-1) in August to September 2024.

4.8.1.10 To further mitigate for the noise impact, the following construction restrictions during examination period of TWGHs Tsoi Wing Sing Primary School (NAP11) or TWGHs Sin Chu Wan Primary School (NAP16) are recommended:

- construction of dry weather flow intercepting channel and pipe laying along the nullah (Work Section 3, Group C-2) should not be undertaken within 30m from TWGHs Tsoi Wing Sing Primary School (NAP11) during examination period; and
- construction of staircases and ramps (Work Section 1, Group B-2) and (connection work to the existing sewerage system (Work Section 1, Group C-1) should not be undertaken concurrently within 30m from TWGHs Sin Chu Wan Primary School (NAP16) during examination period.

4.8.1.11 The recommended minimum separation distance between these construction activities and the schools during examination period has been confirmed by the Project Engineer to be suitable and practical for the construction programme. With the implementation of this additional mitigation measure, the predicted noise levels at NAP11 and NAP16 would comply with the EIAO-TM daytime construction noise criterion as summarised in **Table 4.10**. The detailed calculation with the implementation of this additional noise mitigation measure for NAP11 and NAP16 is presented in **Appendix 4.8**.

4.8.1.12 The results revealed that the construction noise levels from this Project at all NSRs would comply with the EIAO-TM daytime construction noise criteria after the implementation of the

proposed noise mitigation measures. No adverse impact would be anticipated at any existing and planned/committed NSRs within 300m from the Project works area.

Cumulative Construction Noise Impact from Concurrent Projects within 300m Assessment Area

- 4.8.1.13 As mentioned in **Section 4.5.1.4**, potential cumulative construction noise impacts from “Drainage Improvement Works in Sha Tin and Sai Kung” on NAP17 and NAP18, “Revised Trunk Road T4 in Sha Tin” on NAP8 to NAP17 and “Joint-user complex at Tsuen Nam Road, Tai Wai” on NAP14 to NAP18 would be anticipated.
- 4.8.1.14 The detailed construction programme and plant inventory for “Drainage Improvement Works in Sha Tin and Sai Kung” and “Joint-user complex at Tsuen Nam Road, Tai Wai” project are not available at the time of this EIA Study. Amongst the affected representative NSRs, NAP16 and NAP17 are located closest to “Joint-user complex at Tsuen Nam Road, Tai Wai” and “Drainage Improvement Works in Sha Tin and Sai Kung” respectively. Assuming that the construction noise impact from these concurrent projects would comply with the relevant noise criteria at these closest NSRs, maximum predicted cumulative construction noise levels at these representative NSRs are summarised **Table 4.11** as the worst-case scenario. Likewise, based on the detailed construction noise impact assessment in the approved EIA of Revised Trunk Road T4 in Sha Tin (AEIAR-231/2021), maximum predicted cumulative construction noise levels at with this concurrent project are presented **Table 4.11**. Details of the cumulative construction noise impact assessment are presented in **Appendix 4.9**.
- 4.8.1.15 Based on the results in **Appendix 4.9** and **Table 4.11**, the maximum predicted cumulative noise levels arising from the Project at all NSRs selected for construction noise impact assessment would comply with the EIAO-TM daytime construction noise criteria, except at Buddhist Wong Wan Tin College (NAP12) during examination period due to concurrent construction of this Project and Revised Trunk Road T4 during December 2025 to February 2026; as well as at TWGHs Sin Chu Wan Primary School (NAP16) during examination period of due to concurrent construction of this Project and Joint-user complex at Tsuen Nam Road, Tai Wai during January 2024 to April 2024 and July 2024 to October 2024.
- 4.8.1.16 It is anticipated that the most noisy construction works of these two concurrent projects would be the foundation works for the T4 viaducts with reference to the approved EIA of Revised Trunk Road T4 in Sha Tin (AEIAR-231/2021) and foundation works for Joint-user complex at Tsuen Nam Road, Tai Wai. As described in **Section 4.5.1.2**, the area of active work site of this Project would be limited and not be longer than 100m along the nullah at each work section. As such, the tentative construction programme and works at the interface area between the Project and these projects could be arranged efficiently through close liaison between the contractors to avoid construction works of respective works contracts to be carried out concurrently at the same interfacing areas during the examination period. Concurrent construction of this Project with Revised Trunk Road T4 should avoid examination period of Buddhist Wong Wan Tin College (NAP12) between December 2025 and February 2026; whilst concurrent construction of this Project with Joint-user Complex at Tsuen Nam Road, Tai Wai should avoid examination period of TWGHs Sin Chu Wan Primary School (NAP16) from January 2024 to April 2024 and July 2024 to October 2024. The Contractor should keep close communication with the operators of these schools to obtain the updated schedule of examination at the time of conducting the relevant construction works.

Table 4.11 Summary of Cumulative Construction Noise Levels with Concurrent Projects

NAP	Description	Land Use	Daytime Noise Criterion, $L_{eq, 30 mins}$, dB(A) ^[1]	Predicted Maximum Noise Level with Mitigation Measures from the Project	Cumulative Noise Impacts Considered			Maximum Cumulative Noise Levels with Concurrent Projects, dB(A) ^[4]
					Joint-user complex at Tsuen Nam Road, Tai Wai ^[2]	Drainage Improvement Works in Sha Tin and Sai Kung ^[2]	Revised Trunk Road T4 ^[3]	
NAP8	Mei Wai House	Residential	75	71	✗	✗	✓	71
NAP9a	Mei Yeung House, Mei Lam Estate (North Façade)	Residential	75	71	✗	✗	✓	71
NAP9b	Mei Yeung House, Mei Lam Estate (East Façade)	Residential	75	65	✗	✗	✓	65
NAP10	Peak House	Residential	75	55	✗	✗	✓	64
NAP11	TWGHs Tsoi Wing Sing Primary School	Educational Institution	70/65	69 (65 during examination period)	✗	✗	✓	69 (65 during examination period)
NAP12	Buddhist Wong Wan Tin College	Educational Institution	70/65	65	✗	✗	✓	66 (66 during examination period)
NAP13	Tung Lo Wan Village	Residential	75	53	✗	✗	✓	63
NAP14	Lin Fung House	Residential	75	66	✓	✗	✓	69
NAP15	Shing Ho Building	Residential	75	67	✓	✗	✓	69
NAP16	TWGHs Sin Chu Wan Primary School	Educational Institution	70/65	66 (65 during examination period)	✓	✗	✓	69 (68 during examination period)
NAP17	Man Lai Court	Residential	75	64	✓	✓	✓	75
NAP18	Planned Comprehensive Development Area Next to Tai Wai Station	Residential	75	55	✓	✓	✓	75

Note:

N/A NAPs outside 300m from concurrent Project were not assessed.

[1] EIAO-TM noise criteria adopted: 75 dB(A) for residential dwelling; 70 dB(A) during normal school days / 65 dB(A) during examination period for educational institution.

[2] Amongst the affected representative NSRs, NAP16 and NAP17 are located closest to “Joint-user complex at Tsuen Nam Road, Tai Wai” and “Drainage Improvement Works in Sha Tin and Sai Kung” respectively. As the noise levels are not available for the two projects, it is assumed that the construction noise impact from these concurrent projects would comply with the relevant noise criteria at these closest NSRs.

[3] Cumulative construction noise impact assessment based on the detailed construction noise impact assessment in the approved EIA of Revised Trunk Road T4 in Sha Tin (AEIAR-231/2021).

[4] Details of the cumulative construction noise impact assessment are presented in **Appendix 4.9**.

4.8.1.17 With the implementation of the above recommended mitigation measures, the mitigated cumulative construction noise levels from the Project and nearby concurrent project at all representative NSRs would fulfil relevant noise control standards stipulated under Annex 5 of EIAO-TM. A construction noise management plan, which to verify the inventory of noise sources, and to assess the effectiveness and practicality of all identified measures for mitigating the construction noise impact of the project (including the use of quieter construction methods such as road ripper for concrete breaking, hydraulic crusher for demolition and silent piling by press-in method for sheet piles, etc., quieter powered mechanical equipment, noise barriers and noise enclosures as recommended in **Section 4.8.1**), would be prepared before commencement of construction works.

4.8.2 Operational Phase

4.8.2.1 As shown in **Table 4.8**, all the predicted fixed plant noise levels at the representative NSRs due to the operation of the proposed underground water pumps would comply with the fixed plant noise criteria. Likewise, provided that the fixed plants of the proposed UV disinfection system are properly designed to meet the maximum permissible SWL, no operational phase noise impacts would be anticipated. Nonetheless, the following best practices should be implemented as far as practicable to further minimise any potential impacts:

- Quieter plant should be chosen as far as practicable;
- Include noise levels specification when ordering new plant items;
- Locate fixed plant / louvres away from any NSRs as far as practicable;
- Locate fixed plant in walled plant rooms or in specially designed enclosures;
- Install direct noise mitigation measures including silencers, acoustic louvres and acoustic enclosure where necessary; and
- Develop and implement a regularly scheduled plant maintenance programme so that plant items are properly operated and serviced. The programme should be implemented by properly trained personnel.

4.9 Evaluation of Residual Impacts

4.9.1 Construction Phase

4.9.1.1 With the implementation of the recommended noise mitigation measures, construction noise levels at all representative NSRs would comply with *EIAO-TM* daytime construction noise criteria. No residual construction noise impact is anticipated.

4.9.2 Operational Phase

4.9.2.1 No residual noise impact is anticipated during the operational phase of the Project.

4.10 Environmental Monitoring and Audit

4.10.1.1 Noise monitoring is recommended as part of the environmental monitoring and audit (EM&A) programme for the construction phase of the Project to check compliance with the daytime construction noise criteria. A construction noise management plan, which to verify the inventory of noise sources, and to assess the effectiveness and practicality of all identified measures for mitigating the construction noise impact of the project, would be prepared before the commencement of construction works. Weekly site audit is also recommend to ensure the proper implementation of the recommended mitigation measures for daytime construction activities as part of the EM&A programme. Details of the EM&A requirements are provided in the EM&A Manual.

4.10.1.2 No adverse fixed plant noise impact is anticipated during the operation of the underground waterpump and UV disinfection system located beneath Shing Mun Tunnel Road by the bankside of mid-stream TWN. Commissioning tests should be conducted prior to operation of the Project to ensure fixed plant noise impact would comply with the relevant noise standards. No operational noise monitoring is therefore deemed necessary.

4.11 Conclusion

- 4.11.1.1 The assessment for the potential construction noise impact from the Project has been conducted. The assessment result indicated that the mitigated cumulative noise levels at all NSRs would comply with the noise criteria set out in the EIAO-TM with proper implementation of the proposed mitigation measures. No adverse noise impact would be anticipated during construction phase of the Project.
- 4.11.1.2 The noise impact associated with the operation of the Project has been assessed based on the plant inventory provided by the Project Engineer at the time of the assessment. Maximum allowable sound power levels for the fixed noise sources of the Project have been determined. The assessment result indicated that the predicted fixed plant noise levels at all representative NSRs would comply with the noise criteria. No adverse noise impact is anticipated during operational phase of the Project. Commissioning tests should be conducted prior to operation of the Project to ensure that the fixed plant noise impact would comply with the relevant noise standards.

5 WATER QUALITY IMPACT

5.1 Introduction

5.1.1.1 This section presents the assessment on potential water quality impacts arising from construction and operation of the Project, which has been conducted in accordance with the criteria and guidelines as stated in Annexes 6 and 14 of the *Technical Memorandum on Environmental Impact Assessment Process* (EIAO-TM) as well as the requirements given in Clause 3.4.6 and Appendix D of the EIA Study Brief (No. ESB-320/2019).

5.2 Environmental Legislations, Standards and Guidelines

5.2.1 Environmental Impact Assessment Ordinance (EIAO)

5.2.1.1 Technical Memorandum on Environmental Impact Assessment Process (EIAO-TM) was issued by EPD under Section 16 of the EIAO. The EIAO-TM specifies assessment methodologies and criteria that are to be followed in an EIA Study. Sections relevant to water quality impact assessment comprise:

- Annex 6 – Criteria for Evaluating Water Pollution
- Annex 14 – Guidelines for Assessment of Water Pollution

5.2.2 Water Quality Objectives (WQOs)

5.2.2.1 The Water Pollution Control Ordinance (WPCO) provides the major statutory framework for the protection and control of water quality in Hong Kong. According to the Ordinance and its subsidiary legislation, Hong Kong waters are divided into ten Water Control Zones (WCZs). Corresponding statements of Water Quality Objectives (WQOs) are stipulated for different water regimes (marine waters, inland waters, bathing beaches subzones, secondary contact recreation subzones and fish culture subzones) in each WCZ based on their beneficial uses. WQOs for the watercourses in Tolo Harbour and Channel WCZ relevant to this assessment are listed in **Table 5.1**.

Table 5.1 Summary of Water Quality Objectives for Watercourses in Tolo Harbour and Channel WCZ

Parameters	Criteria	Subzone
Aesthetic Appearance	Waste discharges shall not cause the water to contain substances that settle to form objectionable deposits;	Whole Zone
	Waste discharges shall not cause the water to contain substances that float as debris, scum, oil or other matter to form nuisances;	
	Waste discharges shall not cause water to contain substances that produce objectionable colour, odours, taste or turbidity;	
	Waste discharges shall not cause water to contain substances that injure or are toxic or produce adverse physiological responses in humans, animals or plants; or	
	Waste discharges shall not cause water to contain substances that are conducive to undesirable aquatic life or a nuisance to aquatic life.	
<i>E. coli</i>	Should not exceed 1000 cfu per 100 mL, calculated as the running median of the most recent 5 consecutive samples taken at intervals of between 7 and 21 days.	Inland Waters in Shing Mun (A, C, D, E, H, I) subzones, Tai Po (B, C) subzones and other watercourses.
	Should not exceed 0 cfu per 100 mL, calculated as the running median of the most recent 5 consecutive samples taken at intervals of between 7 and 21 days.	Inland Waters in Shing Mun (B, F, G) subzones, Lam Tsuen (C, D) subzones and Tai Po subzone A.
Colour	Waste discharge shall not cause the colour of water to exceed 30 Hazen units.	Inland Waters in Shing Mun (B, F, G) subzones, Lam Tsuen (C, D) subzones and Tai Po subzone A.
	Waste discharge shall not cause the colour of water to exceed 50 Hazen units.	Inland Waters in Shing Mun (A, C, D, E, H, I) subzones, Tai Po (B, C) subzones and other watercourses.

Parameters	Criteria	Subzone
pH	To be in the range of 6.0 – 9.0	Inland Waters in Shing Mun (D, E, I) subzones and other watercourses.
	To be in the range of 6.5 – 8.5	Inland Waters in Shing Mun (A, B, C, F, G, H) subzones, Lam Tsuen (C, D) subzones and Tai Po (A, B, C) subzones.
Temperature	Not to exceed ± 2 °C daily temperature range due to waste discharge	Whole Zone
Suspended solids (SS)	Waste discharges shall not cause the annual median of suspended solids to exceed 25 milligrams per litre.	Inland Waters in Shing Mun (D, E, I) subzones and other watercourses.
	Waste discharges shall not cause the annual median of suspended solids to exceed 20 milligrams per litre.	Inland Waters in Shing Mun (A, B, C, F, G, H) subzones, Lam Tsuen (C, D) subzones and Tai Po (A, B, C) subzones.
Dissolve Oxygen (DO)	Not less than 4 mg/L or 40% saturation at any time.	Whole Zone
5-day biochemical oxygen demand (BOD ₅)	Waste discharges shall not cause the 5-day biochemical oxygen demand to exceed 5 milligrams per litre.	Inland Waters in Shing Mun (A, C, D, E, H, I) subzones, Tai Po (B, C) subzones and other watercourses
	Waste discharges shall not cause the 5-day biochemical oxygen demand to exceed 3 milligrams per litre.	Inland Waters in Shing Mun (B, F, G) subzones, Lam Tsuen (C, D) subzones and Tai Po subzone A.
Chemical oxygen demand (COD)	Waste discharges shall not cause the chemical oxygen demand to exceed 15 milligrams per litre.	Inland Waters in Shing Mun (B, F, G) subzones, Lam Tsuen (C, D) subzones and Tai Po subzone A.
	Waste discharges shall not cause the chemical oxygen demand to exceed 30 milligrams per litre.	Inland Waters in Shing Mun (A, C, D, E, H, I) subzones, Tai Po (B, C) subzones and other watercourses
Ammoniacal nitrogen	The un-ionised ammoniacal nitrogen level should not be more than 0.5 milligram per litre at any time.	Whole Zone
Toxins	Waste discharges shall not cause the toxicants in water to attain such a level as to produce significant toxic effects in humans, fish or any other aquatic organisms, with due regard to biologically cumulative effects in food chains and to toxicant interactions with each other.	Whole Zone

Source: Statement of Water Quality Objectives for Watercourses (Tolo Harbour and Channel Water Control Zone)

5.2.3 Water Supplies Department Water Quality Criteria for Flushing Water Intakes

5.2.3.1 The Water Supplies Department (WSD) has specified a set of target seawater quality objectives for their flushing water intakes. The list is shown in **Table 5.2** below. These target objectives will be applied at the points of seawater abstraction along the coastlines of Tolo Harbour for flushing purpose.

Table 5.2 WSD's Target Seawater Quality Objectives at Flushing Water Intakes

Parameter (in mg/L unless otherwise stated)	WSD's Target Water Quality Limit at Flushing Water Intake
Colour (Hazen Unit)	< 20
Turbidity (NTU)	< 10
Threshold Odour Number (odour unit)	< 100
Ammonia Nitrogen (NH ₃ -N)	< 1
Suspended Solids (SS)	< 10
Dissolved Oxygen (DO)	> 2
Biochemical Oxygen Demand (BOD)	< 10
Synthetic Detergents	< 5
<i>E. coli</i> (no./100mL)	< 20,000

5.2.4 Technical Memorandum on Effluent Discharge Standard (TM-DSS)

5.2.4.1 Discharge of effluents is subject to control under the WPCO. The "*Technical Memorandum on Standards for Effluents Discharged into Drainage and Sewerage Systems, Inland and Coastal Waters*" (TM-DSS) gives guidance on the permissible effluent discharges based on the type of receiving waters (foul sewers, storm water drains, inland and coastal waters). The standards control the physical, chemical and microbial quality of effluents. Any sewage from the proposed construction and operation activities must comply with the standards for effluents discharged into the foul sewers, inland waters and coastal waters of Tolo Harbour and Channel WCZ, as stipulated in the TM-DSS.

5.2.5 Professional Persons Environmental Consultative Committee Practice Notes (ProPECC PNs)

5.2.5.1 A "*Professional Persons Environmental Consultative Committee Practice Note*" (ProPECC PN) was issued by the EPD to provide guidelines for handling and disposal of construction site discharges in order to control site runoff and wastewater generated during the construction phase of the Project. Practices given in the ProPECC PN 1/94 should be followed as far as possible during construction to minimise the water quality impact due to construction site drainage. The ProPECC PN 1/94 provides good practice guidelines for dealing with various types of discharge from construction sites.

5.2.5.2 The ProPECC PN 5/93 "*Drainage Plans subject to Comments by Environmental Protection Department*" provides guidelines and practices for handling, treatment and disposal of various effluent discharges to stormwater drains and foul sewers. The design of site drainage and disposal of various site effluents generated within the new development area should follow the relevant guidelines and practices as given in the ProPECC PN 5/93.

5.2.6 Hong Kong Planning Standards and Guidelines (HKPSG)

5.2.6.1 The Hong Kong Planning Standards and Guidelines (HKPSG), Chapter 9 (Environment), provides additional guidelines against water pollution for sensitive uses such as aquaculture and fisheries zones, bathing waters and other contact recreational waters.

5.2.7 ETWB Technical Circular (Works) No. 5/2005 Protection of Natural Streams/Rivers from Adverse Impacts Arising from Construction Works

5.2.7.1 Environment, Transport and Works Bureau (ETWB) Technical Circular (Works) [ETWB TC(Works)] No. 5/2005 "*Protection of natural streams / rivers from adverse impacts arising from construction works*" provides an administrative framework to better protect all natural streams/rivers from the impacts of construction works. The procedures promulgated under this Circular aim to clarify and strengthen existing measures for protection of natural streams/rivers from government projects and private developments. The guidelines and precautionary mitigation measures given in the ETWB TC (Works) No. 5/2005 should be followed as far as possible to protect the inland watercourse at or near the Project area during the construction phase.

5.2.8 Drainage Services Department Practice Note No. 3/2021 Guidelines on Design for Revitalisation of River Channel

5.2.8.1 Drainage Services Department (DSD) Practice Note (PN) No. 3/2021 "Guidelines on Design for Revitalisation of River Channel" presents the essential environmental, ecological, and social considerations that should be taken into account in the design of river channels. It presents the Water Quality Goals for the designated water uses of the revitalised water bodies, which are classified into 3 types of designated uses (**Table 5.3** refers). The revitalised TWN belongs to Type 1 of designated use as the water body would not be opened for public access or physical contact due to safety reasons as described in **Section 2**. Water Quality Goals (WQGs) for Type 3 designated use is applicable for the proposed water play features in the riparian amenity area. A more stringent treatment standard for *E. coli* will be adopted, i.e. non-detectable in cfu/100 mL, calculated as the geometric mean of all samples collected in one calendar year) in the treated water (**Section 5.7.2.7** refers) for the proposed water play features that in addition to fulfilling the relevant WQGs for Type 3 designated water uses to enhance the environmental performance of the revitalisation design. Grey water reuse or rainwater harvesting has not been proposed under this Project.

Table 5.3 DSD's Water Quality Goals for Revitalisation of Water Bodies based on Designated Water Uses

Type	Designated Use	Description	Example of Water Friendly Activities	Water Quality Goals
1	Aquatic Life and Aesthetic Value (including public access to the river but primary / secondary contact to river water is not allowed)	Water provides a suitable condition for propagation of aquatic life. Also, the water quality shall be of acceptable odour and appearance to the public who participate in water friendliness activities	Riverside walkway Public is allowed to access riverbed and stay close to the water body, but direct contact of the water is not recommended	1) WQOs of the corresponding WCZ 2) No objectionable odour
2	Secondary Contact Recreation	Water supports recreational activities, such as boating and paddling, that may involve limited contact with water with no significant risk of water ingestion	Boating, canoeing, rowing	1) WQOs of the corresponding WCZ 2) Geometric mean <i>E.coli</i> ** ≤ 610 counts/100mL 3) No objectionable odour
3	Primary Contact Recreation	Water is likely come in full body contact and/or incidental water ingestion	Water play zone, interactive fountains, splash pad	1) WQOs of the corresponding WCZ 2) Geometric mean <i>E.coli</i> ** ≤ 180 counts/100mL 3) No objectionable odour

Notes:

* For types 1 and 2, if treated grey water/harvested rainwater (from sources like roofs of buildings, permeable/non-permeable road pavement and surface runoff from hard/soft landscaped areas) is used to replenish the river, reference might be made to Technical Specifications on Grey Water Reuse and Rainwater Harvesting to specify the water quality.

** WQO of *E.coli* under WPCO is calculated as annual geometric mean.

5.3 Description of Environment

5.3.1 Assessment Area

5.3.1.1 In accordance with Clause 3.4.6.2 of the EIA Study Brief (No. ESB-320/2019), the assessment area for this water quality impact assessment includes areas within 500 m from the boundary of the Project and covers Shing Mun River, Tolo Harbour and Channel Water Control Zone (WCZ) as designated under the Water Pollution Control Ordinance (WPCO).

5.3.1.2 The baseline conditions of the water bodies in the assessment area were established with reference to the routine river and marine water quality monitoring data collected by EPD. Descriptions of the baseline conditions provided in the subsequent sections are extracted from the EPD's reports "*River Water Quality in Hong Kong in 2020*" and "*Marine Water Quality in Hong Kong in 2020*".

5.3.2 Marine Water

5.3.2.1 The water quality monitoring results at station closest to the Project, namely TM2 within Harbour Subzone in Tolo Harbour & Channel WCZ, is shown in **Table 5.4**. Full compliances with the WQO was recorded at the selected EPD station TM2 for DO (depth average and bottom), chlorophyll-a and *E. coli* in 2020.

Table 5.4 Baseline Water Quality Condition for Tolo Harbour and Channel WCZ in 2020

Parameters		Harbour Subzone	WPCO WQO (in marine waters)
		TM2	
Temperature (°C)		26.3 (20.6 - 29.8)	Change due to waste discharge not to exceed $\pm 1^\circ\text{C}$ and not to exceed 0.5°C per hour at any location
Salinity (ppt)		29.9 (24.8 - 32.8)	Change due to waste discharge not to be greater than ± 3 ppt
Dissolved Oxygen (DO) (mg/L)	Depth Average	6.1 (5.1 - 7.9)	Not less than 4 mg/L in the water column (except for the bottom water within 2 m from the seabed)
	Bottom	6.2 (4.5 - 8.3)	Not less than 2 mg/L within 2 m from the seabed
Dissolved Oxygen (% Saturation)	Depth Average	89 (73 - 112)	Not available
	Bottom	90 (70 - 120)	Not available
pH		8.0 (7.7 - 8.3)	Change due to waste discharge not to be greater than ± 0.5 from natural range pH units at any time
Secchi Disc Depth (m)		2.4 (1.6 - 3.4)	Not available
Turbidity (NTU)		3.1 (1.5 - 5.5)	Not available
Suspended Solids (SS) (mg/L)		8.1 (1.4 - 17.0)	Not available
5-day Biochemical Oxygen Demand (BOD ₅) (mg/L)		1.7 (0.8 - 2.6)	Not available
Ammonia Nitrogen (mg/L)		0.045 (0.022 - 0.076)	Not available
Unionised Ammonia (UIA) (mg/L)		0.003 (<0.001 - 0.005)	Not available
Nitrite Nitrogen (mg/L)		0.004 (<0.002 - 0.010)	Not available
Nitrate Nitrogen (mg/L)		0.039 (<0.002 - 0.215)	Not available
Total Inorganic Nitrogen (TIN) (mg/L)		0.09 (0.03 - 0.27)	Not available
Total Kjeldahl Nitrogen (mg/L)		0.50 (0.22 - 0.81)	Not available
Total Nitrogen (mg/L)		0.54 (0.29 - 0.82)	Not available
Orthophosphate Phosphorus (PO ₄ -P) (mg/L)		0.008 (0.002 - 0.026)	Not available
Total Phosphorus (mg/L)		0.04 (<0.02 - 0.06)	Not available
Silica (as SiO ₂) (mg/L)		1.48 (0.50 - 4.15)	Not available
Chlorophyll-a (µg/L)		5.8 (1.4 - 9.2)	Harbour Subzone: Not to exceed 20µg/L, calculated as a running arithmetic mean of 5 daily measurements for any single location and depth
<i>E. coli</i> (cfu/100mL)		13 (<1 - 4500)	Not to exceed 610 cfu/100mL for geometric mean of all samples collected in one calendar year
Faecal Coliforms (cfu/100mL)		76 (6 - 32000)	Not available

Notes:

1. Data source: EPD Marine Water Quality in Hong Kong in 2020
2. Unless otherwise specified, data presented are depth-averaged values calculated by taking the means of three depths: Surface, Mid-depth, Bottom.
3. Data presented are annual arithmetic means of depth-averaged results except for *E. coli* and faecal coliforms that are annual geometric means.
4. Data in brackets indicate the ranges.
5. cfu – colony forming unit.

5.3.2.2 The monitoring results of key water quality parameters indicate that the overall WQO compliance rate of the Tolo Harbour and Channel WCZ in 2020 was 93%, markedly improved compared to 79% in 2019. Tolo Harbour consistently complied with the bacteriological WQO for the secondary contact recreation subzone. Tolo Channel, however, was subject to a

natural hydrological phenomenon of water column stratification and associated lower bottom DO level due to restricted water exchange with the open waters.

- 5.3.2.3 In the mid-1980s, with the implementation of the Tolo Harbour Action Plan, which includes the control of livestock waste, the provision and improvement of sewerage infrastructure, the export of treated sewage effluent from Sha Tin and Tai Po Sewage Treatment Works outside Tolo Harbour for discharging into Victoria Harbour via Kai Tak River, as well as the extension of village sewerage in the catchment area, there has been a steady improvement in water quality in Tolo Harbour in the past three decades.

5.3.3 Inland Water

- 5.3.3.1 Section of Shing Mun River, and its tributaries including Tai Wai Nullah and Tin Sum Nullah are located within the assessment area, the corresponding water quality monitoring results at stations, namely TR19I, TR19A, TR19C, TR19 and TR20B, are shown in **Table 5.5**.
- 5.3.3.2 The water quality at Shing Mun River, a major river which has three main tributaries and runs through the densely populated Sha Tin urban area, showed marked improvement in the past three decades. The WQO compliance rate of Shing Mun River was 90% in 2020.
- 5.3.3.3 The *E. coli* level at Shing Mun River Main Channel (TR19I), the only watercourse currently used for secondary contact recreation activities in Hong Kong, was rated "Low" (i.e. ≤ 610 counts/100mL) in 2020. And the Annual Water Quality Index (WQI) was rated "Excellent" in 2020, while it was rated "Good" in 2019.

Table 5.5 Baseline Water Quality Condition for Shing Mun River and its Tributaries in 2020

Parameters	Shing Mun Main Channel	Tai Wai Nullah			Tin Sum Nullah	WPCO WQO (in inland waters)
	TR19I	TR19A	TR19C	TR19	TR20B	
Dissolved Oxygen (DO) (mg/L)	6.7 (4.4 - 8.0)	8.8 (8.5 - 9.5)	9.5 (7.8 - 10.5)	10.2 (7.7 - 12.8)	7.9 (7.7 - 8.9)	≥ 4 mg/L or 40% saturation (at 15°C)
pH	8.1 (7.6 - 8.9)	8.5 (7.7 - 9.6)	7.7 (7.4 - 8.8)	7.7 (7.6 - 8.9)	7.7 (6.8 - 8.9)	within 6.0 - 9.0 for TR19A, TR19C, TR19I, TR20B; within 6.5 - 8.5 for TR19,
Suspended Solids (SS) (mg/L)	3.5 (1.4 - 16.0)	2.4 (0.9 - 6.4)	6.6 (1.0 - 24.0)	4.0 (1.4 - 43.0)	0.5 (<0.5 - 1.1)	Annual median: ≤ 25 mg/L, for TR19A, TR19C, TR19I, TR20B; ≤ 20 mg/L, for TR19
5-day Biochemical Oxygen Demand (BOD ₅) (mg/L)	3.1 (1.7 - 8.5)	1.4 (0.4 - 1.7)	1.8 (0.9 - 5.8)	4.6 (1.0 - 13.0)	<0.1 (<0.1 - 0.4)	≤ 5 mg/L, for TR19A, TR19C, TR19I, TR20B; ≤ 3 mg/L, for TR19
Chemical Oxygen Demand (COD) (mg/L)	13 (8 - 24)	4 (3 - 8)	6 (3 - 23)	11 (3 - 29)	5 (<2 - 9)	≤ 30 mg/L, for TR19A, TR19C, TR19I, TR20B; ≤ 15 mg/L, for TR19.
Oil & Grease (mg/L)	<0.5 (<0.5 - <0.5)	<0.5 (<0.5 - <0.5)	<0.5 (<0.5 - <0.5)	<0.5 (<0.5 - <0.5)	<0.5 (<0.5 - <0.5)	Not available
<i>E. coli</i> (cfu/100mL)	140 (40 - 630)	3 000 (140 - 34 000)	3 000 (320 - 39 000)	7 400 (2 100 - 90 000)	<1 (<1 - <1)	Running median of the most recent 5 consecutive samples taken at intervals of between 7 and 21 days (or 14 and 42 days): ≤ 1,000 cfu/100mL, for TR19A, TR19C, TR19I, TR20B; ≤ 0 cfu/100mL, for TR19.
Faecal Coliforms (cfu/100mL)	2 500 (810 - 56 000)	9 200 (430 - 42 000)	26 000 (2 600 - 200 000)	110 000 (19 000 - 290 000)	<1 (<1 - <1)	Not available
Ammonia Nitrogen (mg/L)	0.130 (0.058 - 0.230)	0.060 (0.030 - 0.140)	0.035 (0.018 - 0.090)	0.065 (0.018 - 0.190)	0.034 (0.014 - 0.180)	≤ 0.5 mg/L
Nitrate Nitrogen (mg/L)	0.130 (0.014 - 0.510)	0.710 (0.560 - 1.100)	0.540 (0.400 - 0.820)	0.540 (0.400 - 0.690)	0.910 (0.470 - 1.800)	Not available
Total Kjeldahl Nitrogen (mg/L)	0.58 (0.22 - 0.92)	0.28 (0.12 - 0.73)	0.72 (0.24 - 2.50)	0.80 (0.08 - 1.20)	0.20 (<0.05 - 0.29)	Not available

Parameters	Shing Mun Main Channel	Tai Wai Nullah			Tin Sum Nullah	WPCO WQO (in inland waters)
	TR19I	TR19A	TR19C	TR19	TR20B	
Orthophosphate Phosphorus (PO ₄ -P) (mg/L)	0.027 (0.014 - 0.047)	0.022 (0.004 - 0.032)	0.011 (0.004 - 0.044)	0.008 (0.004 - 0.024)	0.012 (0.007 - 0.130)	Not available
Total Phosphorus (mg/L)	0.05 (0.04 - 0.40)	0.05 (<0.02 - 0.10)	0.05 (<0.02 - 0.10)	0.06 (0.02 - 0.12)	0.02 (<0.02 - 2.50)	Not available
Sulphide (mg/L)	<0.02 (<0.02 - <0.02)	<0.02 (<0.02 - 0.55)	<0.02 (<0.02 - <0.02)	<0.02 (<0.02 - <0.02)	<0.02 (<0.02 - <0.02)	Not available
Aluminium (Al) (µg/L)	<50 (<50 - <50)	85 (<50 - 161)	75 (<50 - 178)	70 (<50 - 140)	64 (<50 - 210)	Not available
Cadmium (Cd) (µg/L)	<0.1 (<0.1 - <0.1)	<0.1 (<0.1 - <0.1)	<0.1 (<0.1 - 0.1)	<0.1 (<0.1 - <0.1)	<0.1 (<0.1 - 0.7)	Not available
Chromium (Cr) (µg/L)	2 (2 - 4)	<1 (<1 - 5)	<1 (<1 - 1)	<1 (<1 - 1)	<1 (<1 - <1)	Not available
Copper (Cu) (µg/L)	5 (3 - 6)	1 (<1 - 2)	3 (1 - 23)	3 (2 - 7)	1 (<1 - 3)	Not available
Lead (Pb) (µg/L)	<1 (<1 - <1)	<1 (<1 - <1)	<1 (<1 - 8)	<1 (<1 - <1)	<1 (<1 - <1)	Not available
Zinc (Zn) (µg/L)	<10 (<10 - 16)	<10 (<10 - 15)	13 (<10 - 73)	12 (<10 - 34)	<10 (<10 - 13)	Not available
Flow (m ³ /s)	NM	0.018 (0.012 - 0.192)	0.041 (0.030 - 0.189)	0.120 (0.066 - 0.270)	0.024 (0.015 - 0.098)	Not available

Notes:

1. Data source: EPD River Water Quality in Hong Kong in 2020
2. Data presented are in annual medians of monthly samples; except those for faecal coliforms and *E. coli* and which are in annual geometric means.
3. Equal values for annual medians (or geometric means) and ranges indicate that all data are the same as or below laboratory reporting limits.
4. Figures in brackets are annual ranges.
5. "NM" indicates no measurement taken.
6. cfu – colony forming unit

5.4 Identification of Water Sensitive Receivers

5.4.1.1 In accordance with Clause 3.4.6.2 of the EIA Study Brief (No. ESB-320/2019), the assessment area for this water quality impact assessment includes areas within 500 m from the boundary of the Project and covers Shing Mun River, Tolo Harbour and Channel WCZ as designated under the WPCO and the water sensitive receivers (WSRs) in the vicinity of the Project. WSRs within the assessment area were identified with reference to Annex 14 of the EIAO-TM.

5.4.1.2 Key inland WSRs within 500 m from the boundary of the Project and representative marine WSR in Tolo Harbour and Channel WCZ were identified and are summarised in **Table 5.6** below. Locations of the identified WSRs are illustrated in **Figure 5.1**.

Table 5.6 Summary of Representative Water Sensitive Receivers

ID	Location	Nature	Description
<i>Key Inland WSR within 500 m from the boundary of the Project</i>			
WSR1	Shing Mun River	Channelised watercourse	Trapezoidal channel with concrete bank and experienced tidal influence.
WSR2	Tai Wai Nullah	Channelised watercourse	Trapezoidal channel with concrete bank and experienced tidal influence.
WSR3	Tin Sum Nullah	Channelised watercourse	Trapezoidal channel with concrete bank and experienced tidal influence.
WSR4 / S1 ^[1]	Heung Fan Liu, upstream of Tai Wai Nullah	Natural watercourse	Fairly natural with rocky substrate with muddy bottom at its downstream. Litter were commonly found along downstream.
WSR5 / S2 ^[1]	Hillside adjacent to Shatin 400 kV substation	Natural watercourse	Fairly natural with rocky substrate with occasional sandy bottom, and a clear and small water flow.
WSR6 / S3 ^[1]	Hillside west to Mei Chung Court	Natural watercourse	Relatively natural substrate, its downstream is partly modified, and relatively fast water flow rate.
WSR7 / S4 ^[1]	Hillside north to Mei Chung Court	Natural watercourse	Relatively natural substrate, its upstream is partly modified, and relatively fast water flow rate.
WSR8 / S5 ^[1]	Hillside north to Peak One	Natural watercourse	Relatively natural substrate and relatively fast water flow rate. Discharge into the existing drainage outlet of TWN via underground drainage network, which is proposed to be partially intercepted and be treated for the proposed water play features (Section 5.5.2.3 refers).
WSR9	Water gathering ground located upstream of Tai Wai Nullah	Water gathering ground	-
WSR10	Lower Shing Mun Reservoir located upstream of Tai Wai Nullah	Reservoir	-
<i>Representative marine WSR in Tolo Harbour and Channel WCZ</i>			
W1	WSD Flushing Water Intakes at Shatin	Water abstraction for flushing purpose	-

Note:

[1] Refer to **Section 9.5** on full descriptions and locations of the natural watercourses S1 – S5, i.e. WSR4 – WSR8.

5.4.1.3 The existing water gathering grounds are located outside the boundary of the Project and upstream to the Project site. That is, the watercourses identified at or near the Project site are running from the water gathering grounds towards the Project site. No aboveground structure would be constructed within the water gathering grounds. Thus, the water source of the existing water gathering grounds is not expected to be affected during both construction and operation phases of the Project.

5.4.1.4 The inland water in Shing Mun River and the marine water in Tolo Harbour and Channel WCZ are designated under the WPCO as secondary contact recreation subzone, which can be used for water sports and water recreational activities (e.g. dragon boating, sailing, rowing etc.). The *E. coli* bacteria would be the principle parameter for assessing the acceptability of using the inland and marine water for water sports or secondary contact recreation activities with a WQO of not exceeding 610 cfu/100 mL (calculated as the geometric mean of all samples collected in one calendar year). Apart from the secondary contact recreation subzone, *E. coli* should not exceed 0 cfu per 100ml for inland waters in Shing Mun (B, F, G) subzones.

5.5 Identification of Environmental Impacts

5.5.1 Construction Phase

5.5.1.1 As detailed in **Section 2**, the proposed revitalisation works involves mainly channel bed modification, improvement of existing walkways and riparian public open spaces (which also involves demolition and revamp of existing footbridge), construction of dry weather flow interceptor (DWFI) system, landscaping and miscellaneous, as well as construction of underground water pumps near mid-stream of TWN for ecological enhancement associated water retention and supplement. Desilting works at downstream tidal zone of TWN would be carried out at the commencement and prior to the completion of the construction works to remove the silt accumulated at the nullah, in addition to the routine maintenance desilting works of smaller scale undertaken by DSD along TWN and by CEDD along Shing Mun River under existing arrangement. The Contractor should communicate and coordinate with DSD and CEDD to avoid overlapping of the proposed desilting works at downstream tidal zone of TWN during construction phase with DSD's or CEDD's routine maintenance desilting works as far as practicable to minimise the potential water quality impacts. The potential sources of water quality impact associated with the construction works would include:

- Wastewater from general construction activities;
- Construction site run-off;
- Construction works in close proximity to inland water;
- Construction works at TWN;
- Sewage from construction workforce; and
- Accidental spillage of chemicals.

5.5.1.2 Except for the flow diversion required for the construction works within Tai Wai Nullah as detailed in **Section 5.8.1.16**, no alteration of watercourses would be required.

5.5.2 Operational Phase

5.5.2.1 The Project would not change the path of any existing flow or catchment of TWN. Due to ageing drainage systems and possible expedient connection made in the past, polluted discharges from the existing drainage outlets along TWN were observed. The proposed DWFI system and specific treatment wetlands under the Project are expected to improve the water quality of the TWN by using the DWFI system to intercept all of the heavily polluted dry weather flows from the drainage outlets along the nullah and discharging the dry weather flows to the existing sewerage system that would eventually reach the relocated Sha Tin Sewage Treatment Works for treatment, as well as by using the treatment wetlands to polish the remaining comparatively less polluted and not-intercepted in-situ with TWN. As detailed in **Section 2**, the introduction of general constructed wetland systems and provision of emergent wetland planting (e.g. reed and other aquatic herbs) / mangroves to the channel bed as greening and ecological enhancement measures are also expected to be beneficial to the water quality of TWN. As detailed in sewerage impact assessment in **Section 8**, the existing sewerage system has enough capacity to cater for the additional dry weather flow

intercepted by the DWF system. No adverse water quality impact would be expected from operation of the proposed DWF system and ecological enhancement works.

5.5.2.2 After the revitalisation works, the nullah bed of the engineering channel of TWN would be dry most of the time during non-rainy days, except for the low flow channel in the middle (which is similar to the existing condition), and the main water body of TWN, i.e. the low flow channel, would not be opened for public access or physical contact due to safety reasons as detailed in **Section 2**. Taking advantage of the improved water quality of the revitalised TWN, the riparian area (nullah bed of the engineering channel of TWN outside of the low flow channel) of midstream TWN near Pok Ngar Villa would be opened for public access and be transformed into a public open space that can provide communal spaces for recreation and leisure activities to promote water friendliness (e.g. riparian walkway, sightseeing of greening and ecological enhancement features, water play features equipped with UV disinfection system). An additional permanent public toilet facility (which would be operated and maintained by Food and Environmental Hygiene Department like the existing public toilets in Tai Wai) for the visitors to TWN is also proposed near Pok Ngar Villa. As detailed in sewerage impact assessment in **Section 8**, the existing sewerage system has enough capacity to cater for the additional dry weather flow intercepted by the DWF system and additional sewage flow from the proposed toilet. No water quality impact would be expected from the operation of the additional toilet.

5.5.2.3 Potential water quality impacts associated with the operation phase would include:

- Non-point source surface run-off / irrigation runoff from the proposed greening elements and landscaping;
- Routine maintenance works for the drainage and sewerage systems along TWN, including desilting along the nullah and minor maintenance to the DWF system, by the DSD to remove excessive / accumulated silt, vegetation, debris and obstructions within the channel (similar to the ones undertaken by DSD along TWN under existing arrangement), which may lead to disturbance and re-suspension of river sediments and thereby affecting water quality;
- Potential changes in hydrodynamics properties and hydrology; and
- Water quality impact from riparian public open space (including operation of UV disinfection system and water play features in amenity area).

5.6 Assessment Methodology

5.6.1.1 The assessment area includes inland waters within 500 m from the boundary of the Project and shall cover Shing Mun River, Tolo Harbour and Channel WCZ as designated under the WPCO and WSRs in the vicinity of the Project. The methodology employed to assess potential water quality impacts associated with the construction and operation of the Project followed the detailed technical requirements given in Appendix D of the EIA Study Brief and was based on the information presented in **Section 2**. The WSRs that may be affected by the Project have been identified. Potential sources of water quality impact that may arise during the construction and operation stages of the Project were described, including point source discharges and non-point source surface water runoff / irrigation runoff, sewage from workforce and polluted discharge generated from the Project. All the identified sources of potential water quality impact will be evaluated and their impact significance will be determined. Practical water pollution control measures will be recommended to mitigate identified water quality impacts.

5.7 Prediction and Evaluation of Environmental Impacts

5.7.1 Construction Phase

Wastewater from General Construction Activities

5.7.1.1 Wastewater generated from construction activities, including general cleaning and polishing, wheel washing, dust suppression and utility installation may contain high SS concentrations, as well as a certain amount of grease and oil. Potential water quality impacts due to uncontrolled wastewater discharge can be avoided if construction and site management practices are implemented to ensure that litter, fuels, and solvents do not enter the water

environment. It is expected that if the good site practice suggested in **Section 5.8** are followed as far as practicable, the potential water quality impacts associated with construction activities would be minimal.

Construction Site Run-off

5.7.1.2 Potential pollution sources of site run-off may include:

- Run-off and erosion of exposed bare soil and earth, drainage channels, earth working areas and stockpiles;
- Wash water from dust suppression sprays and wheel washing facilities; and
- Fuel, oil and lubricants from maintenance of construction vehicles and equipment.

5.7.1.3 During rainstorms, site run-off would wash away the soil particles on unpaved lands and areas with topsoil exposed, if any. The run-off is generally characterised by high concentrations of SS. Release of uncontrolled site run-off would increase the SS levels and turbidity in the nearby water environment. Site run-off may also wash away soil particles that were contaminated by the construction activities and therefore cause water pollution.

5.7.1.4 Wind-blown dust would be generated from exposed soil surfaces in works areas. It is possible that wind-blown dust would fall directly onto the nearby water bodies when a strong wind occurs. Dispersion of dust within the works areas may increase the SS levels in surface run-off causing a potential impact to the nearby sensitive receivers.

5.7.1.5 It is important that proper site practice and good site management should be followed to prevent run-off with high level of SS from entering the surrounding waters. Best Management Practices (BMPs) in controlling construction site discharges are recommended in **Section 5.8** for this Project. With the implementation of BMPs to control run-off and drainage from the construction site, disturbance of water bodies would be avoided and deterioration in water quality would be minimal.

Construction Works in Close Proximity to Inland Water

5.7.1.6 Landscaping / greening of the bankside as well as improvement of existing walkways along TWN by the bankside (which also involves demolition and revamp of existing footbridge) will be provided along TWN. Construction activities in close vicinity to the inland watercourses may impact water quality due to the potential uncontrolled release of construction waste and wastewater. Construction waste and wastewater are generally characterised by high SS concentration and elevated pH. The implementation of adequate construction site drainage and BMPs as described in **Section 5.8** and provision of precautionary measures / practices as specified in ETWB TC(Works) No. 5/2005 "*Protection of natural streams / rivers from adverse impacts arising from construction works*" as detailed in **Section 5.8**, it is anticipated that water quality impacts would be minimal.

Construction Works at Tai Wai Nullah

5.7.1.7 Construction within TWN would involve channel bed modification (including construction of energy dissipation structures), construction of DWF1 system along the nullah, construction of mid-stream underground water pipes along the nullah for water supplement, construction of riparian walkway and amenity areas, and desilting works at downstream tidal zone. The existing concrete nullah of TWN will be modified and resurfaced with layer of vegetation while the channel bed downstream of TWN's broad-crested weir at its confluence with Shing Mun River near Man Lai Court will be modified, with an aim to improve the existing excessive accumulation of silts brought by tidal influence due to uneven surface and flat gradient of the existing channel in front of the broad-crested weir. Riparian walkway and amenity facilities will also be constructed within TWN near its midstream section. Potential water quality impacts may be generated by uncontrolled discharge of excavated materials, wastewater, spillage and contaminants to the downstream receiving waters. Construction works within TWN would be divided into sections and constructed in sequence starting from downstream TWN first. For each section, these construction works within the nullah, would be scheduled in dry season when the flow is low. Site demarcation and flow diversion will be implemented prior to the construction works within channel to ensure that all the construction works would be undertaken in dry conditions and physically separated from the watercourses downstream to avoid potential water quality impacts upon the downstream water quality. Together with

the implementation of precautionary and pollution control measures as detailed in **Section 5.8**, the potential water quality impacts would be well controlled.

Sewage from Construction Workforce

- 5.7.1.8 During the construction of the Project, the workforce on site will generate sewage effluent, which is characterised by high levels of BOD, ammonia and *E. coli* counts. Based on the DSD Sewerage Manual, the sewage production rate for construction workers is estimated at 0.35 m³ per worker per day. Potential water quality impacts upon the local drainage and freshwater system may arise from these sewage effluents, if uncontrolled.
- 5.7.1.9 Temporary sewage generation can be adequately treated by interim sewage treatment facilities, such as portable chemical toilets. Provided that sewage is not discharged directly into storm drains or inland waters adjacent to the construction site, temporary sanitary facilities are used and properly maintained, and control measures as recommended in **Section 5.8** are adopted as far as practicable, it is unlikely that sewage generated from construction workforce would have a significant water quality impact.

Accidental Spillage of Chemicals

- 5.7.1.10 The use of chemicals such as engine oil and lubricants, and their storage as waste materials has the potential to impact water quality if spillage occurs and enters adjacent water environment. Waste oil may infiltrate into the surface soil layer, or runoff into the nearby water environment, increasing hydrocarbon levels. The potential impacts could however be avoided by practical precautionary measures and good site practices (as given in **Section 5.8**).

5.7.2 Operational Phase

Surface Run-off / Irrigation Run-off

- 5.7.2.1 Surface run-off / irrigation run-off to be generated from the Project is known as non-point source pollution. The paved and developed areas, especially the new public open space (e.g. viewing decks) / footpath will increase the quantity of surface runoff. Irrigation run-off would also be anticipated from the routine maintenance of the proposed planting. Release of uncontrolled surface / irrigation run-off would increase the suspended solids levels and turbidity as well as fertiliser / pesticides (if required to sustain healthy growth of the proposed plantings) in the nearby waterbodies. However, impacts upon water quality would be minimal provided that proper drainage system would be incorporated into the proposed works to receive surface / irrigation runoff to the drainage system at the planning and design stages. It is anticipated that with proper implementation of BMPs as recommended in **Section 5.8**, no adverse water quality impact from non-point source surface / irrigation run-off is expected.

Routine Maintenance Works

- 5.7.2.2 During the operational phase, similar to the existing practices, regular maintenance works for the drainage and sewerage systems along TWN, including desilting along the nullah and minor maintenance to the DWFI system, would be carried out by the DSD to remove excessive silts, debris and any obstructions to safeguard the hydraulic capacity of the nullah. The maintenance practices and frequency would be similar to the existing maintenance works undertaken by the DSD. Such small-scale routine maintenance works would require only light mechanical equipment such as a small loader and/or a small crane truck. Hand-held equipment will be used for vegetation removal along the nullah.
- 5.7.2.3 Maintenance desilting of the nullah should be carried out on an annual basis during dry season (November to March) when the water flow is low, except during emergency situations where the accumulated silt would adversely affect the hydraulic capacity of the nullah or where flooding risk is imminent, or when complaints on environmental nuisance associated with the accumulated silt are received. Whilst possible changes to water quality may be expected during the removal of excessive silt, vegetation, debris and obstructions within the nullah, such as increases in SS due to disturbance of nullah bed material and subsequently increased sedimentation onto the nullah bed, it is expected that these changes will be short-term and localised within the area of maintenance works and for a short distance downstream due to rapid settling out of any disturbed nullah bed material that no unacceptable adverse water quality impacts to WSRs downstream would be anticipated. Changes in SS

concentrations would be expected to be within the typical ranges experienced under ambient conditions following heavy storms and increased sediment run-off. Therefore, no unacceptable water quality impacts are anticipated to occur as a result of the small-scale maintenance desilting works.

- 5.7.2.4 For the minor maintenance works for the DWFI system, it is expected that any maintenance will only be undertaken on an as-needed basis and frequent maintenance (i.e. monthly) will not be required. Diversion of the dry weather flow to the nearby sewerage system can be adopted during maintenance of DWFI system so that the water quality at TWN would not be adversely affected. Given the infrequent maintenance requirements and the collected solid wastes will be collected and disposed off-site properly, unacceptable water quality impact is not expected.

Potential Changes in Hydrodynamics Properties and Hydrology

- 5.7.2.5 During operation of the Project, DWFI system will be in place along the nullah to intercept and convey the flow with heavily polluted discharges from some of the drainage outlets along the nullah to Sha Tin Sewage Treatment Works for treatment, which would inevitably lead to reduced flowrate and amount of freshwater input into TWN and downstream receiving water (Shing Mun River Main Channel). With the provision of treatment wetland for in-situ polishing of non-intercepted flow with less polluted discharges as discussed in **Section 2**, the polished flow could serve as a part of the environmental flow to sustain the ecological function of the flora and fauna and habitat processes present within the revitalised TWN. Furthermore, with the incorporation of water retention and replenish designs and ecological enhancement features (e.g. wetland habitats created) within the nullah (see **Section 2**), average flow rate will remain similar to baseline condition and no unacceptable impacts on hydrodynamics properties and hydrology are anticipated. Furthermore, with the modification of channel bed and realignment of low flow channel at downstream TWN near its confluence with Shing Mun River near Man Lai Court, the sedimentation in front of the broad-crested weir caused by tidal influence and uneven surface and flat gradient of the existing channel in front of the broad-crested weir, as well as the associated water quality issues and environmental nuisance, would be greatly reduced.
- 5.7.2.6 In addition, as all the identified natural watercourses within the assessment area are located at the upper catchment of TWN (see **Section 8**), no changes in hydrodynamic properties or hydrology are anticipated for the watercourses during operational phase of the Project.

Riparian Public Open Space

- 5.7.2.7 Relatively clean freshwater discharge from an existing drainage outlet of the nullah near Pok Ngar Villa, which receives mainly clean river flow from upstream natural hillside catchment north to Peak One (i.e. WSR8 / S5 in **Figure 5.1**), were identified through the pollution source identification survey conducted under this Project. The clean freshwater discharge will be partially intercepted and directed to the proposed UV disinfection system for treatment and be used in the water play features (e.g. water spouts and fountains) in the riparian amenity area (fully separated from the water body of the revitalised TWN). Based on preliminary design, no additional stormwater collection facilities would be required for the conveyance of freshwater for the proposed water play features. A more stringent treatment standard will be adopted for the proposed water play features that in addition to fulfilling the relevant WQGs for primary contact recreation (type 3 designated use) as stipulated in DSD PN No. 3/2021 (**Table 5.3** refers), *E. coli* bacteria should be non-detectable (in cfu/100 mL, calculated as the geometric mean of all samples collected in one calendar year) in the treated water. When the disinfection system is not under normal operation, under maintenance or when the treatment standard as specified in the post-revitalisation water quality monitoring programme established and implemented by DSD is not complied with (detailed in **Section 5.8.3**), the water play features will be closed and the water will be directly discharged into the low flow channel. Since UV treatment is a physical treatment process and the intercepted freshwater discharge would be relatively clean, no wastewater would be generated and no secondary water quality impact would be anticipated from its overall operation.
- 5.7.2.8 The riparian walkway and amenity areas would be properly designed to restrict public access / physical contact to the water body, i.e. the low flow channel, and to ensure safe and appropriate usage of the riparian public space and water play features (e.g. elevated walkway design, fencing, provision of warnings / signage, deployment of management personnel etc.).

In particular, it should be noted that neither the water from the revitalised nullah with improved water quality or the water play features utilising treated freshwater shall be used for human or animal consumption, bathing or showering, food preparation / washing. As detailed in **Section 2**, access to the riparian walkway and amenity areas [provided with water play features] will be closed and evacuated in case of foreseeable flooding at the nullah bed or under extreme weather conditions. It is anticipated that with proper implementation of BMPs and the adoption of channel management system by the DSD as detailed in **Section 5.8**, no adverse water quality impact from the operation of the riparian public open space is expected.

5.8 Mitigation of Environmental Impacts

5.8.1 Construction Phase

Wastewater from General Construction Activities and Construction Site Run-off

5.8.1.1 Control of potential pollution of nearby water bodies during the construction phase of the Project should be achieved by measures to:

- prevent or minimise the likelihood of pollutants (generated from construction activities) being in contact with rainfall or run-off; and
- abate pollutants in the stormwater surface run-off prior to the discharge of surface run-off to the nearby water bodies.

5.8.1.2 These principle objectives should be achieved by implementation of the BMPs of mitigation measures in controlling water pollution. The guidelines for handling and disposal of construction site discharges as detailed in the ProPECC PN 1/94 should be followed, where applicable. All effluent discharged from the construction site should comply with the standards stipulated in the TM-DSS. The following measures are recommended to protect water quality of the inland and coastal waters, and when properly implemented should be sufficient to adequately control site discharges so as to avoid water quality impacts.

Construction Site Run-off

5.8.1.3 Surface runoff from construction sites should be discharged into storm drains via adequately designed sand/silt removal facilities such as sand traps, silt traps and sedimentation basins. Channels or earth bunds or sandbag barriers should be provided on site during construction works to properly direct stormwater to such silt removal facilities. Perimeter channels should be provided on site boundaries where necessary to intercept storm runoff from outside the site so that it will not wash across the site. Catchpits and perimeter channels should be constructed in advance of site formation works and earthworks.

5.8.1.4 Silt removal facilities, channels and manholes should be maintained and the deposited silt and grit should be removed regularly, at the onset of and after each rainstorm to prevent local flooding. Any practical options for the diversion and re-alignment of drainage should comply with both engineering and environmental requirements in order to provide adequate hydraulic capacity of all drains.

5.8.1.5 Construction works should be programmed to minimise soil excavation works in rainy seasons (April to September). If soil excavation cannot be avoided in these months or at any time of year when rainstorms are likely, for the purpose of preventing soil erosion, temporary exposed slope surfaces should be covered e.g. by tarpaulin, and temporary access roads should be protected by crushed stone or gravel, as excavation proceeds. Intercepting channels should be provided (e.g. along the crest / edge of excavation) to prevent storm runoff from washing across exposed soil surfaces. Arrangements should always be in place in such a way that adequate surface protection measures can be safely carried out well before the arrival of a rainstorm.

5.8.1.6 Earthworks final surfaces should be well compacted and the subsequent permanent work or surface protection should be carried out immediately after the final surfaces are formed to prevent erosion caused by rainstorms. Appropriate drainage like intercepting channels should be provided where necessary.

5.8.1.7 Measures should be taken to minimise the ingress of rainwater into trenches. If excavation of trenches in wet seasons is necessary, they should be dug and backfilled in short sections.

Rainwater pumped out from trenches or foundation excavations should be discharged into storm drains via silt removal facilities.

5.8.1.8 Open stockpiles of construction materials (e.g. aggregates, sand and fill material) on sites should be covered with tarpaulin or similar fabric during rainstorms. Measures should be taken to prevent the washing away of construction materials, soil, silt or debris into any drainage system.

5.8.1.9 Manholes (including newly constructed ones) should always be adequately covered and temporarily sealed so as to prevent silt, construction materials or debris from getting into the drainage system, and to prevent storm runoff from getting into foul sewers. Discharge of surface runoff into foul sewers must always be prevented in order not to unduly overload the foul sewerage system.

Boring and Drilling Water

5.8.1.10 Water used in ground boring and drilling for site investigation or rock / soil anchoring should as far as practicable be re-circulated after sedimentation. When there is a need for final disposal, the wastewater should be discharged into storm drains via silt removal facilities.

Wheel Washing Water

5.8.1.11 All vehicles and plants should be cleaned before they leave a construction site to minimise the deposition of earth, mud, debris on roads. A wheel washing bay should be provided at every site exit if practicable and wash water should have sand and silt settled out or removed before discharging into storm drains. The section of construction road between the wheel washing bay and the public road should be paved to reduce vehicle tracking of soil and to prevent site runoff from entering public road drains.

Rubbish and Litter

5.8.1.12 Good site practices should be adopted to remove rubbish and litter from construction sites so as to prevent the rubbish and litter from spreading from the site area. It is recommended to clean the construction sites on a regular basis.

Acid Cleaning, Etching and Pickling Wastewater

5.8.1.13 Acidic wastewater generated from acid cleaning, etching, pickling and similar activities should be neutralised to within the pH range of 6 to 10 before discharging into foul sewers.

Effluent Discharge

5.8.1.14 There is a need to apply to EPD for a discharge licence for discharge of effluent from the construction site under the WPCO. The discharge quality must meet the requirements specified in the discharge licence. All the runoff and wastewater generated from the works areas should be treated so that it satisfies all the standards listed in the TM-DSS. The beneficial uses of the treated effluent for other on-site activities such as dust suppression sprays, wheel washing and general cleaning etc., can minimise water consumption and reduce the effluent discharge volume. If monitoring of the treated effluent quality from the works areas is required during the construction phase of the Project, the monitoring should be carried out in accordance with the relevant WPCO licence.

Construction Works in Close Proximity to Inland Water

5.8.1.15 The precautionary measures / practices outlined in ETWB TC (Works) No. 5/2005 "*Protection of natural streams / rivers from adverse impacts arising from construction works*" should also be adopted where applicable to minimise the water quality impacts on any natural streams or surface water systems. Relevant precautionary measures / practices from the ETWB TC (Works) No. 5/2005 include but not limited to the following:

- The use of less or smaller construction plants may be specified in areas close to the watercourses to reduce the disturbance to the surface water.
- Temporary storage of materials (e.g. equipment, chemicals and fuel) and temporary stockpile of construction materials should be located well away from any water courses when carrying out of the construction works.
- Stockpiling of construction materials and dusty materials should be covered and located away from any watercourses.

- Construction debris and spoil should be covered up and / or disposed of as soon as possible to avoid being washed into the nearby water receivers.
- Proper shoring may need to be erected in order to prevent soil or mud from slipping into the watercourses.

Construction Works at Tai Wai Nullah

- 5.8.1.16 As detailed in **Section 5.7.1.7**, construction works within TWN would be divided into sections and constructed in sequence and all construction works within the nullah should be scheduled in dry season when the flow is low. All the construction works should be undertaken in dry conditions and physically separated from the watercourses downstream. Precautionary measures in Appendix D of ETWB TC No. 5/2005, such as temporary isolation to other connected watercourse using concrete blocks, sandbag barriers or other appropriate measures, shall be applied. Site demarcation and flow diversion with physical barriers / temporary drainage will be implemented prior to the construction works within channel to ensure that all the construction works would be undertaken in dry conditions and physically separated from the watercourses downstream to avoid potential water quality impacts upon the downstream water quality. Physical barriers (such as concrete blocks/sandbags or other appropriate measures) with impermeable liners will be deployed to confine the works area to maintain a dry condition within and to prevent pollutants running into the downstream waters; and depending on the site conditions, physical barriers or temporary drainage would be established to intercept and divert the upstream flow. Dewatering of the construction works area shall be conducted prior to the construction works. Silt removal facilities should be adopted to treat the wastewater from dewatering operations prior to discharge. Details of the containment structures, flow diversion pathway and water treatment method should be provided by the Contractor to the Engineer for approval before commencement of construction works for the Project. After completion of the construction works, the works area shall be cleaned up before receiving any water flow or connecting to any existing watercourse.
- 5.8.1.17 All excavated materials generated from construction works in watercourses and wet areas should be collected and handled in compliance with the Waste Disposal Ordinance. No direct disposal of the construction wastes or excavated materials into the stormwater drainage system and inland water should be allowed. The above pollution control measures for handling and disposal of excavated materials should be followed to avoid and minimise the potential environmental impacts arising from the excavated materials.
- 5.8.1.18 The pollution control measures for construction works in close proximity to inland water and mitigation measures for general construction activities as recommended in **Section 5.8.1.1** to **5.8.1.15** should also be implemented to avoid and minimise any potential water quality impacts from construction within TWN. Regular site checks should be conducted to ensure no adverse impact to TWN are induced by the construction activities.

Sewage from Construction Workforce

- 5.8.1.19 No direct discharge of sewage to the stormwater drains and inland water will be allowed. Adequate and sufficient portable chemical toilets should be provided in the works areas to handle sewage from construction workforce. A licensed collector should be employed to clean and maintain the chemical toilets on a regular basis.
- 5.8.1.20 Notices should be posted at conspicuous locations to remind the workers not to discharge any sewage or wastewater into the surrounding environment. Regular environmental audit of the construction site should be conducted to provide an effective control of any malpractices and achieve continual improvement of environmental performance on site.

Accidental Spillage of Chemicals

- 5.8.1.21 Contractor must register as a chemical waste producer if chemical wastes would be produced from the construction activities. The Waste Disposal Ordinance (Cap 354) and its subsidiary regulations in particular the Waste Disposal (Chemical Waste) (General) Regulation, should be observed and complied with for control of chemical wastes. The Contractor is also recommended to develop management procedures for chemicals used and prepare an emergency spillage handling procedure to deal with chemical spillage in case of accident occurs.

- 5.8.1.22 Any service shop and maintenance facilities should be located on hard standings within a bunded area, and sumps and oil interceptors should be provided. Maintenance of vehicles and equipment involving activities with potential for leakage and spillage should only be undertaken within the areas appropriately equipped to control these discharges.
- 5.8.1.23 Disposal of chemical wastes should be carried out in compliance with the Waste Disposal Ordinance. The Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes published under the Waste Disposal Ordinance details the requirements to deal with chemical wastes. General requirements are given as follows:
- Suitable containers should be used to hold the chemical wastes to avoid leakage or spillage during storage, handling and transport.
 - Chemical waste containers should be suitably labelled, to notify and warn the personnel who are handling the wastes, to avoid accidents.
 - Storage area should be selected at a safe location on site and adequate space should be allocated to the storage area.

5.8.2 Operational Phase

Surface Run-off / Irrigation Run-off / Runoff from Riparian Public Open Space

- 5.8.2.1 The ProPECC PN 5/93 "Drainage Plans subject to Comments by Environmental Protection Department" provides guidelines and practices for handling, treatment and disposal of various effluent discharges to stormwater drains and foul sewers. The design of site drainage should follow the relevant guidelines and practices as given in the ProPECC PN 5/93. DSD PN No. 3/2021 "Guidelines on Design for Revitalisation of River Channel" presents the essential environmental considerations and maintenance and management requirements for a revitalised river channel.

Design Measures

- 5.8.2.2 Exposed surface shall be avoided within the site to minimise soil erosion. The site shall be either hard paved or covered by landscaping area and plantation where appropriate.
- 5.8.2.3 The drainage system within the site should be designed to cater for the runoff from 50 year-return-period rainstorm.

Devices / Facilities to Control Pollution

- 5.8.2.4 Screening facilities such as standard gully grating and trash grille, with spacing which is capable of screening large substances such as fallen leaves and rubbish should be provided at the inlet of drainage system.
- 5.8.2.5 Road gullies with standard design and silt traps and oil interceptors should be incorporated during the detailed design to remove particles present in stormwater runoff.

Administrative Measures

- 5.8.2.6 BMPs for storm water discharge and management, as well as good administrative and management measures for riparian public open spaces as detailed below are recommended for the Project to mitigate potential adverse water quality impacts.
- 5.8.2.7 Good management measures such as regular cleaning and sweeping of road surface / open areas should be followed. The road surface / open area cleaning should also be carried out prior to occurrence of rainstorm. Sufficient garbage collection unit / system should be established / maintained (**Section 6** refers) and litters in amenity areas or river should be regularly removed.
- 5.8.2.8 Good management practices should be adopted to properly manage the water application rate and time during irrigation to minimise chance of run-off. Use of fertilisers and pesticides, if required, should be properly controlled, e.g. applications prior to forecasted heavy rain event should also be avoided to minimise the potential for run-off of residual fertiliser. Priority would be given to remove infected/sick plantings over the use of pesticides. In addition, use of more specific, systemic and biodegradable pesticide in low dosage is more preferred. The use and handling of fertilisers and pesticides should follow the Pesticide Ordinance and Code of Practice for the Safe and Proper Use of Pesticides in Public Areas by AFCD, Food and Health Bureau (FEHD) and Leisure and Cultural Services Department (LCSD).

- 5.8.2.9 Manholes, as well as storm water gullies, ditches provided among the development areas should be regularly inspected and cleaned (e.g. monthly). Additional inspection and cleansing should be carried out before forecasting heavy rainfall.
- 5.8.2.10 Channel that allows activities close to the water should deploy a patrol team to identify unsafe behaviours and to safeguard the public's safety. The leisure facilities should also be provided with instructions and safety warnings in conspicuous places.
- 5.8.2.11 The following management and maintenance requirements on water quality control recommended in DSD PN No. 3/2021:
- Regular sample and test water quality;
 - Facilities that allow primary contact recreation (e.g. water play zone) should develop its standard operating procedure in case of not meeting the Water Quality Goals (Mitigation measures during operation phase for water play zone);
 - Regularly maintain the treatment unit to meet its design treatment effectiveness;
 - Develop emergency response plan on how primary/secondary contact recreation activities; and shall be suspended when water quality fails to achieve the water quality goals i.e. mitigation measures during operation phase for water play zone.

Routine Maintenance Works

- 5.8.2.12 During the operational phase, similar to the existing practices, regular maintenance works for the drainage and sewerage systems along TWN, including desilting along the nullah and minor maintenance to the DWFI system, would be carried out by the DSD to remove excessive silts, debris and any obstructions to safeguard the hydraulic capacity of the nullah. The maintenance practices and frequency would be similar to the existing maintenance works undertaken by the DSD.
- 5.8.2.13 The following good site practices would be included in planning for the maintenance works:
- Maintenance desilting of the nullah should be carried out on an annual basis during dry season (November to March) when the water flow is low, with the exception of during emergency situations where the accumulated silt would adversely affect the hydraulic capacity of the nullah or where flooding risk is imminent, or when complaints on environmental nuisance associated with the accumulated silt are received. Desilting should be carried out by hand-held or light machinery at low tide.
 - Phasing of the works should be considered to better control and reduce any impacts caused. Where possible, works should be carried out along half width of the drainage channel in short sections. A free passage along the drainage channel is necessary to avoid forming stagnant water in any phase of the works.
 - Containment structures (such as sandbags barrier) should be provided for the desilting works area to facilitate a dry or at least confined working area within the drainage channel.
 - The locations for the disposal of the removed materials should be identified and agreement sought with the relevant departments before commencement of the maintenance works. Temporary stockpile of waste materials should be located away from the channel and properly covered. These waste materials should be disposed of in a timely and appropriate manner.
 - Effective temporary flow diversion scheme should be implemented and the generated wastes should be collected and disposed off-site properly to avoid adversely affecting the water quality of the drainage system.

5.8.3 Enhancement Opportunities and Environmental Benefit

- 5.8.3.1 Upon completion of revitalisation for TWN, water quality of TWN is anticipated to be improved with the implementation of the proposed DWFI system and treatment wetland systems. A post-revitalisation water quality monitoring programme, covering the water quality of the revitalised TWN and the disinfected water for the proposed water play features, would be established and implemented by the DSD, with an aim to assess the compliance with the WQGs; to monitor long-term water quality trend; to facilitate the emergency response plans for failing to achieve WQGs; and to facilitate the development and implementation of operation and maintenance plan. Maintenance and management requirements for TWN would be adjusted accordingly based on the monitoring results following the operation and maintenance considerations / guidelines stipulated in DSD PN No. 3/2021.

5.9 Cumulative Impacts

5.9.1 Potential Concurrent Projects

5.9.1.1 A number of potential concurrent projects have been identified and their potential environmental cumulated impacts are discussed in **Section 2.8**. Based on the latest available information at the time of preparation of this EIA Report, there are four projects potentially be constructed and operated concurrently with the Project, including:

- Box culverts along Chui Tin Street under “Drainage Improvement Works in Sha Tin and Sai Kung;”
- “Revitalisation of Tai Wai Nullah”;
- “Revised Trunk Road T4”; and
- Joint-user complex at Tsuen Nam Road, Tai Wai.

5.9.2 Construction Phase

5.9.2.1 Based on the tentative construction programme of potential concurrent projects as detailed in **Section 2.8**, the construction phase of the Project would potentially overlap with that of the box culvert construction under “Drainage Improvement Works in Sha Tin and Sai Kung” during 2024 – 2029, “Revised Trunk Road T4” during 2024 – 2028; and “Joint-user complex at Tsuen Nam Road, Tai Wai” during 2024 – 2029.

5.9.2.2 For “Drainage Improvement Works in Sha Tin and Sai Kung” and “Joint-user complex at Tsuen Nam Road, Tai Wai”, while no confirmed construction programme of these concurrent projects is available at time of the preparation of this EIA, potential water quality impacts from these concurrent projects are expected to be localised and land-based, including construction site runoff, wastewater from general construction activities, accidental spillage and sewage from construction workforce. With proper implementation of mitigation measures and good site practices, potential water quality impacts to downstream areas in Shing Mun River Channel would be well controlled. No unacceptable cumulative water quality impacts from these concurrent projects would therefore be anticipated. Nonetheless, during the detailed design stage, the contractor of this Project should be requested to closely liaise with the contractors of these potential concurrent projects in planning the interfacing works properly to further minimise any potential cumulative impacts.

5.9.2.3 For “Revised Trunk Road T4”, the water quality key issues of this concurrent project include construction works at Shing Mun Main River Channel and in close proximity to inland water, wastewater generated from general construction activities, construction site runoff, sewage from construction workforce, accidental spillage of chemicals and diversion of watercourse, which could be mitigated and controlled by implementing the recommended mitigation measures that no unacceptable water quality impacts were expected based on the approved EIA report (AEIAR-231/2021). In view that the construction works of the concurrent project within the site area of overlapping with this Project would be the foundation works for the Revised Trunk Road T4 viaducts, and that the construction works along the nullah will not be undertaken at the entire work section at the same time (see **Section 2**), the tentative construction programme and works at the interface area between the two projects could be arranged efficiently, e.g. scheduling works to be carried out during dry season, through close liaison between DSD’s and CEDD’s contractors of this Project and the concurrent project respectively in order to avoid construction works of respective works contracts to be carried out concurrently at the same interfacing areas and CEDD has agreed to include this requirement in the respective works contract. With such arrangement in place, cumulative construction environmental impacts, and water quality impacts upon the downstream water body could be minimised. For the construction of bridge piers within Shing Mun River under “Revised Trunk Road T4 in Sha Tin”, the construction activities for bridge piers would be conducted by phases and all piling and excavation works in river would be fully enclosed by cofferdam/watertight steel casing and with deployment of silt curtains to completely enclose the cofferdam/watertight steel casing prior to setting up piling works, hence, the potential water quality impacts could be mitigated and controlled by implementing the recommended mitigation measures. As such, no unacceptable cumulative water quality impacts from these projects would be anticipated.

5.9.2.4 Based on the tentative construction programme of potential concurrent projects as detailed in **Section 2.8**, the construction of “Revitalisation of Fo Tan Nullah” would overlap with that of the Project during 2024 to 2029. The concurrent projects are located over 2km from this Project. Potential water quality impacts from this concurrent project are expected to be similar to this Project and localised that significant cumulative water quality impacts would not be expected given the large separation distance. With proper implementation of mitigation measures and good site practices, potential water quality impacts to downstream areas in Shing Mun River Channel would be minimised.

5.9.3 Operational Phase

5.9.3.1 The operation of box culverts under “Drainage Improvement Works in Sha Tin and Sai Kung” does not constitute any elements that would be water pollution sources and would not generate any new pollution load to the catchment, no cumulative water quality impact would be expected from its operation.

5.9.3.2 The nature of “Revitalisation of Fo Tan Nullah” is similar to the Project that no adverse water quality impact would be anticipated with the implementation of appropriate control measures and good site practices during the operational phase. Furthermore, water quality and hygiene of the nullahs would be improved by the proposed DWFI system.

5.9.3.3 For the “Revised Trunk Road T4”, major sources of water quality impacts were expected to be non-point source surface run-off from new impervious areas; and hydrodynamic and water quality impact on Shing Mun River during operational phase. Based on the approved EIA Report (AEIAR-231/2021), no unacceptable water quality impacts from its operation would be anticipated provided that the recommended mitigation measures are implemented properly.

5.9.3.4 For the operation of “Joint-user complex at Tsuen Nam Road, Tai Wai”, provided that the site drainage would be properly designed and adequate sewerage works would be provided for the development in accordance with relevant guidelines (e.g. ProPECC PN 5/93) to avoid direct discharge of sewage and wastewater to the nearby drainage system and inland watercourses. No unacceptable water quality impact would be anticipated.

5.9.3.5 As neither the Project nor the concurrent projects were anticipated to generate significant water quality impact during the operational phase, adverse cumulative water quality impacts would not be expected.

5.10 Evaluation of Residual Impacts

5.10.1.1 With proper implementation of mitigation measures described in **Section 5.8**, no adverse residual water quality impact to nearby WSRs or downstream areas in Shing Mun River Channel is expected from the construction or operation of this Project.

5.11 Environmental Monitoring and Audit

5.11.1.1 With proper implementation of the recommended pollution control measures, water pollution from the Project would be avoided and minimised and no adverse water quality impacts would be expected during the construction and operational phases. Water quality monitoring is therefore not considered necessary. Nonetheless, regular weekly site audit during the construction phase is proposed to inspect the construction activities and works area to ensure the recommended pollution control measures are properly implemented.

5.11.1.2 While the Project is expected to improve the overall water quality of TWN and environmental monitoring and audit for water quality is not considered necessary for the operational phase under this EIA study, as detailed in **Section 5.8.3.1**, a post-revitalisation water quality monitoring programme to review compliance with the Water Quality Goals as stipulated in DSD PN No. 3/2021 will be established and implemented by the DSD.

5.12 Conclusion

5.12.1 Construction Phase

5.12.1.1 The key issues of the land-based construction works include construction works at and in close proximity to TWN / inland water, wastewater generated from general construction activities, construction site runoff, sewage from construction workforce and accidental spillage of chemicals. The potential water quality impacts would be avoided and minimised by implementing the recommended pollution control measures. No adverse water quality impact during construction phase would therefore be anticipated. Water quality monitoring is therefore not considered necessary. Nonetheless, regular weekly site audit during the construction phase is proposed to inspect the construction activities and works area to ensure the recommended pollution control measures are properly implemented.

5.12.2 Operational Phase

5.12.2.1 The potential sources of water quality impacts during the operational phase would be related to non-point source surface / irrigation runoff, routine maintenance works (maintenance desilting and minor maintenance to DWF1 system), potential changes in hydrodynamics properties and hydrology, and water quality impact from riparian public open space (including operation of UV disinfection system and water play features in amenity area). Adequate drainage system with silt traps and oil interceptors should be incorporated into the proposed works to collect the surface / irrigation runoff or runoff from riparian public open space. With proper design of drainage system and implementation of the recommended pollution control measures, no adverse water quality impact from non-point source surface / irrigation run-off or runoff from riparian public open space would be expected. No adverse water quality impacts would be expected to occur at any identified WSRs due to the small-scale and infrequent routine maintenance works to remove excessive silts, debris and any obstructions for safeguarding the hydraulic capacity of the nullah, which practices and frequencies would be similar to the ones undertaken by DSD along TWN under existing arrangement.

5.12.2.2 Despite the reduced environmental baseflow at the nullah due to the interception of the flow with polluted discharges by the DWF1 system, owing to the natural sloping gradient along TWN and the water retention and replenish designs and ecological enhancement features (e.g. wetland habitats created) within the nullah, average flow rate would remain similar to baseline condition and no unacceptable impacts on hydrodynamics properties and hydrology would be anticipated. No adverse water quality impact during the operational phase would therefore be anticipated.

5.12.2.3 While the Project is expected to improve the overall water quality of TWN and environmental monitoring and audit for water quality is not considered necessary for the operational phase under this EIA study, a post-revitalisation water quality monitoring programme to review compliance with the Water Quality Goals as stipulated in DSD PN No. 3/2021 will be established and implemented by the DSD.

6. WASTE MANAGEMENT IMPLICATIONS

6.1 Introduction

6.1.1.1 This section identifies the types of wastes that are likely to be generated during the construction and operation of the Project and evaluates the potential environmental impacts that may result from the handling, transport and disposal of these wastes.

6.1.1.2 Mitigation measures and good site practices regarding waste handling, storage, collection and disposal have been recommended with reference to the criteria and guidelines as stated in the requirements given in Section 3.4.7 and Appendix E of the EIA Study Brief, as well as Annexes 7 and 15 of the *Technical Memorandum on Environmental Impact Assessment Process* (EIAO-TM) and relevant waste legislation and guidelines.

6.2 Environmental Legislation, Standards and Guidelines

6.2.1.1 The criteria and guidelines for assessing waste management implications are outlined in Annex 7 and 15 of the *EIAO-TM*, respectively.

6.2.1.2 The following legislation also covers the handling, treatment and disposal of wastes in the Hong Kong Special Administrative Region (HKSAR):

- Waste Disposal Ordinance (Cap. 354);
- Waste Disposal (Chemical Waste) (General) Regulation (Cap. 354C);
- Waste Disposal (Charges for Disposal of Construction Waste) Regulation (Cap. 354N);
- Land (Miscellaneous Provisions) Ordinance (Cap. 28);
- Public Health and Municipal Services Ordinance (Cap. 132) – Public Cleansing and Prevention of Nuisances Regulation; and
- Air Pollution Control Ordinance (Cap. 311).

Waste Disposal Ordinance

6.2.1.3 The *Waste Disposal Ordinance (WDO) (Cap. 354)* prohibits any unauthorised disposal of waste. Construction waste defined under Cap. 354N of the *WDO*, refers to a substance, matter or thing which is generated from construction works. It includes all abandoned materials, whether processed or stockpiled or not, before being abandoned, but does not include sludge, screenings or matter removed or generated from desludging, desilting or dredging works. Under the *WDO*, waste can be disposed of only at designated waste disposal facilities licensed by EPD.

Waste Disposal (Chemical Waste) (General) Regulation

6.2.1.4 Under the *WDO*, the *Chemical Waste (General) Regulation (Cap. 354C)* provides regulations for chemical waste control, and administers the possession, storage, collection, transport and disposal of chemical wastes. EPD has also issued three statutory guidelines: *A Guide to the Chemical Waste Control Scheme* (2016) to introduce and explain the legislative controls over the management of chemical waste in Hong Kong; *A Guide to the Registration of Chemical Waste Producers* (2016) to introduce the registration provisions of the Waste Disposal (Chemical Waste)(General) Regulation (the Regulation) and the procedure for identifying chemical waste generation; and the *Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes* (1992), which details how the chemical waste producers should comply with the regulations on chemical waste.

Waste Disposal (Charges for Disposal of Construction Waste) Regulation

6.2.1.5 Under the *Waste Disposal (Charges for Disposal of Construction Waste) Regulation (Cap. 354N)*, construction waste delivered to a landfill for disposal must not contain more than 50% by weight of inert material. Construction waste delivered to a sorting facility for disposal must contain more than 50% by weight of inert material, and construction waste delivered to a Public Fill Reception Facilities (PFRF) for disposal must consist entirely of inert material.

Land (Miscellaneous Provisions) Ordinance

- 6.2.1.6 The inert portion of construction and demolition (C&D) materials (including rocks, soil, broken concrete, building debris, etc.) may be taken to public filling facilities including public filling area, public filling barging points and stockpiling areas. These facilities usually form part of land reclamation schemes and are operated by Civil Engineering & Development Department (CEDD). The *Land (Miscellaneous Provisions) Ordinance (Cap. 28)* requires that individuals or companies who deliver public fill to the public filling facilities are required to obtain Dumping Licences. The licences are issued by CEDD under delegated authority from the Director of Lands.

Public Health and Municipal Services Ordinance

- 6.2.1.7 The *Public Cleansing and Prevention of Nuisances Regulation (Cap. 132)* under the Public Health and Municipal Services Ordinance provides control on dumping of litter in public places.

Other Relevant Guidelines

- 6.2.1.8 Other relevant circulars / guidelines are applicable to waste management practices for the Project include:

- Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes (1992), EPD;
- A Guide to the Chemical Waste Control Scheme (EPD);
- A Guide to the Registration of Chemical Waste Producers (EPD);
- Environment, Transport and Works Bureau Technical Circular (Works) ETWB TC(W) No. 19/2005 'Environmental Management on Construction Sites';
- ETWB TC(W) No. 34/2002, Management of Dredged / Excavated Sediment;
- Development Bureau Technical Circular (Works) DEVB TC(W) No.06/2010 'Trip Ticket System for Disposal of C&D Materials';
- DEVB TC(W) No. 2/2011 'Encouraging the Use of Recycled and other Green Materials in Public Works Projects';
- DEVB TC(W) No. 9/2011 'Enhanced Control Measures for Management of Public Fill';
- DEVB TC(W) No. 08/2010 'Enhanced Specification for Site Cleanliness and Tidiness';
- Works Branch Technical Circular WBTC No. 2/93 'Public Dumps';
- WBTC No. 2/93B 'Public Filling Facilities';
- WBTC No. 16/96 'Wet Soil in Public Dumps';
- WBTC No. 12/2000 'Fill Management';
- WBTC Nos. 25/99, 25/99A and 25/99C, 'Incorporation of Information on Construction and Demolition Material Management in Public Works Subcommittee Papers';
- Project Administration Handbook (PAH) for Civil Engineering Works, Section 4.1.3 of Chapter 4, 2020 Edition; and
- CEDD TC No. 11/2019 'Management of Construction and Demolition Materials'.

- 6.2.1.9 The *ETWB TC(W) No. 19/2005 on Environmental Management on Construction Site* includes procedures on waste management requiring contractors to reduce the C&D materials to be disposed of during the course of construction, The *Project Administration Handbook for Civil Engineering Works, Section 4.1.3 Management of Construction and Demolition Material Including Rock* published by CEDD to enhance the management of C&D materials and to minimise their generation at source. The enhancement measures include drawing up a Construction and Demolition Material Management Plan (C&DMMP) at an early design stage to minimise C&D materials generation and encourage proper management of such materials. Projects generating less than 50,000 m³ C&D materials or importing less than 50,000 m³ of fill material are exempted from the C&DMMP. Under *ETWB TC(W) No. 19/2005*, the Contractor is required to prepare and implement an Environmental Management Plan (EMP) and the Waste Management Plan (WMP) becomes part of the EMP. The WMP will be submitted to the Architect/Engineer for approval.

- 6.2.1.10 Under *DEVB TCW No. 6/2010 Trip Ticket System for Disposal of Construction and Demolition Materials*, for all contracts that are expected to generate inert C&D materials requiring disposal from site, the project office shall write to the Public Fill Committee (PFC) through Secretary of the PFC to request a designated disposal ground for incorporation into the tender documents. For contracts where the estimated amount of non-inert C&D materials requiring disposal at landfill facilities equals to or exceeds 50 m³, the project office shall seek confirmation from the DEP in terms of the availability of landfill facilities for disposal of such materials and the DEP will designate landfill facilities, if available, for the contracts. For contracts where the estimated amount of non-inert C&D materials to be generated from the contract is less than 50 m³, the project office is not required to apply to DEP for designated landfill facilities but it should still specify in the tender documents of the appropriate landfill facilities for disposal.

6.3 Assessment Methodology

- 6.3.1.1 The assessment of waste management impacts arising from the construction and operation activities of the Revitalisation of Tai Wai Nullah, has been undertaken in accordance with the EIA Study Brief and criteria given in Annexes 7 and 15 of the *EIAO-TM* and includes the following tasks:

- Identification of the construction and operation activities of the Project which could give rise to waste arising;
- Estimation of types and quantities of waste generated;
- Examination of opportunities for waste reduction and re-use (both on-site and off-site) and the required disposal options for each waste;
- Evaluation of potential impacts caused by improper handling, collection, transportation and re-use / disposal of wastes with respect to potential hazards, air and odour emissions, noise, wastewater discharges and public transport.

6.4 Identification and Evaluation of Potential Impacts

6.4.1 Construction Phase

- 6.4.1.1 The proposed revitalisation works include the following construction activities:

- Channel Bed Modification;
- Improvement of Existing Walkways and Riparian Public Open Spaces;
- Construction of Dry Weather Flow Interceptor (DWFI) System;
- Landscaping and Miscellaneous Works;
- Desilting Works at Downstream Tidal Zone;
- Construction of Mid-stream Underground Water Pumps for Ecological Enhancement-Associated Water Retention and Supplement

- 6.4.1.2 The types of waste associated with these construction activities include:

- C&D materials;
- Desilted materials from desilting;
- Chemical waste; and
- General refuse

C&D Materials

- 6.4.1.3 C&D materials would be generated from the channel bed modification, improvement of existing walkways and riparian public open space, landscaping and miscellaneous works, construction of DWFI system and mid-stream underground water pumps. The C&D materials would both comprise inert C&D materials (e.g. soil, rock and concrete, etc.) and non-inert C&D materials (e.g. timber, paper, etc.) generated. Based on the current latest design information, it is estimated a total of approximately 122,000 m³ of C&D materials would be generated during construction phase. A summary of the C&D materials estimates during construction phase is shown in **Table 6.1**.

- 6.4.1.4 The inert C&D materials should be reused on-site as far as possible to minimise the net amount of inert C&D materials generated from the Project. It is estimated that that approximately 116,000 m³ of inert C&D materials (mainly soil) could be reused on-site as backfill materials whilst approximately 4,000 m³ of surplus inert C&D materials would be delivered to public fill reception facility (PFRF) for beneficial reuse in other projects. It is proposed to deliver the materials at Tseung Kwan O Area 137 Fill Bank for beneficial reuse in other projects via Lung Cheung Road and Kwun Tong Road or other approved PFRF. It is estimated that an average of about 1 truck trip per day will be required to dispose these materials off-site.
- 6.4.1.5 It is estimated that approximately 2,000 m³ of non-inert C&D materials would be generated during construction phase. The non-inert C&D materials would be reused and recycled as much as possible before disposal of at landfill. It is proposed to dispose the materials at NENT landfill via Tate's Cairn Highway, Territories Circular Road and Po Shek Wu Road or other approved landfills. It is estimated that an average of about 1 truck trip per day will be required to dispose these materials off-site. DSD shall enquire with the EPD on the availability of landfill and acceptability of the waste.
- 6.4.1.6 The waste collection frequency and transportation routes would be reviewed and subject to the actual operation of the construction activities. Considering the minor scale of the construction activities, no barging point or conveyor system would be necessary.

Table 6.1 Summary of Estimated Quantities of C&D Materials Generated during Construction Phase

Inert C&D Materials (m ³)		Non-inert C&D Materials (m ³)	Total C&D Materials (m ³)
Inert C&D Materials to be Reused	Inert C&D Materials to be Beneficially Reused in Other Projects		
116,000	4,000	2,000	122,000

Note:

* The non-inert C&D materials would be reused and recycled as much as possible before disposal of at landfill.

- 6.4.1.7 It is the Contractor's responsibility to separate the inert and non-inert C&D materials on-site. The non-inert C&D materials would be disposed of at strategic landfill and surplus inert C&D materials will be transported to PFRF by trucks. A Construction and Demolition Material Management Plan (C&DMMP) would be prepared in accordance with Section 4.1.3 of the *Project Administration Handbook for Civil Engineering Works (PAH)* and submitted to Public Fill Committee (PFC) for approval in the detail design stage. With the implementation of proper management for C&D materials and good site practices, no unacceptable environmental impacts (including potential hazard, air and odour emissions, noise and wastewater discharges) and public transport impact due to handling and disposal of C&D materials arising from the Project would be anticipated.

Desilted Materials from Desilting at Downstream Tidal Zone

- 6.4.1.8 Two desilting works at downstream tidal zone would tentatively be undertaken at the commencement and prior to the completion of the construction works respectively (**Appendix 2.2** refers) to remove the accumulated silting and debris at the nullah. The desilting volume of each desilting works is estimated to be 1,000 m³, i.e. a total of 2,000 m³. The desilted materials will be contained in watertight container on-site and be transported off-site by trucks for disposal of at NENT landfill. With the implementation of proper management for desilted materials and good site practices, no unacceptable environmental impacts (including potential hazard, air and odour emissions, noise and wastewater discharges) and public transport impact due to handling and disposal of the desilted materials arising from the Project would be anticipated.

Chemical Waste

- 6.4.1.9 Materials classified as chemical waste shall require special handling and storage arrangements by the Contractor. All chemical waste shall be collected by a licensed collector and be disposed at a licensed chemical waste treatment and disposal facility such

as Chemical Waste Treatment Centre (CWTC) at Tsing Yi. Unused chemical or those with remaining functional capacity would be reused and recycled on site or by licensed companies whenever possible. Mitigation and control requirements for chemical wastes are detailed in **Section 6.5.1.10**. Provided that the handling, storage and disposal of chemical wastes are to be in accordance with these requirements, adverse environmental impacts (including potential hazard, air and odour emissions, noise and wastewater discharges) or public transport impact would not be expected.

- 6.4.1.10 The maintenance and servicing of construction plants and vehicles would generate a negligibly small amount of chemical wastes, for instance, oil / grease, cleaning fluids, solvents, lubrication oil and fuel, used oil filter and scrap batteries. It is difficult to quantify the amount of chemical waste that would arise from the construction activities as it would be highly dependent on the contractor's on-site maintenance activities and the quantity of plant and equipment utilised. It is anticipated that the quantity of chemical waste would be small and in the order of a few cubic meters per month. The amount of chemical waste to be generated would be quantified in the WMP to be prepared by the Contractors. Since the construction activities would be carried out in the vicinity to the drainage system, chemical wastes arising during the construction phase may pose environmental, health and safety hazards if not stored and disposed of in an appropriate manner as stipulated in the *Waste Disposal (Chemical Waste) (General) Regulations (Cap. 354C)*.

General Refuse

- 6.4.1.11 General refuse comprises general site wastes, such as packaging and container waste from materials and equipment used on the site, and refuse generated by workforce. It is estimated that around 30 workers would be working on site per day during construction phase. Based on a generation rate of 0.65 kg per worker per day, the daily arising of general refuse during the construction period would be about 19.5 kg. Although the quantity of general refuse is expected to be small, improper collection and removal of general refuse would give rise to hygiene problems and adverse environmental impacts to local residents, e.g. odour impacts, and contamination of the nearby drainage channel if being blown around by wind, flushed or leached into the waterbodies.
- 6.4.1.12 The general refuse will be collected on-site on a daily basis, separately from C&D materials by an appropriate waste collector to be employed by the Contractor. Prior to disposal off-site, such refuse will be temporarily put in suitably covered storage areas / bins where they will have to be regularly cleaned and maintained to avoid attracting vermin and pests. With proper on-site handling and storage as well as regular disposal of the waste, no unacceptable environmental impact (including potential hazard, air and odour emissions, noise and wastewater discharges) or public transport impact would be anticipated. Recommendations of mitigation measures for managing general refuse are presented in **Section 6.5.1.11**.

6.4.2 Operational Phase

- 6.4.2.1 During the operational phase of the Project, similar to the existing practices, regular maintenance works for the drainage and sewerage systems along TWN, including desilting along the nullah and minor maintenance to the DWFI system, would be carried out by the DSD to remove excessive silts, debris and any obstructions to safeguard the hydraulic capacity of the nullah. The maintenance practices and frequency would be similar to the existing maintenance works undertaken by the DSD. Maintenance desilting of the nullah would tentatively be carried out on an annual basis during dry season (November to March) when the water flow is low, except during emergency situations where the accumulated silt would adversely affect the hydraulic capacity of the nullah or where flooding risk is imminent, or when complaints on environmental nuisance associated with the accumulated silt are received. Minor maintenance to DWFI system would only be undertaken on an as-needed basis and frequent maintenance (i.e. monthly) would not be required. Small amount of silt, debris and screenings, which would be similar in nature to general refuse, would be generated from the operation and routine maintenance works of the DWFI system and nullah. Such waste will be removed by hand-held / light machinery and disposed of at landfill after the clearance works. Similar to the existing maintenance practices at TWN, regular maintenance desilting along the nullah would be undertaken during operational phase and approximately 100m³ of desilted materials, which are similar to general refuse, are anticipate

to be generated from each routine desilting maintenance works with reference to the existing practice. Very small amount of chemical waste, in the order of less than a cubic meter each time, would be generated during maintenance works and would be properly stored, labelled and removed by licensed waste collectors. No unacceptable environmental impact (including potential hazard, air and odour emissions, noise and wastewater discharges) and public transport impact would thus be anticipated.

- 6.4.2.2 General refuse would also be generated from the visitors to the revamped public open space (e.g. viewing decks, walkways, pavilions etc.) along TWN and riparian amenity areas near Pok Ngar Villa. Under the revitalisation design, there would be an addition of around 420 visitors per day on weekdays and 1,845 visitors per day on weekends/holidays, mainly at the riparian amenity areas. Based on the additional number of visitors and the 0.60 kg per capita generation rate of commercial waste (waste generated by visitor) in 2019¹, around 252 kg and 1,107 kg of general refuse would be generated daily on weekdays and on weekends/holidays respectively during operation. Provided that sufficient number of trash bins and recycling bins (which are enclosed / covered with lid) have already been provided and would be retained for the collection of general refuse generated by visitors along TWN, no unacceptable environmental impact (including potential hazard, air and odour emissions, noise, wastewater discharges and wind-blown litters) and public transport impact would thus be anticipated. Same as the existing practice, the general refuse would be removed by reputable waste collector on a daily basis.

6.5 Mitigation Measures

6.5.1 Construction Phase

Waste Management Hierarchy

- 6.5.1.1 The waste management hierarchy has been applied in the assessment and development of mitigation measures for waste which aims at evaluating the desirability of waste management methods and includes the followings in descending preference:

- Avoidance and reduction of waste generation;
- Reuse of materials as far as practicable;
- Recovery and recycling of residual materials where possible; and
- Treatment and disposal according to relevant laws, guidelines and good practices.

- 6.5.1.2 Good site practices and waste reduction measures to achieve avoidance and minimisation of waste generation in the hierarchy are recommended as follow.

Good Site Practices

- 6.5.1.3 Adverse impacts would not arise in the construction site, provided that good site practices are strictly followed. Recommendations for good site practices during the construction phase include:

- Nomination of approved personnel, such as a site manager, to be responsible for implementation of good site practices, arrangements for waste collection and effective disposal to an appropriate facility;
- Training of site personnel in site cleanliness, concepts of waste reduction, reuse and recycling, proper waste management and chemical waste handling procedures;
- Provision of sufficient waste reception / disposal points, and regular collection of waste;
- Adoption of appropriate measures to minimise windblown litter and dust during transportation of waste by either covering trucks or by transporting wastes in enclosed containers;

¹ According to Monitoring of Solid Waste in Hong Kong – Waste Statistics for 2020, the quantity of municipal solid waste (MSW) disposed in 2020 has reduced as compared to 2019 partly due to the COVID-19 pandemic, which affected local consumption and economic activities and the associated waste disposal. As such, the waste disposal rate in 2019 has been adopted for conservative assessment. The disposal rate of commercial waste (waste generated by visitors) was 0.60 kg/person/day in 2019.

- Provision of regular cleaning and maintenance programme for drainage systems, sumps and oil interceptors;
- Adoption of a recording system for the amount of wastes generated, recycled and disposed (including the disposal sites); and
- Preparation of WMP, as a part of the EMP in accordance with ETWB TC(W) No. 19/2005 "Environmental Management on Construction Sites" for submission to the Architect/Engineer for approval.

Waste Reduction Measures

6.5.1.4 Good management and control of construction site activities / processes can minimise the generation of waste. Waste reduction is best achieved at the planning and design stage, as well as by ensuring the implementation of good site practices. Recommendations to achieve waste reduction are discussed as follow:

- Segregate and store different types of construction related waste in different containers, skips or stockpiles to enhance reuse or recycling of materials and their proper disposal;
- Provide separate labelled bins to segregate recyclable waste such as aluminium cans from other general refuse generated by the work force, and to encourage collection by individual collectors;
- Recycle any unused chemicals or those with remaining functional capacity;
- Maximise the use of reusable steel formwork to reduce the amount of C&D materials;
- Adopt proper storage and site practices to minimise the potential for damage to, or contamination of construction materials;
- Plan the delivery and stock of construction materials carefully to minimise the amount of waste generated; and
- Minimise over ordering and wastage through careful planning during purchasing of construction materials.

6.5.1.5 In addition to the above good site practices and waste reduction measures, specific mitigation measures are recommended below for the identified waste arising to minimise environmental impacts during the handling, transportation and disposal of these waste.

Reducing and Reuse of C&D Materials

6.5.1.6 Careful design, planning together with good site management can reduce over-ordering and generation of C&D materials such as concrete, mortar and cement grouts. Formwork should be designed to minimise the use of standard wooden panels, so that high reuse levels can be achieved. Alternatives such as steel formwork or plastic facing should be considered to increase the potential for reuse.

6.5.1.7 To minimise off-site disposal of inert C&D materials, the excavated inert materials with suitable characteristics / size should be reused on-site as fill material as far as practicable. The surplus inert C&D materials would be transported and delivered to public filling area for beneficial reuse as fill material by other projects. Prior to disposal of non-inert C&D materials, wood, steel and other metals should also be separated for reuse and / or recycle where practicable so as to minimise the quantity of waste to be disposed of at landfill.

Storage of C&D Materials

6.5.1.8 Suitable areas should be designated within the works site boundaries for temporary stockpiling of C&D materials. The temporary storage of C&D materials on-site should be limited to no more than 1,000m³. Within stockpile areas, the following measures should be taken to control potential environmental impacts or nuisance:

- cover material during heavy rainfall;
- locate stockpiles to minimise potential visual impacts; and
- minimise land intake of stockpile areas as far as possible.

Delivering of C&D Materials

6.5.1.9 In order to monitor the delivering of C&D materials at the designated public fill reception facility and landfill and to control fly-tipping, a trip-ticket system should be included. One

may make reference to *DEVB TC(W) No.06/2010* for details. A recording system for the amount of waste generated, recycled and disposed, including the disposal sites, should also be set up. Warning signs should be put up to remind the designated disposal sites. CCTV should also be installed at the vehicular entrance and exit of the site as additional measures to prevent fly-tipping. When delivering inert C&D materials at a public fill reception facility for beneficial reuse, the material shall only consist of soil, rock, concrete, brick, cement plaster / mortar, inert building debris, aggregates and asphalt, and be free from marine mud, household refuse, plastic, metals, industrial and chemical waste, animal and vegetable matter, and other material considered to be unsuitable by the Filling Supervisor.

Chemical Waste

- 6.5.1.10 If chemical waste is produced at the construction site, the Contractor would be required to register with the EPD as a Chemical Waste Producer and must follow the guidelines stated in the *Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes*. Good quality containers compatible with the chemical wastes should be used, and incompatible chemicals should be stored separately. Appropriate labels should be securely attached on each chemical waste container indicating the corresponding chemical characteristics of the chemical waste, such as explosives, flammable, oxidising, irritant, toxic, harmful, corrosive, etc. The Contractor shall use a licensed collector to transport and dispose of the chemical wastes at a licensed chemical waste treatment and disposal facility such as CWTC at Tsing Yi in accordance with the *Waste Disposal (Chemical Waste) (General) Regulation*.

General Refuse

- 6.5.1.11 General refuse should be stored in enclosed bins or compaction units separate from C&D materials and chemical wastes. A reputable waste collector should be employed by the Contractor to remove general from the site, separately from C&D materials and chemical wastes, on a daily basis to minimise odour, pest and litter impacts. The collected general refuse will be disposed of at designated landfill. Clearly labelled recycling bins should be provided on site in order to encourage segregation and recycling of aluminium and plastic wastes, and wastepaper in order to reduce general refuse production. The contractor should carry out an education programme for workers in avoiding, reducing, reusing and recycling of materials generation. Posters and leaflets advising on the use of the bins should also be provided onsite as reminders. The recyclable waste materials should then be collected by reliable waste recycling agents on a regular basis.

Desilted Materials

- 6.5.1.12 The desilted materials should be contained in watertight container on-site and be transported off-site by trucks for disposal of at strategic landfill. In order to minimise the potential odour emissions during excavation and transportation of the desilted materials, the excavated silts shall be wetted during excavation / material handling and shall be properly covered when placed on trucks. Loading of the materials to the truck shall be controlled to avoid splashing and overflowing of the slurry to the surrounding water.
- 6.5.1.13 Requirements of the Air Pollution Control (Construction Dust) Regulation and Water Pollution Control Ordinance (WPCO), where relevant, shall be adhered to during excavation, transportation and disposal of the desilted materials.

6.5.2 Operational Phase

- 6.5.2.1 The maintenance practices would be similar to the existing maintenance works undertaken by the DSD. The silt materials, debris and screenings from the DWFI system and nullah during routine maintenance, as well as from maintenance desilting would be stored in enclosed bins or compaction units and transported to the designated landfill for disposal as soon as possible following good waste management practices for handling of desilted materials generated during construction phase as detailed in **Sections 6.5.1.12 – 6.5.1.13**.
- 6.5.2.2 Mitigation measure as mentioned in **Section 6.5.1.10** would be followed during operational phase. All chemical waste generated from the maintenance works should be properly stored, labelled and removed by licensed waste collectors in accordance with *Waste Disposal (Chemical Waste) (General) Regulation*.

- 6.5.2.3 Sufficient number of trash bins and recycling bins have already been provided and would be retained for the collection of general refuse generated by visitors along TWN. Same as the existing practice, the general refuse would be removed by reputable waste collector on a daily basis.
- 6.5.2.4 A summary of the various types of waste to be generated during construction and operational phases of the Project, together with the recommended handling methods and disposal routes are presented in **Table 6.2**.

Table 6.2 Summary of Waste Handling Methods, Transportation Routes and Disposal Outlets

Waste Type and Estimated Quantity to be Generated	Handling Methods	Transportation Routes & Disposal Outlets
Construction Phase		
Inert C&D materials • 120,000 m ³	<ul style="list-style-type: none"> Segregation from non-inert C&D materials Reuse on-site as far as practicable 	<ul style="list-style-type: none"> Tseung Kwan O Area 137 Fill Bank for beneficial reuse in other projects via Lung Cheung Road and Kwun Tong Road
Non-inert C&D materials • 2,000 m ³	<ul style="list-style-type: none"> Segregation from inert C&D materials Reusable materials should be separated and recycled as far as practicable 	<ul style="list-style-type: none"> NENT landfill via Tate's Cairn Highway, Territories Circular Road and Po Shek Wu Road
Chemical wastes from maintenance and servicing of construction plants • A few cubic meters per month	<ul style="list-style-type: none"> Unused chemical would be recycled on-site or off-site disposal by licensed collectors. Store on-site within suitably designed containers 	<ul style="list-style-type: none"> CWTC via Tsing Sha Highway
General refuse • 19.5 kg/day	<ul style="list-style-type: none"> Provide on-site refuse collection facilities Provide on-site clearly labelled recycling bins for segregation of aluminium and plastic wastes, and wastepaper 	<ul style="list-style-type: none"> Employ a reputable waste collector for collection and final disposal of general refuse to NENT landfill to via Tate's Cairn Highway, Territories Circular Road and Po Shek Wu Road Employ reliable waste recycling agents to collect the segregated recyclable wastes
Desilted materials from desilting works at downstream tidal zone • 2,000 m ³	<ul style="list-style-type: none"> Contained in watertight container on-site 	<ul style="list-style-type: none"> Employ a reputable waste collector for collection and final disposal of general refuse to NENT landfill to via Tate's Cairn Highway, Territories Circular Road and Po Shek Wu Road
Operational Phase		
Silts, debris and screenings from maintenance of DWFI system and nullah • Small amount	<ul style="list-style-type: none"> Store in enclosed bins or compaction units for off-site disposal by reputable waste collector 	<ul style="list-style-type: none"> NENT landfill via Tate's Cairn Highway, Territories Circular Road and Po Shek Wu Road
Desilted materials from maintenance desilting works • Up to 100 m ³ each time	<ul style="list-style-type: none"> contained in watertight container on-site 	<ul style="list-style-type: none"> Employ a reputable waste collector for collection and final disposal of general refuse to NENT landfill to via Tate's Cairn Highway, Territories Circular Road and Po Shek Wu Road
Chemical wastes • Very small amount of	<ul style="list-style-type: none"> Store in compatible containers in designated 	<ul style="list-style-type: none"> CWTC via Tsing Sha Highway

Waste Type and Estimated Quantity to be Generated	Handling Methods	Transportation Routes & Disposal Outlets
less than a cubic meter each time	area on site for off-site disposal by licensed collectors	
General refuse from visitors along TWN <ul style="list-style-type: none"> • 252 kg/day on weekdays • 1,107 kg/day on weekends/holidays 	<ul style="list-style-type: none"> • Retain existing trash bins and recycling bins along TWN for collection of general refuse 	<ul style="list-style-type: none"> • Follow existing practice to be collected and removed by reputable waste collector for final disposal of to NENT landfill via Tate's Cairn Highway, Territories Circular Road and Po Shek Wu Road

6.6 Evaluation of Residual Impacts

6.6.1.1 With the implementation of the recommended mitigation measures for the handling, transportation and disposal of the identified waste arising, residual impacts would not be expected during the construction and operation of the proposed Project.

6.7 Environmental Audit

6.7.1 Construction Phase

6.7.1.1 Waste management would be the Contractor's responsibility to ensure that all wastes produced during the construction of the Project are handled, stored and disposed of in accordance with good waste management practices and EPD's regulations and requirements. The recommended mitigation measures should form the basis of the site WMP to be developed by the Contractors as part of the Environmental Management Plan in accordance with ETWB TC(W) No. 19/2005 *Environmental Management on Construction Sites* and submitted to the Architect / Engineer for approval at the construction stage. The monitoring and auditing requirement stated in ETWB TCW No.19/2005 should be followed with regard to the management of C&D materials.

6.7.1.2 Monthly site audit should be conducted by the Environmental Team (ET) during construction phase to check if wastes are being managed in accordance with approved procedures. The audits should cover site inspection on all aspects of on-site waste management practices including waste generation, storage, recycling, transport and disposal. Apart from site inspections, waste management related documents including licenses, permits, disposal and recycling records should be reviewed and audited for compliance with the legislation of the recommended good site practice and other waste management mitigation measures under the site audit.

6.7.2 Operational Phase

6.7.2.1 It is expected that there would be limited quantities of waste to be generated from the operation of the Project and adverse environmental impacts would not be anticipated with the implementation of good waste management practices following the existing practices of regular maintenance works. Environmental audit programme on waste management for the operation phase of the Project would not be required.

6.8 Conclusion

6.8.1.1 During construction phase, waste types generated from the Project are likely to include C&D materials from construction activities, chemical wastes from maintenance and servicing of construction plants and vehicles, desilted materials from desilting works at downstream tidal zone, and general refuse from workforce. In view of the nature and limited scale of the Project, the quantity of waste arisings would not be substantial. However, improper handling, collection, transportation and re-use / disposal of the wastes would likely give rise to hygiene problems and adverse environmental impacts, e.g. odour nuisance to local residents, and contamination of the nearby watercourses. Provided that these wastes are handled, transported and disposed of according to the recommended good site practices

and measures, no adverse environmental impacts (including potential hazard, air and odour emissions, noise and wastewater discharges) would be anticipated during the construction phase.

- 6.8.1.2 The main waste types generated from the operation of the Project would be silt, debris, screening and limited amount of chemical waste from the routine maintenance of the DWFI system and nullah as well as desilted materials from maintenance desilting works. The maintenance practices would be similar to the existing maintenance works undertaken by the DSD. With implementation of the good waste management practices, adverse environmental impacts (including potential hazard, air and odour emissions, noise and wastewater discharges) and public transport impact would not be anticipated during operational phase. General refuse would also be generated from the visitors of the revamped public open space along TWN. Provided that sufficient number of trash bins and recycling bins have already been provided and would be retained for the collection of general refuse generated by visitors along TWN, no unacceptable environmental impact would be anticipated.

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7 LAND CONTAMINATION

7.1 Introduction

7.1.1.1 This section presents the potential implications of land contamination associated with the Project.

7.2 Environmental Legislations, Standards and Guidelines

7.2.1.1 The relevant environmental guidelines and standards on land contamination aspect include the following:

- Annex 19 of Technical Memorandum on Environmental Impact Assessment Process (*EIAO-TM*)
- Guidance Note for Contaminated Land Assessment and Remediation (Guidance Note) – The Guidance Note sets out the requirements for proper assessment and management of potentially contaminated sites such as oil installations (e.g. oil depots, petrol filling stations), gas works, power plants, shipyards / boatyards, chemical manufacturing / processing plants, steel mills / metal workshops, car repairing / dismantling workshops and scrap yards. In addition, this Guidance Note provides guidelines on how site assessments should be conducted and analysed and suggests practical remedial measures that can be adopted for the remediation of contaminated sites.
- Practice Guide for Investigation and Remediation of Contaminated Land (Practice Guide) – The Practice Guide outlines typical investigation methods and remediation strategies for the range of potential contaminants typically encountered in Hong Kong.
- Guidance Manual for Use of Risk-based Remediation Goals for Contaminated Land Management (Guidance Manual) – The Guidance Manual introduces the risk based approach in land contamination assessment and present instructions for comparison of soil and groundwater data to the Risk-Based Remediation Goals (RBRGs) for 54 chemicals of concern commonly found in Hong Kong. The RBRGs were derived to suit Hong Kong conditions by following the international practice of adopting a risk-based methodology for contaminated land assessment and remediation and were designed to protect the health of people who could potentially be exposed to land impacted by chemicals under four broad post restoration land use categories. The RBRGs also serve as the remediation targets if remediation is necessary.

7.3 Description of Environment

7.3.1.1 The Project site covers the existing Tai Wai Nullah, which is approximately 2 km long and 40 m wide, located at the northern region of the Tai Wai District and is mainly surrounded by residential developments. The general layout of the Project is shown in **Figure 2.1**.

7.4 Assessment Methodology

7.4.1.1 Land contamination assessment was carried out according to the abovementioned EIAO-TM, Guidance Note, Practice Guide, Guidance Manual as well as the requirements given in Section 3.4.8 and Appendix F of the EIA Study Brief.

7.4.1.2 A site appraisal, including site walkover and desktop review, was conducted to identify the potentially contaminating activities that may pose adverse impact to the Project. Site walkover was conducted within the Project site to review the general site conditions and to identify any sources of land contamination (or 'hotspots'). For the desktop review, the following information was reviewed:

- Aerial photographs and topographic maps held by the Lands Department;
- Hong Kong Geological Survey Map (Series HGM20) – Sheet No. 7 (1:20,000);
- Records on dangerous goods, Chemical Waste Producer, chemical spillage/leakage and fire incidents from the identified potentially contaminated sites from Environmental Protection Department (EPD) and Fire Services Department (FSD); and
- Relevant ground investigation (GI) reports from the Civil Engineering and Development Department (CEDD) civil engineering library.

7.4.1.3 If potentially contaminated land use(s) were identified within the Project site, the potential land contamination impacts arising from the Project would be evaluated and appropriate mitigation measures would be recommended. If necessary, Contamination Assessment Plan (CAP), Contamination Assessment Report (CAR) and Remediation Action Plan (RAP) would be submitted to EPD for endorsement. Any contaminated soil and/or groundwater should be treated according to EPD's approved RAP. A Remediation Report (RR), demonstrating adequate remediation, should be submitted to EPD for endorsement prior to the commencement of any development or redevelopment works within the Project site.

7.5 Identification of Potential Land Contamination Concern

7.5.1 Review of Historical Land Use

7.5.1.1 A review of historical aerial photographs was undertaken to evaluate the likelihood of potential contamination associated with past land uses within the Project site. Findings of the review are summarised in **Table 7.1** below and the aerial photographs reviewed are provided in **Appendix 7.1**.

Table 7.1 Aerial Photographs Reviewed

Year	Reference of Aerial Photos in Appendix 7.1 (Photo Reference Number#)	Description of Land-Uses and Site Operation/Activities
1963	AP1 (#1963-6155)	The Project site was mainly occupied by agricultural land, village houses and the Shing Mun River.
1973	AP2 (#03252)	The existing Tai Wai Nullah was observed within the Project site. The village houses and agricultural land were no longer observed in the Project site.
1983	AP3 (#48565)	The existing Shing Mun River Channel and Pok Ngar Villa were observed in the south eastern and northern section of the Project site respectively. Existing Tsuen Nam Road and the riverbank of Shing Mun River Channel were observed within the encroached portion of "Industrial (I)" zone.
1993	AP4 (#A36821)	The existing power cable bridge and Pak Tin Village Section 5 Refuse Collection Point were observed at the centre and west of the Project site respectively.
2003	AP5 (#CW53245)	No significant land use changes were observed within the Project site.
2013	AP6 (#CS45201, #CS45203)	No significant land use changes were observed within the Project site.
2021	AP7 (#E129333C, #E129336C, #E129339C, #E129342C)	Existing Tai Wai Soccer Pitch was observed in the southeast of the Project site. No significant land use changes were observed in the remaining portions of the Project site.

#Source of aerial photographs: Survey and Mapping Office, Lands Department

7.5.1.2 Based on the review, no potentially contaminating land uses were identified within the Project site. Non-contaminating land use including the existing Tsuen Nam Road and the riverbank of Shing Mun River Channel were observed within the encroached portion of "Industrial (I)" zone since 1983. No potential land contamination issues within the encroached portion of the "Industrial (I)" zone were noted.

7.5.2 Site Geology

- 7.5.2.1 Based on the HKGS 1:20,000 Geological Map Sheet No.7, 2nd Edition (GEO, 2008), the Project site and the adjacent hillsides generally comprises coarse-grained biotite granite of Needle Hill Granite of Kwai Chung Suite (Jkt_gc). A layer of colluvium (Qd) and alluvium (Qcd and Qfa) is identified as superficial soil.
- 7.5.2.2 Based on available Ground Investigation (GI) records, a layer of fill with thickness varying from 0.1 m to 8.5 m and grain size ranging from silt to gravel was located on the top of the Project site. Approximately 0.1 m to 9.6 m thick of alluvium (typically silt to gravel) was identified underneath the fill. A layer of colluvium with thickness up to 10.2 m and grain size varying between silt and sand was also encountered below the fill / alluvium.
- 7.5.2.3 Approximately 1.18 m to 23 m thick of saprolite comprising highly to completely decomposed granite was encountered. The inferred rockhead level varies from -26.88 mPD to +14.97 mPD. In general, the weathering profile appeared to become deeper towards the southeast. The bedrock was typically described as moderately strong to strong, moderately to slightly decomposed granite.

7.5.3 Acquisition of Information from Government Departments

- 7.5.3.1 The EPD and FSD were contacted for (i) records of any spillage / leakage of chemicals, (ii) records of Dangerous Goods (DG) and (iii) records of Chemical Waste Producer(s) (CWPs) within the Project site.
- 7.5.3.2 EPD and FSD's replies on the request have been received and attached in **Appendix 7.2**. The information is summarised below.

Environmental Protection Department

- 7.5.3.3 Based on the replies given by EPD on 18 September 2020 and 14 September 2022, there is no record of spillage / leakage of chemical wastes or chemicals within the Project site.
- 7.5.3.4 Further to the EPD's reply, visits to EPD's Southorn Centre Office were undertaken on 14 October 2020 and 4 November 2022 to review the available CWP records. No CWP records were found within the Project site.

Fire Services Department

- 7.5.3.5 Based on the reply from FSD on 21 September 2020 and 5 October 2022, no records of DG license or incidents of spillage / leakage of DG were found within the Project site. However, there were a total of 8 incidents records and the details are summarized in **Table 7.2**. Locations of the incidents are shown in **Figure 7.1 to 7.3**.
- 7.5.3.6 As shown in **Table 7.2**, of the 8 incident records, 7 (Record No. 1 to 7) are related to fire incidents whereas 1 (Record No. 8) is related to animal rescue. Given the nature of the incident, no land contamination issues are anticipated for Record No. 8.
- 7.5.3.7 For the remaining 7 incident records (Record No. 1 to 7), based on the observation from the site walkover (refer to **Section 7.5.4**), no stains, burn marks or stressed vegetation were observed at the locations. As such, these 7 incidents were not expected to pose any potential land contamination issues to the Project.

Table 7.2 Summary of Incident Records

Record No.	Address / Lamp Post No. (Photo Reference Number in Figure 7.1 to Figure 7.3)	Date	Types of Incidents
1.	Near Lamppost EA5356, Near Shing Mun Tunnel Road, Roadside (#3472)	7 September 2019	Vegetation Fire
2.	Near Lamppost AE3708, Near Shing Wan Road, Roadside (#3462)	20 February 2020	Rubbish Fire
3.	Near Lamppost BE4330, Chung Ling Road (#3465)	24 February 2020	Rubbish Fire
4.	7SW-D/C331, Near Shing Mun River (#3552)	26 February 2020	Rubbish Fire

Record No.	Address / Lamp Post No. (Photo Reference Number in Figure 7.1 to Figure 7.3)	Date	Types of Incidents
5.	Lamppost BE4333, Near Shing Mun Tunnel Road, Tung Lo Wan Hill Road (#3469)	24 May 2020	Vegetation Fire
6.	Near Lamppost BE4332, Near Shing Mun Tunnel Road, Roadside (#3467)	20 June 2020	Vegetation Fire
7.	Lamppost CE0608, Near Heung Fan Liu Street (#3495)	20 January 2021	Rubbish Fire
8.	Near Lamppost CE0957, Near Mei Tin Road (outside Project site)	18 February 2022	Animal Rescue

7.5.4 Site Walkovers

- 7.5.4.1 Site walkovers were conducted on 14 August 2020 and 31 October 2022 to investigate any contaminative issues associated with current land uses and activities within the Project site. Findings of the site walkover, including the photographic records and site layout plan, are shown in **Figure 7.1 to 7.3**. Site walkover checklist is provided in **Appendix 7.3**.
- 7.5.4.2 The Project site was occupied by non-contaminating land uses including vegetation, Tai Wai Nullah, sections of Shing Mun River Channel and Mei Tin Road, footbridges, bridges, a cable bridge, footpaths, pedestrian underpass, cycling tracks, a football field (Tai Wai Soccer Pitch), a garden (Pok Ngar Villa) and a refuse collection point. The areas at/near the 7 FSD fire incident records (Record No. 1 to 7) as discussed in **Section 7.5.3** above were occupied by footpaths, cycling tracks and slope. Based on the site walkover, no chemical / oil storage, burn marks or stressed vegetation were observed within the Project site. The concrete paved ground was noted to be in good condition with no oil stains observed. No potentially contaminating land uses / activities were observed within the Project site during the site walkover.
- 7.5.4.3 According to the Approved Sha Tin Outline Zoning Plan (OZP) No. S/ST/36, part of the Project site was identified as "Industrial (I)" zone. However, the encroached portion only consists of Tsuen Nam Road, footpath, cycling tracks and vegetated land. Based on the site walkover, no chemical / oil storage or stressed vegetation were observed within the encroached portion. The concrete paved ground was noted to be in good condition with no oil stains observed. No potentially contaminating land uses / activities were observed during the site walkover. Given the above, no potential land contamination issues within the encroached portion of the "Industrial (I)" zone were observed.

7.6 Prediction and Evaluation of Environmental Impacts

- 7.6.1.1 Based on the findings of site appraisal, the Project site has been occupied by non-contaminating land uses (e.g. the existing nullah, football field, refuse collection point and roads) and no potentially contaminating activities were observed. Therefore, no adverse land contamination impact arising from the Project is anticipated and mitigation measures are considered not necessary. No further site investigation (SI) works at the Project site is required.

7.7 Evaluation of Residual Impacts

- 7.7.1.1 As land contamination impacts are not anticipated for the Project, no residual impacts are expected.

7.8 Environmental Monitoring and Audit

- 7.8.1.1 Based on the site appraisal, no land contamination impacts are anticipated for the Project. No environmental monitoring and audit programme would be required.

7.9 Conclusion

- 7.9.1.1 A site appraisal, in the form of desktop review and site walkover, was conducted from August 2020 to November 2022 to identify any current/historical potentially contaminating and uses within the Project site.
- 7.9.1.2 Based on the findings of the site appraisal, no adverse land contamination impact arising from Project is anticipated. No further SI works at the Project site is required.

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8 SEWERAGE AND SEWAGE TREATMENT IMPLICATION

8.1 Introduction

8.1.1.1 This section presents the assessment on potential sewerage and sewage treatment impacts on the downstream public sewerage, sewage treatment and disposal facilities arising from the Project, which has been conducted in accordance with the criteria and guidelines as stated in Section 6.5 of Annex 14 of the *Technical Memorandum on Environmental Impact Assessment Process* (EIAO-TM) as well as the requirements given in Clause 3.4.9 and Appendix G of the EIA Study Brief (No. ESB-320/2019).

8.2 Description of Environment

8.2.1.1 Tai Wai Nullah is located within the catchment of Sha Tin Sewage Treatment Works (STSTW). The land uses within the Project boundary are mainly residential and commercial uses, partly industrial uses, and some recreational areas.

8.3 Design Guidelines and Standards

8.3.1.1 The design guidelines and standards adopted in the sewerage and sewage treatment assessment are:

- DSD Sewerage Manual Part 1 (2013 Version);
- DSD Sewerage Manual Part 2 (2013 Version);
- DSD Technical Circulars and Practice Notes;
- EPD Guideline for Estimating Sewage Flows for Sewage Infrastructure Planning Version 1.0 (Report No. EPD/TP 1/05); and
- Environmental Impact Assessment Ordinance (EIAO), Technical Memorandum on Environmental Impact Assessment Process (EIAO-TM), Annex 14 Section 6.5.

8.4 Sewage Estimation and Impact Assessment

8.4.1 Dry Weather Flow Intercepting System

8.4.1.1 Due to possible ageing drainage systems, individual direct discharge and possible expedient connection made in the past to Tai Wai Nullah, number of water quality pollution incidents have been reported and there still remains a portion of polluting sources. Hence, a dry weather flow interceptor (DWFI) system is proposed to improve the water quality in the nullah.

8.4.1.2 With the proposed DWFI system, polluted dry weather flows from drainage outlets would be intercepted by two dry weather flow channels, running along both sides of the nullah bed (see **Section 2**). The dry weather flow will be carried downstream eventually joining the nearby existing sewerage system. The dry weather flow then follows the existing sewerage route to existing sewage pumping stations and eventually reaching the relocated Sha Tin Sewage Treatment Works. Proposed alignment of DWFI system is shown in **Figure 8.1 to Figure 8.3**.

8.4.2 Estimation of Existing Sewage Flow

8.4.2.1 The DWFI system is proposed to discharge into an existing 900mm dia. sewer between manhole FMH4046338 and FMH4046340. To assess the hydraulic performance of the existing 900mm dia. sewer, existing sewage flow from the concerned sewerage catchment was estimated.

8.4.2.2 The sewage flow from the concern sewerage catchment comprises several components: residential, commercial, and institution/schools. Population from each of the components were estimated and the average dry weather flow (ADWF) were calculated based on the "Guidelines for Estimating Sewage Flows for Sewage Infrastructure Planning" (GESF) by the Environmental Protection Department.

8.4.2.3 The existing development parameters in the concerned sewerage catchment are estimated and summarised in Table 8.1 to Table 8.6.

Table 8.1 Residents in the Concerned Sewerage Catchment (to FMH4046332)

Residential Buildings ^[1]	Population ^[2]	Unit Flow Factor ^[3] (m ³ /day)	ADWF (m ³ /day)
Ho Sze House	45	0.27	13.9
Lai Shing Mansion	20	0.27	6.1
Cheung Hing Mansion	48	0.27	14.8
Moon Wah Mansion	56	0.27	17.4
Wing Fu Building	45	0.27	13.9
Kam Cheong Building	112	0.27	34.8
Tai On Building	168	0.27	52.2
Tin Po Building	84	0.27	26.1
Tak On Building	224	0.27	69.6
Shu Tak Building	84	0.27	26.1
Wah Mee House	42	0.27	13.0
Rich Mansion	14	0.27	4.3
Chik Fu Mansion	84	0.27	26.1
Lai Ming Building	36	0.27	11.3
Yue Huen House	28	0.27	8.7
On Ting Mansion	53	0.27	16.5
Chik Kin Mansion	56	0.27	17.4
Chik Hong Mansion	112	0.27	34.8
Ka Po House	28	0.27	8.7
Chik Tat House	84	0.27	26.1
Fu Cheong House	42	0.27	13.0
Lung Fung House	36	0.27	11.3
Kai Tak Building	22	0.27	7.0
Hey Yuet Building	56	0.27	17.4
Cheung Fung Mansion	56	0.27	17.4
Ka Chuen House	53	0.27	16.5
On Fu Mansion	28	0.27	8.7
Kut Hing House	42	0.27	13.0
Moon Tong House	25	0.27	7.8
Sui Fung Mansion	56	0.27	17.4
Lin King House	25	0.27	7.8
Kai Yuen Building	14	0.27	4.3
Sui Yuen House	53	0.27	16.5
Lung King Building	28	0.27	8.7
Lung Wah House	17	0.27	5.2
Kam Shan Building	448	0.27	139.1
Yiu Po Mansion	112	0.27	34.8
Yuet On Building	112	0.27	34.8
Hing Shing Building	70	0.27	21.7
Glamour Garden	538	0.27	166.9
Grandeur Garden	2117	0.27	657.3
The Garrison	319	0.27	99.1
Kam Fai Building	98	0.27	30.4
Hong Lok Building	168	0.27	52.2
Mei Lun House	28	0.27	8.7
Chung Pak Lau	42	0.27	13.0
Luen Fat House	67	0.27	20.9
Rich Court	84	0.27	26.1
Yan On Building	45	0.27	13.9
On Hong Building	84	0.27	26.1
On Tai Building	84	0.27	26.1
Grandway Garden Block 2 & 3	1612.8	0.27	500.8
Tai Wai Village	1691.2	0.27	525.1
Sub-total =			3010.7

Notes:

- [1] Information on no. of flat of existing residential building is collected from the website of Home Affairs Department https://www.buildingmgt.gov.hk/en/database_of_private_buildings_in_hong_kong/12.htm.
- [2] According to statistics on population and households by the Census and Statistics Department, an average domestic household size of 2.8 people was adopted in the population estimation.
- [3] Unit Flow Factors were obtained from "Guidelines for Estimating Sewage Flows for Sewage Infrastructure Planning" (GESF) by the Environmental Protection Department.

Table 8.2 Residents in the Sewerage Catchment (to FMH4046336)

Commercial Buildings	Nos. of Workers ^{[1][2]}	Unit Flow Factor ^[3] (m ³ /day)	ADWF (m ³ /day)
Chik Fuk Building	28	0.27	8.7
Chik Tak Building	33.6	0.27	10.4
Shing Ho Building	28	0.27	8.7
Ping Yuen	8.4	0.27	2.6
20 Chik Fu Street	33.6	0.27	10.4
15 - 17 Shing Ho Road	14	0.27	4.3
Chik Sin Building	28	0.27	8.7
Lin Fung House	30.8	0.27	9.6
Kong Yip House	28	0.27	8.7
Lap Wo Building (House)	56	0.27	17.4
Hing Wan House	28	0.27	8.7
King Sing House	28	0.27	8.7
Chik Shun Building	56	0.27	17.4
Kwai Wai Building	56	0.27	17.4
Yung Wun Building	39.2	0.27	12.2
On Shun Mansion A block	84	0.27	26.1
On Shun Mansion B block	56	0.27	17.4
Mei Fung House	2870	0.19	627.1
Mei Tao House	2870	0.19	627.1
Mei Yeung House	2870	0.19	627.1
Mei Ying Court	604.8	0.19	132.1
Mei Tin Estate	18760	0.19	4099.1
Sub-total=			6309.9

Notes:

- [1] The total area of commercial building is measured using base map.
[2] The worker density per area is based on Commercial and Industrial Floor Space Utilization Survey (CIFSUS) conducted by the Planning Department.
[3] Unit Flow Factor was obtained from "Guidelines for Estimating Sewage Flows for Sewage Infrastructure Planning" (GESF) by the Environmental Protection Department.

Table 8.3 Employees in the Sewerage Catchment (to FMH4046332)

Commercial Buildings	Nos. of Workers ^{[1][2]}	Type	Unit Flow Factor ^[3] (m ³ /day)	ADWF (m ³ /day)
Tai Wai MTR Station	703	J3	0.18	145.5
Shops below Grandway Garden Block 1	6	J10	1.58	10.9
Shops below Grandway Garden Block 2&3	8	J10	1.58	14.5
Market near Shatin Public School	58	J4	0.28	18.7
McDonald under Yiu Po Building	21	J10	1.58	38.2
Restaurants under Kam Shan Building	41	J10	1.58	74.5
Restaurants under Tai On Building	48	J10	1.58	87.2
Restaurants under Cheung Hing Mansion	24	J10	1.58	43.6
Restaurants under Kam Fai Building	21	J10	1.58	38.2
Restaurants under Hong Lok Building	65	J10	1.58	118.1
Salon under Tak On Building	6	J11	0.28	1.9
Restaurant under Shu Tak Building	6	J10	1.58	10.9
Restaurant under Chik Fu Building	2	J10	1.58	3.6
Salon under Chik Sing Building	2	J11	0.28	0.6

Commercial Buildings	Nos. of Workers [1][2]	Type	Unit Flow Factor [3] (m ³ /day)	ADWF (m ³ /day)
Restaurant under Chik King Building	4	J10	1.58	7.3
Restaurant under Yuet Fu Building	8	J10	1.58	14.5
Salon under Yuet Fu Building	5	J11	0.28	1.6
Restaurant under Chik Tak Building	14	J10	1.58	25.4
Restaurant under Kai Tak Building	7	J10	1.58	12.7
Restaurant under Lung Fung House	12	J10	1.58	21.8
Salon under Hey Yuet Building	5	J11	0.28	1.6
Restaurant under Cheong Fung Building	13	J10	1.58	23.6
Restaurant under Sui Fung Mansion	5	J10	1.58	9.1
Salon under Kut Hing Mansion	2	J11	0.28	0.6
Restaurant Yun Wun Building	9	J10	1.58	16.4
Restaurant under On Fu Building	23	J10	1.58	41.8
Restaurant under Nin King Building	12	J10	1.58	21.8
Restaurant under Lung King Building	11	J10	1.58	20.0
Restaurants near Shing Ho Road Refuse Point	7	J10	1.58	12.7
Salon near Shing Ho Road Refuse Point	6	J11	0.28	1.9
Clothes washing shop near Shing Ho Road Refuse Point	3	J11	0.28	1.0
Sub-total=				840.4

Notes:

[1] The total area of commercial building is measured using base map.

[2] The worker density per 100m² is based on Commercial and Industrial Floor Space Utilization Survey (CIFSUS) conducted by the Planning Department.

[3] Unit Flow Factors and Catchment Inflow Factor (Sha Tin Catchment) were obtained from "Guidelines for Estimating Sewage Flows for Sewage Infrastructure Planning" (GESF) by the Environmental Protection Department.

Table 8.4 Employees in the Sewerage Catchment (to FMH4046336)

Commercial Buildings	Nos. of Workers [1][2]	Type	Unit Flow Factor [3] (m ³ /day)	ADWF (m ³ /day)
Home for the aged	10	J11	0.28	3.2
Mei Lam Shopping Centre	681	J4	0.28	219.3
Mei Lam Cooked Food Stalls	26	J10	1.58	47.2
Mei Tin Community Hall	118	J11	0.28	38.0
Mei Tin Shopping Centre	260	J4	0.28	83.7
Shing Ho Road Refuse Collection Point	2	J3	0.18	0.4
Shops near Mei Chuen House	19	J4	0.28	6.1
Po Fook Memorial Hall	398	J11	0.28	128.2
Fu Shan Crematorium	76	J11	0.28	24.5
Fu Shan Public Mortuary	311	J11	0.28	100.1
Sub-total=				650.7

Notes:

[1] The total area of commercial building is measured using base map.

[2] The worker density per 100m² is based on Commercial and Industrial Floor Space Utilization Survey (CIFSUS) conducted by the Planning Department.

[3] Unit Flow Factors and Catchment Inflow Factor (Sha Tin Catchment) were obtained from "Guidelines for Estimating Sewage Flows for Sewage Infrastructure Planning" (GESF) from Environmental Protection Department.

Table 8.5 Students and Staffs in the Concerned Sewerage Catchment (to FMH4046332)

School/ Institution	Nos. of Students [1]	Nos. of Staff [1]	Unit Flow Factor for Students [3] (m ³ /day)	Unit Flow Factor for Staff [3] (m ³ /day)	ADWF (m ³ /day)
Sha Tin Public School	273	68	0.04	0.28	34.5
Sub-total=					34.5

Notes:

- [1] Number of students and staffs was collected from the websites of kindergarten, primary school, secondary school and special school.
- [2] Unit Flow Factors and Catchment Inflow Factor (Sha Tin Catchment) were obtained from “Guidelines for Estimating Sewage Flows for Sewage Infrastructure Planning” (GESF) by the Environmental Protection Department.

Table 8.6 Students and Staffs in the Concerned Sewerage Catchment (to FMH4046336)

School/ Institution	Nos. of Students [1]	Nos. of Staff [1]	Unit Flow Factor for Students [3] (m ³ /day)	Unit Flow Factor for Staff [3] (m ³ /day)	ADWF (m ³ /day)
Sin Chu Wan Primary School	685	48	0.04	0.28	47.0
Buddhist Wong Wan Tin College	657.6	62	0.04	0.28	50.2
TWGHs Shui Chuen O Primary School	191.8	47.95	0.04	0.28	24.3
The Salvation Army Centaline Charity Fund Kindergarten	247	21	0.04	0.28	18.1
Sub-total=					139.6

Notes:

- [1] Number of students and staffs was collected from the websites of kindergarten, primary school, secondary school and special school.
- [2] Unit Flow Factors and Catchment Inflow Factor (Sha Tin Catchment) were obtained from “Guidelines for Estimating Sewage Flows for Sewage Infrastructure Planning” (GESF) by the Environmental Protection Department.

8.4.2.4 By summing up all the contributing sources in the concerned sewerage catchment mentioned above (**Table 8.1** to **Table 8.6**), the total ADWF that eventually discharges sewer manhole FMH4046336 combined with the upstream flows from FMH4046332 is 10,985.8 m³/day.

8.4.3 Estimation of Dry Weather Flow

8.4.3.1 As mentioned in **Section 8.4.1**, a DWFI system was proposed as a water quality enhancement measure. It will intercept dry weather flows with substandard water quality that would otherwise be discharged to Tai Wai Nullah from drainage outlets.

8.4.3.2 A water quality survey has been conducted under this Project. The water quality survey consists of two parts. The first part is the visual inspection of all the drainage outlets along the nullah with an aim to identify outlets with substandard water quality and odour issues, which will likely be intercepted by the DWFI system. The second part is the water quality sampling and testing to verify the water quality conditions of selected outlets.

8.4.3.3 In addition, a flow survey has also been conducted under this Project. Flow sensors have been installed in major drainage outlets and along the main channel.

8.4.3.4 Based on the results from the water quality and flow surveys, outlets that will likely discharge polluted flow into the nullah have been identified, and the dry weather flow targeted for interception was estimated to be roughly 2,850 m³/day.

8.4.4 Sewage from Proposed Toilet near Pok Ngar Villa

8.4.4.1 An additional toilet facility for the visitors in Tai Wai Nullah is located near Pok Ngar Villa. As such, this toilet facility would generate additional sewerage flow that is required to be conveyed to the nearby existing sewerage system. A proposed outlet pipe from the new toilet would be connected to the nearest manhole FMH4039953. The fresh water and salt water consumption combined for the toilet flushing and handwashing basins is estimated to be 10.8m³/day.

Checking of the impact to the pipe immediately downstream of FMH4039953 has been carried out. An additional flow percentage of approximately 0.03% from the toilet facility is added to the pipe system downstream of FMH4039953. Considering that the flow from the proposed toilet is small, it is considered to be negligible and would not have adverse impacts on the downstream sewerage network.

8.4.5 Impact Review on Existing Sewerage Network and the Proposed Sewerage Improvement Works

8.4.5.1 To assess the sewerage impact from the additional 2,850 m³/day dry weather flow as mentioned above, the hydraulic performance of the existing 900mm dia. sewer between manhole FMH4046332 and FMH4046340 was reviewed and the results are shown in **Appendix 8.1**.

8.4.5.2 The assessment results demonstrate that the existing 900mm dia. sewer has enough capacity to cater for the additional flow intercepted by the DWFI system. Under current condition, the percentage utilisation of the concerned sewerage system is 83%. The percentage goes up to 89% with the additional dry weather flows, which still leaves roughly 11% spare capacity. No mitigation measures are anticipated.

8.4.6 Impact Assessment on Treatment Capacity of Sha Tin Sewage Treatment Works

8.4.6.1 **Table 8.7** and **Table 8.8** outline the information on capacity for concerned pumping stations and sewage treatment works of the DWFI system. The planned ultimate flow to STSTW was 339,000 m³/day, which includes 10% for flow uncertainties. In other words, the relocated STSTW shall be able to take up the dry weather flow whose amount is within the 10% flow uncertainties limit.

Table 8.7 Summary of Capacity for Concerned Pumping Stations

Sewage Pumping Stations	Existing Maximum Daily Flow 2017 (m ³ /day)	Planned Maximum Daily Flow (m ³ /day)	Design Capacity (m ³ /day)
P7 Sha Tin Main SPS	173,240	547,000	552,960
ISPS [1]	-	708,000	708,000

Note:

[1] Intermediate Sewage Pumping Station (ISPS) will be located within the existing STSTW.

Table 8.8 Summary of Capacity for the Relocated Sha Tin Sewage Treatment Works (STSTW)

Relocated Sha Tin Sewage Treatment Works	Flow (m ³ /day)
Planned Ultimate Flow (THEES Review Study)	309,000
Planned Ultimate Flow (Cavern Study) [1]	339,000
Design Capacity for the Relocated STSTW	340,000

Note:

[1] Cavern study has an additional 10% for flow uncertainties

8.5 Conclusion

8.5.1.1 To improve the water quality in the nullah, a DWFI scheme is proposed. The intercepted dry weather flow along the nullah was estimated to be 2,850 m³/day. An additional toilet facility for the visitors in Tai Wai Nullah located near Pok Ngar Villa with negligible additional sewage flow has also been proposed. The sewage impact assessment indicated that existing sewerage system has enough capacity to take up the additional dry weather flow intercepted by the DWFI system and proposed toilet facility. Thus, no mitigation measures are anticipated. No adverse sewerage impact arising from the Project is anticipated.

9 ECOLOGY (TERRESTRIAL AND MARINE)

9.1 Introduction

9.1.1.1 This section presents the assessment on potential ecological impacts arising from construction and operation of the Project, which has been conducted in accordance with the criteria and guidelines as stated in Annexes 8 and 16 of the *Technical Memorandum on Environmental Impact Assessment Process* (EIAO-TM) as well as the requirements given in Clause 3.4.10 and Appendix H of the EIA Study Brief (No. ESB-320/2019).

9.2 Environmental Legislation, Standards and Guidelines

9.2.1.1 This assessment makes reference to the following Hong Kong Special Administrative Region (HKSAR) Government ordinances, regulations, standards, guidelines, and documents that are relevant to ecological impact assessment:

- Environmental Impact Assessment Ordinance (Cap. 499), and its subsidiary legislation – aims to avoid, minimise and control the adverse effects on the environment by designated projects through the application of the environmental impacts assessment process and the environmental permit system.
- EIAO-TM Annex 8 – recommends the criteria to be used for evaluating habitat and ecological impact.
- EIAO-TM Annex 16 – sets out the general approach and methodology for assessment of ecological impacts arising from a project or proposal, to allow a complete and objective identification, prediction and evaluation of the potential ecological impacts.
- EIAO Guidance Note No. 3/2010 Flexibility and Enforceability of Mitigation Measures Proposed in an Environmental Impact Assessment Report – provides guiding principles on the approach to assess the recommended environmental mitigation measures in EIA reports.
- EIAO Guidance Note No. 6/2010 Some Observations on Ecological Assessment from the Environmental Impact Assessment Perspective – clarifies the requirements of ecological assessments under the EIAO.
- EIAO Guidance Note No. 7/2010 Ecological Baseline Survey for Ecological Assessment – provides general guidelines for conducting ecological baseline surveys in order to fulfil requirements stipulated in the EIAO-TM.
- EIAO Guidance Note No. 10/2010 Methodologies for Terrestrial and Freshwater Ecological Baseline Surveys – introduces some general methodologies for terrestrial and freshwater ecological baseline surveys in order to fulfil requirements stipulated in the EIAO-TM.
- EIAO Guidance Note No. 11/2010 Methodologies for Marine Ecological Baseline Surveys – introduces some general methodologies for marine ecological baseline surveys in order to fulfil requirements stipulated in the EIAO-TM.
- Country Parks Ordinance (Cap. 208) – provides a legal framework for the designation, development and management of country parks and special areas. Country parks are designated for the purposes of nature conservation, countryside recreation and outdoor education. Special Areas are created mainly for the purpose of nature conservation.
- Marine Parks Ordinance (Cap. 476) and Subsidiary Legislation – allows for designation, control and management of marine parks and marine reserves through regulation of activities therein to protect, conserve and enhance the marine environment for the purposes of nature conservation, education, scientific research and recreation. The Ordinance came into effect on 1 June 1995.
- Forest and Countryside Ordinance (Cap. 96) – prohibits felling, cutting, burning or destroying of trees and growing plants in forests and plantations on Government land. Related subsidiary regulations prohibit the selling or possession of listed, restricted and protected plant species.
- Wild Animals Protection Ordinance (Cap. 170) – designated wild animals are protected from being hunted, whilst their nests and eggs are protected from injury destruction and removal. All birds and most mammals, including marine cetaceans, are protected under

this Ordinance. The Second Schedule of the Ordinance, which lists all the animals protected, was last revised in June 1997.

- Protection of Endangered Species of Animals and Plants Ordinance (Cap. 586) – gives effect to the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) in Hong Kong. It restricts import and export of species listed in CITES Appendices so as to protect wildlife from overexploitation or extinction. Certain types of corals are listed in Schedule 1 of the Ordinance, including Blue Coral (*Heliopora coerulea*), Organ Pipe Corals (family Tubiporidae), Black Corals (order Antipatharia), Stony Corals (order Scleractinia), Firecorals (family Milleporidae) and Lace Corals (family Stylasteridae). Cetacean including whales, dolphins, porpoises, and orquals are also listed under Schedules 1 & 2 of the Ordinance. The import, export and possession of scheduled corals, no matter dead or living, is restricted.
- Town Planning Ordinance (Cap. 131) – provides designation of Coastal Protection Areas, Sites of Special Scientific Interest (SSSIs), Conservation Area (CA), Country Park, Green Belt (GB) or other specified uses that promote conservation or protection of the environment.
- Chapter 10 of the Hong Kong Planning Standard and Guidelines (HKPSG) – covers planning considerations relevant to conservation. This chapter details the principles of conservation, the conservation of natural landscape and habitats, historic buildings, archaeological sites and other antiquities. It also describes enforcement issue. The appendices list the legislation and administrative controls for conservation, other conservation related measures in Hong Kong and government departments involved in conservation.
- Water Pollution Control Ordinance (Cap. 358) – aims to control water pollution in waters of Hong Kong. WCZs are designated with individual water quality objective to promote the conservation and best use of those waters in the public interest. The most updated water quality objectives for the Victoria Harbour WCZ were revised in June 1997.
- Development Bureau (DEVB) TC(W) No. 4/2020 Tree Preservation – sets out the policy, control procedures and detailed requirements on tree preservation at different stages of Government projects as well as those under arboricultural maintenance.
- Drainage Services Department (DSD) Practice Note (PN) No. 3/2021 Guidelines on Design for Revitalisation of River Channel – presents the essential environmental and ecological considerations that should be taken into account in the design of river channels (superseding DSD PN No.1/2015 – Guidelines on Environmental and Ecological Considerations for River Channel Design)
- ETWB TCW No. 5/2005 Protection of Natural Streams/Rivers from Adverse Impacts arising from Construction Works – provide guidelines for the planning and execution of construction works and for the vetting of public and private development proposals that affect natural rivers and streams, e.g. including those not classified as environmentally sensitive.
- Hong Kong Biodiversity Strategy and Action Plan (HKBSAP) (2016-2021) – the first city-level BSAP for Hong Kong, aims to step up biodiversity conservation, support sustainable development, contribute to global efforts on biodiversity conservation and China's National BSAP. The People's Republic of China has become a Party of the Convention of Biological Diversity (CBD) since 1993 and was formally extended to Hong Kong in May 2011.

9.2.1.2 This section also makes reference to the following international conventions and national legislation:

- The International Union for Conservation of Nature (IUCN) Red List of Threatened Species – provides taxonomic, conservation status and distribution information on taxa that have been evaluated using the IUCN Red List Categories and Criteria. This system is designed to determine the relative risk of extinction, and the main purpose of the IUCN Red List is to catalogue and highlight those taxa that are facing a higher risk of global extinction. The IUCN Red List also includes information on taxa that are either close to meeting the threatened thresholds or that would be threatened were it not for an ongoing taxon-specific conservation programme. Using the IUCN Red List's guidelines, categories and criteria,

China had assessed overall threat status of its wild vertebrates and developed the Red List of China's Vertebrates.

- The People's Republic of China National Protection Lists of Important Wild Animals and Plants – lists detailed Class I & II key protected animals and Category I and II plant species under Mainland Chinese Legislation. The list was last updated in February 2021.

9.3 Assessment Methodology

9.3.1 Assessment Area

9.3.1.1 In accordance with Clause 3.4.10.2 of the EIA Study Brief, the assessment area for terrestrial ecological impact assessment includes areas within 500m of the Project boundary and any other areas likely to be impacted by the Project (refer to **Figure 9.1** and **Figure 9.2**). For marine ecology, the assessment area is same as the water quality impact assessment area, covering Shing Mun River, Tolo Harbour and Channel Water Control Zone (WCZ).

9.3.2 Literature Review

9.3.2.1 The ecological characteristics of the assessment area were identified through a comprehensive review of the available literature. This review collated ecological information from various reports and publications, as summarised in **Table 9.1**.

Table 9.1 Literature Describing Ecological Resources in the Assessment Area

Relevant Literature	Terrestrial Ecology	Corals	Benthos	Intertidal	Marine Mammals and Seahorse
(1) Revitalisation of Water Bodies – Feasibility Study (DSD, 2019)	✓				
(2) EIA Report for Sha Tin Cavern Sewage Treatment Works (DSD, 2016)		✓	✓	✓	
(3) Ecological Status and Revised Species Records of Hong Kong's Scleractinian Corals (AFCD, 2004)		✓			
(4) Drainage Improvement in Sha Tin and Tai Po – EIA Report (DSD, 2007)		✓		✓	
(5) Development of a Bathing Beach at Lung Mei, Tai Po – EIA Report (CEDD, 2007)		✓	✓	✓	
(6) The Proposed Submarine Gas Pipelines from Cheng Tou Jiao Liquefied Natural Gas Receiving Terminal, Shenzhen to Tai Po Gas Production Plant, Hong Kong – EIA Report (HKCGCL, 2003)		✓	✓	✓	✓
(7) Pak Shek Kok Development – EIA Report (TDD, 1998)				✓	
(8) Feasibility Study for Housing Development at Whitehead and Lee On in Ma On Shan, Sha Tin – EIA Report (TDD, 2002)		✓			
(9) Consultancy Study on Marine Benthic Communities in Hong Kong (AFCD, 2002)			✓		
(10) Unpublished data collected in the territory-wide long-term monitoring survey undertaken by AFCD from 2002 to 2020 (AFCD, 2020c)	✓				

Relevant Literature	Terrestrial Ecology	Corals	Benthos	Intertidal	Marine Mammals and Seahorse
(11) Hong Kong Biodiversity newsletter Issue no.26 December 2020 (AFCD, 2020d)	✓				

9.3.3 Ecological Survey Methodology

9.3.3.1 Terrestrial and marine ecological surveys were conducted between May 2020 and January 2021 covering both dry and wet seasons to collect up-to-date ecological baseline information and verify information from literature review for the subsequent assessment of ecological value of habitats and species, evaluation of potential ecological impact resulting from the proposed Project; and provision of appropriate mitigation measures.

9.3.3.2 Ecological surveys were conducted following the requirements stipulated under Annexes 8 and 16 of EIAO-TM and relevant EIAO Guidance Notes 6/2010, 7/2010, 10/2010 and 11/2010. All field surveys were carried out in such ways to minimise unnecessary stress or damage to the existing habitats and wildlife. The ecological survey schedule is presented in **Table 9.2** and the survey transects / locations are presented in **Figure 9.1** and **Figure 9.2**. Methodologies of the ecological surveys are discussed below.

Table 9.2 Ecological Survey Schedule

Survey	2020									2021
	Wet Season						Dry Season			Jan
	May	Jun	Jul	Aug	Sep	Oct *	Nov	Dec		
Terrestrial Ecology										
Habitat and Vegetation (Day)		✓				✓				
Avifauna (Day)	✓	✓	✓	✓	✓	✓				
Avifauna (Night)			✓			✓				
Ardeid Night Roost and Pre-Roost (Night)			✓			✓				✓
Butterfly and Odonate (Day)		✓				✓				
Herpetofauna (Day)			✓			✓				
Herpetofauna (Night)			✓			✓				
Mammal (Day)			✓			✓				
Mammal (Night)			✓			✓				
Freshwater Communities (Day)		✓	✓			✓				
Marine Ecology										
Dive (Day)				✓			✓			
Benthos (Day)				✓			✓			
Intertidal (Day)				✓			✓			

* Transitional month

Habitat Mapping and Vegetation Survey

9.3.3.3 A habitat map showing the types and locations of terrestrial habitats within the assessment area was prepared with reference to aerial photographs obtained from Lands Department (LandsD) and ground-truthing.

9.3.3.4 During habitat surveys, ecological characteristics of each identified habitat type, including size, vegetation type, dominant species, species abundance and diversity, community structure, seasonal patterns and inter-dependence of habitats and species, and presence of any features of ecological importance, were defined and characterised. Representative photographs of the habitat types and/or any important ecological features recorded were taken. Binoculars were used to observe ecological characteristics of inaccessible areas.

9.3.3.5 Vegetation surveys were conducted along transects set across representative patches of each habitat type by direct observation. Diversity and relative abundance of flora species were recorded, with particular attention paid to the presence of any species of conservation importance. A plant species list detailing the recorded species, including presence of species of conservation importance, was prepared for each habitat in the assessment area.

Nomenclature and conservation status of floral species in Hong Kong made reference to Wu & Lee (2000), Xing *et al.* (2000), Siu (2000), Hu *et al.* (2003), Hong Kong Herbarium (2012) and South China Botanical Gardens (2007; 2008; 2009; 2011).

Avifauna Survey – Transect Count Survey

- 9.3.3.6 Avifauna surveys were conducted monthly using transect count method covering all identified habitat type within assessment area at suitable time (usually in early morning) when birds are most active. The presence and abundance of avifauna species at various habitats were recorded visually and aurally. Night surveys were also conducted to record any nocturnal species present.
- 9.3.3.7 Avifauna species were recorded either by direct sightings or by their call and identified to species level. The location of any avifauna species of conservation importance encountered were recorded, along with notable behaviour (e.g. breeding behaviours such as nesting and presence of recently fledged juveniles, roosting, and feeding activities). A comprehensive list detailing species recorded in the assessment area was prepared, indicating wetland dependent species and species with conservation importance and/or protection status. Ornithological nomenclature in this report follows Carey *et al.* (2001), Viney *et al.* (2005) and the most recently updated list from the Hong Kong Bird Watching Society (HKBWS, 2020).

Avifauna Survey – Ardeid Night Roost and Pre-Roost Survey

- 9.3.3.8 Ardeid night roost and pre-roost survey were conducted once in wet season and once in dry season to review usage of existing and potential ardeid night roosting and pre-roosting sites along the banks of Shing Mun River Channel. An extra site check was conducted during late dry season to confirm on the ardeid roosting condition. Direct observation was made from two proposed vantage points on both sides of the Shing Mun River Channel (**Figure 9.1** refers). Species, abundance, returning time, flight route and location of roost and pre-roost were recorded. Tree species used for night roost by ardeids were identified and located. The surveys started approximately an hour before sunset and lasted until nightfall, which is the peak period of ardeid flight towards the roosting and pre-roosting sites.

Butterfly and Odonate Survey

- 9.3.3.9 Butterflies and odonates (dragonflies and damselflies) within the assessment area were surveyed using transect count method. Attention was given to potential habitats of odonates (e.g. stream, pond). Larvae and pupae of butterfly were actively searched. The surveys were conducted under suitable weather conditions (avoiding overcast weather when butterflies and odonates are less active). Relative abundance of butterfly, dragonfly and damselfly species were recorded. Nomenclature of butterfly follows Lo (2005) and nomenclature of dragonfly and damselfly follows Tam *et al.* (2011).

Herpetofauna Survey

- 9.3.3.10 Herpetofauna within the assessment area was surveyed. Potential microhabitats (e.g. leaf litter and underneath of rotten logs) were actively searched and examined. Any rocks / objects that were turned over during the search were returned to their original location and orientation. Active searching for eggs and tadpoles of amphibians in aquatic habitats were conducted to identify breeding activity. In addition to active searching, observation of exposed, basking, or foraging reptiles were recorded. Night surveys were also conducted due to the nocturnal behaviour of most herpetofauna species. All reptiles and amphibians, in any life-cycle stage, sighted or heard were recorded. Nomenclature of amphibian and reptile follows Chan *et al.* (2005a) and Karsen *et al.* (1998), respectively.

Terrestrial Mammal Survey

- 9.3.3.11 Surveys were conducted in areas potentially utilised by terrestrial mammals. The surveys focused on active searching for field signs of mammal occurrence, such as droppings, footprints, diggings or burrows left by larger terrestrial mammals. Mammal identification was made to species level where possible from the field signs encountered and mammal directly observed. Night surveys were also conducted to record any nocturnal species present.
- 9.3.3.12 Bat surveys were undertaken by an experienced surveyor equipped with an ultrasonic bat detector (Echo Meter Touch 2 Pro) at potential roosting, commuting, foraging and drinking sites, with calls recorded for later analysis with computer softwares (AnalogW and

Kaleidoscope). Bat species were located by direct sighting and field observation (e.g. their behaviours, such as flying pattern and height, size of bat species, nearby habitats, etc.) to aid in the identification of the bat species. Nomenclature of mammal follows Shek (2006).

Freshwater Communities Survey

9.3.3.13 Freshwater fish and invertebrate communities surveys were conducted via active searching, direct observation and kick sampling within the assessment area. Representative sampling locations (**Figure 9.1**) were selected for surveys, where rocks within the watercourses were turned over to locate any aquatic animals beneath. Kick sampling was used to survey benthic macroinvertebrates in shallow waters and hand net was used to collect organisms along the watercourses. Organisms encountered were recorded and identified to the lowest possible taxonomic level. All organisms collected were released to the point of collection after identification. No unnecessary stress was exerted on the freshwater organisms during the surveys.

Dive Survey

9.3.3.14 Spot-check dive surveys were conducted with regular zig-zag dive routes covering the assessment area of Sha Tin Hoi. Subtidal substrata (hard substratum seabed and seawall, etc.) at the spot-check dive locations (**Figure 9.2**) were surveyed for the presence and composition of coral communities, including hard corals (order *Scleractinia*), octocorals (sub-class *Octocorallia*) and black corals (order *Antipatharia*).

9.3.3.15 As corals were recorded during the spot-check dive survey, a more detailed Rapid Ecological Assessment (REA) was carried out with reference to DeVantier *et al.* (1998) (see **Appendix 9.1** for details). The locations of 100 m REA transect(s) were proposed, based on the preliminary results from the spot-check dives. For each transect, the locations (Global Positioning System, GPS) of dive routes, distance surveyed, number of colonies, sizes and types of corals, their coverage, abundance, condition, translocation feasibility and the conservation status of coral species in Hong Kong waters were recorded. Representative photographs were also taken.

Benthos Survey

9.3.3.16 Benthos surveys were conducted to assess marine soft bottom benthic fauna communities via grab sampling of seabed sediment at two sampling locations (refer to **Figure 9.2**). At each sampling location, three replicates of grab sample over a 0.1 m² area seabed substrate were collected using a van Veen grab. Samples were sieved through 0.5 mm sieves and stained with 1% Rose Bengal solution. Collected organisms were counted, weighed and identified to the lowest taxon as far as practicable.

9.3.3.17 Abundance, biomass, species diversity H' and evenness J were calculated for pooled data, using the formulae:

$$H' = - \sum (N_i / N) \ln (N_i / N) ; \text{ and}$$

$$J = H' / \ln S$$

where S is the total number of species in the sample, N is the total number of individuals, and N_i is the number of individuals of the i^{th} species.

Intertidal Survey

9.3.3.18 Surveys on intertidal communities were conducted at representative survey locations (refer to **Figure 9.2**) by line transect method, in order to establish an ecological profile of intertidal habitats within the assessment area.

9.3.3.19 One line transect was deployed at each survey location. The transects were laid perpendicular to shoreline from high water mark down to low water mark during the low tide period (tide level below 1 m). Along each transect, standard ecological sampling quadrat (dimensions 0.5 m x 0.5 m) were laid at 1 m intervals. Intertidal epifauna and flora within each quadrat were identified and enumerated. In general, mobile fauna were counted in terms of abundance per unit area. Sessile organisms such as barnacles, oysters and algae were estimated in terms of percentage cover per fixed area. Recorded intertidal fauna were identified to species level as far as possible. Representative photographs of intertidal habitat and flora/fauna species identified were taken.

9.4 Baseline Conditions

9.4.1 Site of Conservation Importance

Terrestrial Ecology

9.4.1.1 There are no recognised sites of conservation importance within the terrestrial ecology assessment area. The nearest site of conservation importance is:

- A “Conservation Area” (“CA”) located at approximately 4.27 km southeast of the Project site outside the assessment area, zoned under the Approved Kwun Yam Shan & Fa Sam Hang Outline Zoning Plan (OZP) No. S/ST-KYS/11.

Marine Ecology

9.4.1.2 While there are some recognised sites of marine conservation importance within the marine ecology assessment area, all are relatively distant from the Project site:

Kei Ling Ha Mangal Site of Special Scientific Interest

9.4.1.3 The Kei Ling Ha Mangal SSSI is located within the Tolo Harbour and Channel WCZ, approximately 10 km northeast of the Project site. Almost all mangroves and their associated plants recorded in Hong Kong can be found in the SSSI, including the rare *Thespesia populnea* and the uncommon *Lumnitzera racemosa* (Tam *et al.*, 1997).

Ting Kok Site of Special Scientific Interest

9.4.1.4 Ting Kok SSSI lies along the coastal area of Ting Kok Road just south of Lai Pek Shan San Tsuen (more than 11.3 km northeast of the Project site). This site supports mangrove community consisting of *Kandelia obovata*, *Aegiceras corniculatum*, *Avicennia marina*, *Lumnitzera racemosa*, *Excoecaria agallocha* and *Bruguiera gymnorrhiza* (AFCD, 2020b). The species composition of this site presents a good example of plant succession.

Hoi Ha Wan Site of Special Scientific Interest

9.4.1.5 Hoi Ha Wan SSSI is a sheltered bay located at the northern coastline of Sai Kung Peninsula, approximately 13.2 km northeast of the Project site. This site is particularly favourable to coral communities as it is a sheltered bay under the influence of oceanic waters. Coral species such as *Pavona decussata*, *Platygyra sinensis* and *Porites lobata* occupy the shallow habitats. *Alveopora irregularis* and *Stylocoeniella guentheri* occupy the deeper habitats, while *Cyphastrea* spp. are found throughout different depths.

9.4.2 Literature Review

Habitat and Vegetation

9.4.2.1 Only three habitat types (modified watercourse, secondary woodland and urbanised area) had been previously recorded within the current assessment area during ecological surveys conducted for the Revitalisation of Water Bodies – Feasibility Study (DSD 2019, hereafter referred to as the Revitalisation Study). Only two flora species of conservation importance were recorded in these habitats (**Table 9.3**).

Table 9.3 Flora Species of Conservation Importance Previously Recorded within the Assessment Area

Common Name (Scientific Name)	Distribution in Hong Kong ⁽¹⁾	Protection Status	Habitat Recorded ⁽²⁾
Incense Tree (<i>Aquilaria sinensis</i>)	Common	Cap. 586 ⁽³⁾ Category II ⁽⁴⁾ Vulnerable ^{(5) (6) (7)} Near Threatened ^{(8) (9)}	Urbanised Area; Secondary Woodland
Lamb of Tartary (<i>Cibotium barometz</i>)	Very common	Cap. 586 ⁽³⁾ Category II ⁽⁴⁾ Vulnerable ⁽⁹⁾	Urbanised Area; Secondary Woodland

Notes:

1. Wu & Lee (2000).
Xing, *et al.* (2000).
Siu (2000).
2. DSD (2019).
3. Protection of Endangered Species of Animals and Plants Ordinance (Cap. 586).
4. "List of Wild Plants under State Protection" (promulgated by the Ministry of Forestry in 1999).
5. IUCN (2022). IUCN Red List Version 2022-1.
6. Fu & Chin (1992). China Plant Red Data Book – Rare and Endangered Plants.
7. Qin, *et al.* (2017). Threatened Species List of China's Higher Plants.
8. Feng, *et al.* (2002). Study on Rare and Endangered Plants and National Key Protected Plants in Guangdong.
9. Hu, *et al.* (2003). Rare and Precious Plants of Hong Kong.

Terrestrial Fauna

Avifauna

9.4.2.2 A total of 31 avifauna species were previously recorded within the current assessment area from the Revitalisation Study, six of which are of conservation importance (**Table 9.4**). Ardeids were also recorded actively using the night roost at Tai Wai, along Shing Mun River near Caritas Lok Jun School, in 2017 and 2018 (AFCD, 2020d).

Table 9.4 Avifauna Species of Conservation Importance Previously Recorded within the Assessment Area

Common Name (Scientific Name) ⁽¹⁾	Distribution in Hong Kong ⁽²⁾	Protection Status	Habitat Recorded ⁽³⁾
Little Egret (<i>Egretta garzetta</i>)	Common resident	PRC (RC) ⁽⁴⁾	Modified Watercourse
Pygmy Cupwing (<i>Pnoepyga pusilla</i>)	Rare resident	LC ⁽⁴⁾	Secondary Woodland
Black Kite (<i>Milvus migrans</i>)	Common resident and winter visitor	(RC) ⁽⁴⁾ Class II ⁽⁵⁾ Cap. 586 ⁽⁶⁾	Secondary Woodland
Greater Coucal (<i>Centropus sinensis</i>)	Common resident	Class II ⁽⁵⁾ Vulnerable ⁽⁷⁾	Urbanised Area
Collared Scops Owl (<i>Otus lettia</i>)	Common resident	Class II ⁽⁵⁾ Cap. 586 ⁽⁶⁾	Modified Watercourse; Secondary Woodland
Common Emerald Dove (<i>Chalcophaps indica</i>)	Scarce but widespread resident	Vulnerable ⁽⁷⁾	Urbanised Area

Notes:

1. All wild birds are protected under Wild Animals Protection Ordinance (Cap. 170).
2. AFCD (2020a). Hong Kong Biodiversity Database.
3. DSD (2019).
4. Fellowes, *et al.* (2002): LC=Local Concern; RC=Regional Concern; PRC=Potential Regional Concern.
*Letters in parentheses indicate that the assessment is on the basis of restrictedness in nesting and/or roosting sites rather than in general occurrence.
5. "List of Wild Animals under State Protection" (promulgated by State Forestry Administration and Ministry of Agriculture on 14th January 1989).
6. Protection of Endangered Species of Animals and Plants Ordinance (Cap. 586).
7. Zheng & Wang (1998). China Red Data Book of Endangered Animals: Aves.

Butterfly and Odonate

9.4.2.3 Twenty-four butterfly species were previously recorded within the current assessment area from the Revitalisation Study. Most of the recorded species are common and very common

in Hong Kong, with only one rare species common rose (*Pachliopta aristolochiae*) considered of conservation importance (Table 9.5).

Table 9.5 Butterfly Species of Conservation Importance Previously Recorded within the Assessment Area

Common Name (Scientific Name)	Distribution in Hong Kong ⁽¹⁾	Protection Status	Habitat Recorded ⁽²⁾
Common Rose (<i>Pachliopta aristolochiae</i>)	Rare	-	Secondary Woodland

Notes:

1. AFCD (2020a). Hong Kong Biodiversity Database.
2. DSD (2019).

9.4.2.4 A total of 10 dragonfly species were previously recorded within the current assessment area from the Revitalisation Study and the unpublished AFCD data, four of which are of conservation importance as presented in Table 9.6 (DSD, 2019; AFCD, 2020c).

Table 9.6 Odonate Species of Conservation Importance Previously Recorded within the Assessment Area

Common Name (Scientific Name)	Distribution in Hong Kong ⁽¹⁾	Protection Status	Habitat Recorded ⁽²⁾
Chinese Yellowface (<i>Agriomorpha fusca</i>)	Abundant; Scattered	LC ⁽³⁾	-
Hong Kong Clubtail (<i>Leptogomphus hongkongensis</i>)	Common; Scattered	LC ⁽³⁾	-
Small Dragonhunter (<i>Sieboldius alexanderi</i>)	Common; Scattered / (Globally Restricted to Fujian and Guangdong)	GC ⁽³⁾	-
Emerald Cascader (<i>Zygonyx iris insignis</i>)	Abundant; Widespread	PGC ⁽³⁾	Urbanised Area

Notes:

1. AFCD (2020a). Hong Kong Biodiversity Database.
2. DSD (2019); AFCD (2020c).
3. Fellowes, *et al.* (2002): LC=Local Concern; GC=Global Concern; PGC=Potential Global Concern.

Herpetofauna

9.4.2.5 The Revitalisation Study reported six reptile species within the current assessment area. Two species are of conservation importance, which are presented in Table 9.7.

Table 9.7 Reptile Species of Conservation Importance Previously Recorded within the Assessment Area

Common Name (Scientific Name)	Distribution in Hong Kong ⁽¹⁾	Protection Status	Habitat Recorded ⁽²⁾
Tokay Gecko (<i>Gekko gekko</i>)	Widely distributed	RC ⁽⁵⁾ Class II ⁽⁶⁾ Endangered ⁽⁷⁾ Critically Endangered ⁽⁸⁾	Urbanised Area
Common Water Monitor (<i>Varanus salvator</i>)	Rare	Cap. 170 ⁽³⁾ Cap. 586 ⁽⁴⁾ RC ⁽⁵⁾ Class I ⁽⁶⁾ Critically Endangered/Extinct in Wild ⁽⁷⁾ Critically Endangered ⁽⁸⁾	Modified Watercourse

Note:

1. AFCD (2020a). Hong Kong Biodiversity Database.
2. DSD (2019).
3. Protected under Wild Animals Protection Ordinance (Cap. 170).
4. Protected under Protection of Endangered Species of Animals and Plants Ordinance (Cap. 586).
5. Fellowes, *et al.* (2002): RC=Regional Concern
6. "List of Wild Animals under State Protection" (promulgated by State Forestry Administration and Ministry of Agriculture on 14th January 1989).
7. Zhao (1998). China Red Data Book of Endangered Animals. Amphibia and Reptilia.
8. Jiang, *et al.* (2016). Red List of China's Vertebrates.

- 9.4.2.6 Six species of amphibians were previously recorded within the current assessment area from the Revitalisation Study. Two species are of conservation importance, which are presented in **Table 9.8**.

Table 9.8 Amphibian Species of Conservation Importance Previously Recorded within the Assessment Area

Common Name (Scientific Name)	Distribution in Hong Kong ⁽¹⁾	Protection Status	Habitat Recorded ⁽²⁾
Lesser Spiny Frog (<i>Quasipaa exilispinosa</i>)	Occurs throughout territory	PGC ⁽³⁾ Vulnerable ⁽⁴⁾	Secondary Woodland
Brown Wood Frog (<i>Hylarana latouchii</i>)	Widely distributed	LC ⁽³⁾	Urbanised Area Secondary Woodland

Notes:

1. AFCD (2020a). Hong Kong Biodiversity Database.
2. DSD (2019).
3. Fellowes, *et al.* (2002): LC=Local Concern; PGC=Potential Global Concern.
4. Jiang, *et al.* (2016). Red List of China's Vertebrates.

Mammal

- 9.4.2.7 Four species of mammals were previously recorded within the current assessment area from the Revitalisation Study. Two species are of conservation importance, which are presented in **Table 9.9**.

Table 9.9 Mammal Species of Conservation Importance Previously Recorded within the Assessment Area

Common Name (Scientific Name)	Distribution in Hong Kong ⁽¹⁾	Protection Status	Habitat Recorded ⁽²⁾
Rhesus Macaque (<i>Macaca mulatta</i>)	Common	Cap. 170 ⁽³⁾ Cap. 586 ⁽⁴⁾ Class II ⁽⁵⁾ Vulnerable ⁽⁶⁾	Urbanised Area; Secondary Woodland
Japanese Pipistrelle (<i>Pipistrellus abramus</i>)	Very common	Cap. 170 ⁽³⁾	Modified Watercourse

Notes:

1. AFCD (2020a). Hong Kong Biodiversity Database.
2. DSD (2019).
3. Protected under Wild Animals Protection Ordinance (Cap. 170).
4. Protected under Protection of Endangered Species of Animals and Plants Ordinance (Cap. 586).
5. "List of Wild Animals under State Protection" (promulgated by State Forestry Administration and Ministry of Agriculture on 14th January 1989).
6. Wang (1998). China Red Data Book of Endangered Animals. Mammalia.

Freshwater Fish and Macroinvertebrates

- 9.4.2.8 Nine freshwater fish and two freshwater macroinvertebrate species (comprising gastropods and crustaceans) were previously recorded within the current assessment area from the Revitalisation Study and the unpublished AFCD data (DSD, 2019; AFCD, 2020c). Only one freshwater macroinvertebrate species is of conservation importance, which is presented in **Table 9.10**. Nile tilapia (*Oreochromis niloticus*) and grey mullet (*Mugil cephalus*) were the dominant species in Tai Wai Nullah (TWN) channel.

Table 9.10 Freshwater Macroinvertebrate Species of Conservation Importance Previously Recorded within the Assessment Area

Common Name (Scientific Name)	Distribution in Hong Kong ⁽¹⁾	Protection Status	Habitat Recorded ⁽²⁾
<i>Cryptopotamon anacoluthon</i>	Endemic to Hong Kong; Very common	PGC ⁽³⁾ Vulnerable ⁽⁴⁾	Small Stream in Secondary Woodland

Notes:

1. AFCD (2020a). Hong Kong Biodiversity Database.
2. DSD (2019).
3. Fellowes, *et al.* (2002): PGC=Potential Global Concern.
4. IUCN (2022). IUCN Red List Version 2022-1.

Marine Ecological Resources

Coral Communities

- 9.4.2.9 During dive surveys undertaken for the Development of Sha Tin Cavern Sewage Treatment Works – EIA Report (DSD 2016, hereafter refers to as Sha Tin Cavern EIA Report), three species of hard corals were recorded (*Favites chinensis*, *Oulastrea crispata*, and *Porites lutea*). These records were made at Sha Tin Hoi between Sha Tin Sewage Treatment Works (STSTW) and Science Park, which is approximately 5.3 km northeast of the Project site. Although all three recorded species are common in Hong Kong, they are considered species of conservation importance due to protected status under the Protection of Endangered Species of Animals and Plants Ordinance (Cap. 586). Low coverage of hard corals (around 1% to 5%) was recorded from the Sha Tin Cavern EIA Report.
- 9.4.2.10 Dive surveys were conducted along the artificial shoreline of Tai Mei Tuk, east of Ma Shi Chau, and east of Yeung Chau (11.8 km northeast of the Project site) for the Development of a Bathing Beach at Lung Mei, Tai Po – EIA Report (CEDD, 2007). A number of coral colonies of *Oulastrea crispata*, *Cyphastrea serailia* and *Psammocora superficialis* were recorded, all are common and widespread in Hong Kong. Each site sustained less than 10 colonies with coral coverage being less than 5%.
- 9.4.2.11 In the Drainage Improvement in Sha Tin and Tai Po – EIA Report (DSD, 2007), a subtidal survey was undertaken off the shore of Shuen Wan. No colonies of either hard or soft corals were recorded.
- 9.4.2.12 Coral communities had been recorded at Hoi Ha Wan Marine Park and Port Island at the outfall of the Tolo Channel just on the eastern edge of the Tolo Harbour and Channel WCZ (AFCD, 2004). These coral communities are located more than 13.2 km northeast of the Project site.
- 9.4.2.13 Dive surveys were conducted along the coasts of Tai Po Landing Point and Pak Sha Tau Chau for the Proposed Submarine Gas Pipelines from Cheng Tou Jiao Liquefied Natural Gas Receiving Terminal, Shenzhen to Tai Po Gas Production Plant, Hong Kong – EIA Report. The Tai Po Landing only supported low coverage of hard coral (*Oulastrea crispata* and *Goniopora* sp.) and black coral (*Antipatharia Antipathes* sp.) (HKCGCL, 2003).
- 9.4.2.14 Coral surveys were conducted in 2001 off the western coast of Wu Kai Sha Tsui for the Feasibility Study for Housing Development at Whitehead and Lee On in Ma On Shan, Sha Tin – EIA Report. Only one colony of black coral (approximately 0.7 m in height and 0.8 m in width) *Antipathes* sp. was recorded, which was widespread and common in soft seabed (TDD, 2002). The black coral colony was small and made up less than 1% of the sea bottom surface, and is located more than 8.5 km northeast of the Project site. No hard corals or other rare species were observed.

Benthos

- 9.4.2.15 Benthos surveys were conducted within Sha Tin Hoi between STSTW and Science Park during the Development of the Sha Tin Cavern EIA Report. In total, 22 species were recorded, with annelids (Phylum *Annelida*) recorded as the most abundant and the most diverse phylum. No benthos species of conservation importance was recorded.
- 9.4.2.16 During the benthos surveys undertaken for the Development of a Bathing Beach at Lung Mei, Tai Po – EIA Report, core sampling was conducted in Shuen Wan Hoi. A total of 24 species of benthic organisms were recorded, which were dominated by organisms from the Phyla *Annelida* and *Mollusca*. Samples taken in shallow waters contained high biomass and low diversity and vice versa in deep waters. No rare species or species of conservation importance was observed (CEDD, 2007).
- 9.4.2.17 Benthic grab samples were collected in inner Tolo Harbour just south of the Tai Po Industrial Estate for the Proposed Submarine Gas Pipelines from Cheng Tou Jiao Liquefied Natural Gas Receiving Terminal, Shenzhen to Tai Po Gas Production Plant, Hong Kong – EIA Report. Survey results showed the benthic community to be dominated by polychaetes and was characterized as low species diversity, abundance and biomass (HKCGCL, 2003). No rare species or species of conservation importance was recorded.

9.4.2.18 In a territory-wide study on marine benthic communities in Hong Kong, four grab samples were taken from Tolo Harbour and Tolo Channel (AFCD, 2002). Low species richness (4 – 23 species per 0.5 m²) and abundance (26 – 106 individuals per m²) were recorded from the two grab samples taken from Tolo Harbour. The other two grab samples, taken from Tolo Channel, also recorded low species richness (7 – 26 species per 0.5 m²) and abundance (30 – 174 individuals per m²) (AFCD, 2002). No species of conservation importance was recorded.

Intertidal Communities

9.4.2.19 Intertidal surveys were conducted along the artificial shoreline of STSTW and Ma On Shan during the Development of the Sha Tin Cavern EIA Report. A total of 31 species were recorded at the five sampling locations. No intertidal species of conservation importance was recorded.

9.4.2.20 The communities of the intertidal flats of Shuen Wan were surveyed in the Drainage Improvement in Sha Tin and Tai Po EIA report. 30 species were recorded from Shuen Wan flats. Mudsnailed (*Batillaria* spp. and *Cerithidea* spp.), sand snails (*Cerithidea* spp.) and rock oyster (*Saccostrea cucullata*) dominated these intertidal flats (DSD, 2007). No species of conservation importance was recorded.

9.4.2.21 During the intertidal surveys undertaken for the Development of a Bathing Beach at Lung Mei, Tai Po – EIA Report, sandy shore, mangrove and artificial shoreline were identified and surveyed. Sandy shore supported a low diversity of species dominated by common or very common rocky shore species found in Hong Kong (CEDD, 2007). The mangroves were relatively undisturbed and were found at the mouth of Shan Liu River and Ting Kok SSSI. The recorded dominant species with the height ranging from 0.3 m to 1.5 m, these included *Kandelia obovata*, *Excoecaria agallocha*, *Bruguiera gymnorrhiza* and *Aegiceras corniculatum* (CEDD, 2007). These mangroves are more than 11.8 km northeast of the Project site. The artificial shoreline located adjacent to the Tai Mei Tuk barbecue sites was disturbed and species diversity was low. No species of conservation importance was recorded.

9.4.2.22 Intertidal surveys were undertaken along the artificial seawall at the Tai Po Waterfront Park (south of the Tai Po Industrial Estate) for the Proposed Submarine Gas Pipelines from Cheng Tou Jiao Liquefied Natural Gas Receiving Terminal, Shenzhen to Tai Po Gas Production Plant, Hong Kong – EIA Report. Periwinkles (*Littoraria articulata* and *Echinolittorina radiata*), gastropod (*Thais clavigera*) and other sessile filter-feeder organisms, such as rock oysters (*Saccostrea cucullata*) and barnacles (*Tetraclita squamosa*) were recorded to dominate this habitat. No species of conservation importance was recorded (HKCGCL, 2003).

9.4.2.23 An intertidal survey was conducted in 1997 off the shore of Tolo Highway near Deerhill Bay and Pak Shek Kok Sports Center, for the Pak Shek Kok Development – EIA Report. Upon the development of Pak Shek Kok, this area is now reclaimed land. During the survey, the man-made intertidal habitat consisted of large boulders (>1 m diameter). Each intertidal region displayed different species composition. High shore was dominated by littorinids and topshell (*Monodonta labio*), mid shore was dominated by herbivorous gastropods and lower shore was dominated by sea slater (*Ligia exotica*) (TDD, 1998). All species recorded are typical of sheltered shores in Hong Kong. No species of conservation importance was recorded.

9.5 Survey Findings

9.5.1 Habitat and Vegetation

9.5.1.1 A total of nine habitat types were recorded within the 500 m assessment area during recent surveys, comprising woodland, mixed woodland, plantation, grassland, reservoir, village/orchard, developed area/ wasteland, natural and modified watercourses (**Table 9.11** refers). Habitat maps and representative photographs of habitats recorded within assessment area are shown in **Figure 9.3**, **Figures 9.3A – 9.3C** and **Appendix 9.2**. Only two habitat types (developed area and modified watercourses) were recorded within the actual Project site.

Table 9.11 Habitats Recorded within the Assessment Area

Habitat Type	Total Area (ha)		% Assessment Area
	Within Project Site	Within 500m Assessment Area	
Woodland	-	70.6	23.7%
Mixed Woodland	-	29.4	9.9%
Plantation	-	18.3	6.1%
Grassland	-	2.3	0.8%
Reservoir	-	8.7	2.9%
Village/Orchard	-	5.6	1.9%
Developed Area/Wasteland	4.3	151.9 (Including Project site)	51.0%
Natural Watercourse	-	0.4	0.1%
Modified Watercourse	6.8	10.9 (Including Project site)	3.7%
Total	11.1	298.0	100%

9.5.1.2 A total of 332 flora species were recorded during the ecological surveys (**Appendix 9.3**), with eight flora species of conservation importance recorded. The indicative locations and representative photographs of species of conservation importance are presented in **Figure 9.3A – Figure 9.3C** and **Appendix 9.4**. A summary of floral species of conservation importance recorded within the assessment area is presented in **Table 9.12**.

Table 9.12 List of Flora species of conservation importance recorded within the Assessment Area during Recent Survey

Common Name (Scientific Name)	Distribution in Hong Kong ⁽¹⁾	Protection Status	Habitat Recorded
Incense Tree (<i>Aquilaria sinensis</i>)	Common	Cap. 586 ⁽²⁾ Near Threatened ^{(3) (8)} Category II ⁽⁴⁾ Vulnerable ^{(5) (6) (7)}	WL, RES
Silver-back Artocarpus (<i>Artocarpus hypargyreus</i>)	Common	Near Threatened ^{(3) (8)} Endangered ⁽⁶⁾ Vulnerable ⁽⁷⁾	WL, MWL
Butulang Canthium (<i>Canthium dicoccum</i>)	Common	Vulnerable ⁽⁷⁾	WL
Lamb of Tartary (<i>Cibotium barometz</i>)	Very common	Cap. 586 ⁽²⁾ Vulnerable ⁽³⁾ Category II ⁽⁴⁾	WL
Small Persimmon (<i>Diospyros vaccinioides</i>)	Very common	Endangered ⁽⁶⁾ Critically Endangered ⁽⁷⁾	WL
Luofushan Joint-fir (<i>Gnetum luofuense</i>)	Very common	Near Threatened ⁽⁷⁾	WL; MWL
Shrubby Ichnocarpus (<i>Ichnocarpus frutescens</i>)	Very rare	-	MWL
Hairy-fruited Ormosia (<i>Ormosia pachycarpa</i>)	Restricted	Endangered ⁽³⁾ Vulnerable ⁽⁶⁾	WL

Notes:

1. Wu & Lee (2000); Xing, *et al.* (2000); Siu (2000).
2. Protected by the Protection of Endangered Species of Animals and Plants Ordinance (Cap. 586)
3. Hu, *et al.* (2003). Rare and Precious Plants of Hong Kong.
4. "List of Wild Plants under State Protection" (promulgated by the Ministry of Forestry in 1999).
5. Fu (1992). China Plant Red Data Book. Vol. 1 - Rare and Endangered Plants.
6. Qin, *et al.* (2017). Threatened Species List of China's Higher Plants.
7. IUCN (2022). IUCN Red List Version 2022-1
8. Feng, *et al.* (2002). Study on Rare and Endangered Plants and National Key Protected Plants in Guangdong.

Habitat Type: **WL**: Woodland; **MWL**: Mixed Woodland; **RES**: Reservoir.

Woodland

- 9.5.1.3 Woodland was recorded to the north, north-east, south and south-east of the Lower Shing Mun Reservoir Main Dam, covering the majority of the western assessment area as well as north of Mei Chung Court and Peak One in the north-eastern assessment area. The habitat was composed of a moderate diversity of native and exotic species with trees of approximately 5 – 9 m tall. The canopy was dominated by tree species acronychia (*Acronychia pedunculata*), turn-in-the-wind (*Mallotus paniculatus*), ivy tree (*Schefflera heptaphylla*) and lance-leaved sterculia (*Sterculia lanceolata*), while understorey was colonised by a variety of shrubs, including desmos (*Desmos chinensis*), wild coffee (*Psychotria asiatica*) and oblong-leaved litsea (*Litsea rotundifolia* var. *oblongifolia*). Climber species, *Dalbergia* spp., was also commonly recorded along the woodland fringe.
- 9.5.1.4 Seven species of conservation importance were recorded from woodland habitats in the assessment area, comprising: incense tree (*Aquilaria sinensis*), silver-back artocarpus (*Artocarpus hypargyreus*), butulang canthium (*Canthium dicoccum*), lamb of tartary (*Cibotium barometz*), small persimmon (*Diospyros vaccinioides*), luofushan joint-fir (*Gnetum luofuense*) and hairy-fruited ormosia (*Ormosia pachycarpa*). As part of the village/orchard habitat is located within or adjacent to woodland, some fruit trees such as lychee (*Litchi chinensis*) and mango (*Mangifera indica*), were recorded in the habitat as well.

Mixed Woodland

- 9.5.1.5 Mixed woodland was scattered throughout the assessment area, with larger patches located at the north of Lower Shing Mun Road near Lower Shing Mun Reservoir Main Dam, south of Peak One and north of Green View Garden. Dominant canopy tree species included Taiwan acacia (*Acacia confusa*), *Eucalyptus* spp., elephant's ear (*Macaranga tanarius* var. *tomentosa*) and turn-in-the-wind, ranging from 5 – 10 m in height. The understorey was colonised by a variety of shrubs, including pop-gun seed (*Bridelia tomentosa*), desmos and opposite-leaved fig (*Ficus hispida*). Three flora species of conservation importance were recorded including luofushan joint-fir, shrubby ichnocarpus (*Ichnocarpus frutescens*) and silver-back artocarpus.

Plantation

- 9.5.1.6 Patches of mature plantation are scattered around the fringe of other habitats (woodland, mixed woodland and developed area) on engineered slopes. Larger patches of this habitat are located at Mei Tin Estate, Tai Wai New Village, Mei Chung Court and May Shing Court. The structure of this habitat was simple, dominated by planted (often exotic) tree species such as Taiwan acacia, alongside common native and exotic trees such as white popinac (*Leucaena leucocephala*), elephant's ear and turn-in-the-wind. Understorey species included oriental blechnum (*Blechnum orientale*) and wood-fern (*Cyclosorus parasiticus*). No flora species of conservation importance were recorded.

Grassland

- 9.5.1.7 A patch of grassland was recorded at the slope of Lower Shing Mun Reservoir on the Lower Shing Mun Supply Basin. The structure of this habitat was very simple, composed of a variety of herbs, shrubs and climbers, mainly native species. Dominant species included ditch millet (*Paspalum scrobiculatum* var. *orbiculare*), sensitive plant (*Mimosa pudica*), Australian smut-grass (*Sporobolus fertilis*) and dichotomy forked fern (*Dicranopteris pedata*). The shrubs common melastoma (*Melastoma malabathricum*) and rose myrtle (*Rhodomyrtus tomentosa*), were also commonly found in this habitat. No flora species of conservation importance were recorded.

Reservoir

- 9.5.1.8 The Lower Shing Mun Reservoir is located in the western side of the assessment area. Limited vegetation was observed along the riparian habitats of the reservoir. Flora species recorded were all on the eastern slope of the reservoir adjacent to the Lower Shing Mun Supply Basin. Dominant species included exotic tree species Taiwan acacia, native herb species burma-reed (*Neyraudia reynaudiana*) and exotic herb species guinea grass (*Panicum maximum*). Self-sown exotic species such as lantana (*Lantana camara*) and white popinac were commonly recorded in this habitat. One flora species of conservation importance, incense tree, was recorded on the eastern slope of the reservoir, next to the grassland on Lower Shing Mun Supply Basin.

Village / Orchard

- 9.5.1.9 Patches of village habitat were recorded in Heung Fan Liu at the western and north-western side of the assessment area. Vegetation within the village habitat was dominated by planted shrub calamondin (*Citrus mitis*) and weedy trees white popinac, as well as some self-sown trees aporosa (*Aporosa dioica*) and elephant's ear.
- 9.5.1.10 An abandoned orchard (around 0.29 ha and entirely fenced off) was identified within Heung Fan Liu village. Abandoned water supply channel and terrace like concrete structure separating the orchard into different levels were observed. The habitat had a simple structure and supported mainly mature fruit trees, including jackfruit (*Artocarpus heterophyllus*), papaya (*Carica papaya*), pomelo (*Citrus maxima*), calamondin, wampi (*Clausena lansium*), longan (*Dimocarpus longan*), mango, banana (*Musa x paradisiaca*) and rose apple (*Syzygium jambos*). No flora species of conservation importance were recorded.

Developed Area / Wasteland

- 9.5.1.11 Developed areas / wasteland dominate the majority of assessment area, mainly comprised of roads, roadside plantings, residential areas, public facilities (e.g. school, playgrounds and museum) and public utilities. This habitat mostly located at both side of TWN, including Heung Fan Liu New Village, Mei Tin Estate, down to Man Lai Court and extending to south-eastern part of the assessment area. In general, vegetations recorded was mainly landscape and roadside planting as well as exotic plants, such as Taiwan acacia, candlenut tree (*Aleurites moluccana*), paper-bark tree (*Melaleuca cajuputi cumingiana*), flame tree (*Delonix regia*), white popinac, ixora (*Ixora stricta*) and pink powder puff (*Calliandra haematocephala*). Mature trees along the northern bank of Shing Mun River Channel (from Block 3 of Man Lai Court to Sha Tin Government Secondary School) were identified as night roosting site for ardeids. These mature tree species included white popinac, Chinese banyan (*Ficus microcarpa*), cuban bast (*Hibiscus tiliaceus*) and elephant's ear. Part of this habitat was recorded within the Project site, with dominant species of *Bidens alba*, Chinese banyan and guinea grass (*Panicum maximum*). No flora species of conservation importance was recorded.

Natural Watercourse

- 9.5.1.12 A number of natural watercourses (S1 – S5) were recorded within the assessment area, including watercourses running through Heung Fan Liu (S1), east of Shatin 400 kV substation (S2), west (S3) and north (S4) of Mei Chung Court and north of Peak One (S5). Most of the natural watercourses are natural in terms of physical condition, except downstream of S3 and upstream of S4, which are partly modified at the banks. Water flow of all these natural watercourses have been greatly restricted due to water abstraction in the upper reaches. A very small natural watercourse was also identified at the east of Lower Shing Mun Reservoir, which partially runs along surface on the Lower Shing Mun Road down to hillside north of Lakeview Garden. This habitat was mainly dominated by native herb species, including giant alocasia (*Alocasia macrorrhizos*), diffuse day-flower (*Commelina diffusa*), dichotomy forked fern (*Dicranopteris pedata*), ladder brake (*Pteris vittata*), Chinese scaleseed sedge (*Lepidosperma chinense*) and golden-hair grass (*Pogonatherum crinitum*). No flora species of conservation importance were recorded from this habitat type.
- 9.5.1.13 Natural watercourse S1 has two tributaries that flow from the mountain northwest of Heung Fan Liu villages into upper section of TWN (in between stilling basin and Heung Fan Liu Bridge). It is fairly natural with width varies from <1 m to 3 m. Downstream of S1 within village/orchard habitat mainly comprised of rocky substrate with muddy bottom. Litter were commonly found along downstream of S1, particularly with municipal solid waste in the section within Heung Fan Liu Villages. Vegetation such as giant alocasia, diffuse day-flower, dichotomy forked fern, ladder brake and *Bidens alba* were commonly found in this natural watercourse.
- 9.5.1.14 The small natural watercourse S2 was recorded slowly flowing from outside of the assessment area through woodland habitat towards the mixed woodland at north-eastern side of Shatin 400 kV substation. It is fairly natural with width varies from 1 m to 5 m, with a clear and small water flow. It mainly comprises of rocky substrate with occasional sandy bottom. Vegetation such as taro (*Colocasia esculenta*), mile-a-minute weed (*Mikania micrantha*), dieffenbachia (*Dieffenbachia seguine*), wood-fern and giant alocasia were recorded in this natural watercourse.

9.5.1.15 Other three natural watercourses located to the west (S3) and north (S4) of Mei Chung Court and north of Peak One (S5) were shaded by trees in adjacent habitats such as common red-stem fig (*Ficus variegata*), turn-in-the-wind and lance-leaved sterculia. These watercourses have a relatively natural substrate, except downstream of S3 and upstream of S4 are partly modified. Width of S3 are generally <1 m, while the modified part has a width of 6m. Width of S4 varies from 3 m to 14 m, while S5 varies from 4 m to 9 m with a relatively fast water flow rate.

Modified Watercourse

9.5.1.16 Modified watercourses recorded within the assessment area include the channelised TWN and Shing Mun River Channel, which together comprise the fifth largest habitat within the assessment area. No flora species of conservation importance was recorded in this habitat type.

9.5.1.17 The TWN is approximately 2 km long and is a typical trapezoidal drainage channel lined with concrete and provided with a low flow channel. Water flow in the TWN is restricted to the low flow channel most of the year at the upstream and midstream to the Tai Wai Soccer Pitch, after which the flow is tidally influenced. The completely hard paved channel and banks support limited vegetation which only developed in crevices in concrete bed and banks, and along the concreted drains. Common ruderal vegetation (such as *Bidens alba*) was recorded in the channel bed and along the low flow channel but in low abundance.

9.5.1.18 Surveys of TWN for this project divided the channel into six sections from upstream to downstream (**Figure 9.3** refers). Section 6 at upstream starts from the Shing Mun Reservoir overflow dissipater (including the stilling basin) to Heung Fan Liu Bridge, followed by Section 5 to Block 2 of Parkview Garden, Section 4 to footbridge near Mei Yeung House of Mei Lam Estate, Section 3 to Buddhist Wong Wan Tin College basketball court, Section 2 to Shing Ho Building and Section 1 at downstream TWN up till the confluence with Shing Mun River Channel at Tower 1 of Man Lai Court.

9.5.1.19 Upstream Section 6 is approximately 420 m in length, comprising a small patch of disturbed wetland vegetation within the stilling basin and a section of concrete lined channel. The stilling basin is 0.18 ha in size, and while lined with concrete, deposition of fine sediments has allowed some wetland and terrestrial plant species to establish. Dominant species in this area were mainly herbs, such as taro, diffuse day-flower, umbrella plant (*Cyperus involucratus*), *Ludwigia decurrens*, Chinese silvergrass (*Miscanthus sinensis*) and hairy knotweed (*Persicaria barbata*). The width of channel section varies from 35 m to 40 m with a low flow channel (1.5 m wide). Flow rate in the channel section was slow with limited water, algae was also observed along low flow channel during the surveys.

9.5.1.20 Sections 2 to 5 extend from Heung Fan Liu Bridge to Shing Ho Building with similar channel characteristics. Channel width is the same along these four sections (35 m), while the low flow channel gradually increases from 1.5 m (Section 5 to mid-Section 3) to 2.5 m (mid-Section 3 to Section 2) in width. There are several mature trees (mostly Chinese banyan) along the TWN banks along these stretches, with the roots of these trees observed growing on the surface of the channel banks to the channel bed. Aside from planted trees, vegetation in these sections was limited to sparse, common ruderal vegetation.

9.5.1.21 Section 1 (400 m) is tidally influenced. Its width increases gradually from 35 m to 60 m towards the confluence with Shing Mun River Channel with a 2.5 m low flow channel up to the confluence of Shing Mun River Channel and TWN. Sandy sediments were observed deposited in the channel due to tidal movement from the Shing Mun River Channel. At the confluence, there are two large concrete ramps which is used for vehicular access to the nullah bed to facilitate desilting works at the mouth of the nullah. These concrete access ramps running alongside Man Lai Court Block 1 and 2 (Section 1) to Hong Kong Heritage Museum were identified as pre-roosting site for ardeids.

9.5.1.22 The other major channelised watercourse is the Shing Mun River Channel which is located at downstream of TWN and at the eastern end of the assessment area. The channel increases gradually from 60 m to 79 m wide, with the entire channel width submerged with water except during very low tides. The channel is also completely concrete lined with limited self-seeded vegetation growing on the crevices at bankside.

9.5.2 Terrestrial Fauna

Avifauna

- 9.5.2.1 A total of 53 avifauna species were recorded within the assessment area, including 33 species in the Project site. While most recorded species are common and widespread in Hong Kong, twelve are considered species of conservation importance (**Table 9.13** refers). The full list of avifauna species recorded, their protection status, and habitats recorded in are presented in **Appendix 9.5**. Low diversity of avifauna were recorded with the Project site, with only eight species of conservation importance recorded (**Table 9.13** refers). Six of the recorded species of conservation importance are common wetland dependant species that were observed in the downstream tidal Section 1 of TWN, comprising great egret (*Ardea alba*), grey heron (*Ardea cinerea*), Chinese pond heron (*Ardeola bacchus*), collared crow (*Corvus torquatus*), little egret (*Egretta garzetta*) and black-crowned night heron (*Nycticorax nycticorax*). The other two species of conservation importance, greater coucal (*Centropus sinensis*) and rufous-capped babbler (*Stachyridopsis ruficeps*) are common resident birds recorded on trees at upstream stilling basin (Section 6) adjacent to Heung Fan Liu.
- 9.5.2.2 Two raptor species of conservation importance, namely black kite (*Milvus migrans*) and Eastern buzzard (*Buteo japonicus*) were recorded in-flight over of woodland habitats in western side of assessment area. Black kite was also recorded in-flight above village / orchard habitat near Heung Fan Liu and developed area habitats downstream TWN (Section 1) near Man Lai Court.
- 9.5.2.3 Two other species of conservation importance, common emerald dove (*Chalcophaps indica*) and mountain bulbul (*Ixos mcclllandii*) were recorded from woodland / mixed woodland habitats relatively distant from the Project site (approximately 320 m and 245 m respectively).

Table 9.13 Avifauna Species of Conservation Importance Recorded within the Assessment Area during Recent Survey

Common Name (Scientific Name) ⁽¹⁾	Distribution in Hong Kong ⁽³⁾	Protection Status	Habitat Recorded ⁽¹⁰⁾	
			Within Project Site	Within 500m Assessment Area
Great Egret ⁽⁹⁾ (<i>Ardea alba</i>)	Common resident and winter visitor	PRC (RC) ⁽⁴⁾	MWC	MWC; DA
Grey Heron ⁽⁹⁾ (<i>Ardea cinerea</i>)	Common winter visitor	PRC ⁽⁴⁾	MWC	MWC; DA
Chinese Pond Heron ⁽⁹⁾ (<i>Ardeola bacchus</i>)	Common resident	PRC (RC) ⁽⁴⁾	MWC	-
Eastern Buzzard ⁽⁹⁾ (<i>Buteo japonicus</i>)	Common winter visitor	Cap. 586 ⁽²⁾ Class II ⁽⁵⁾	-	WL
Greater Coucal (<i>Centropus sinensis</i>)	Common resident	Class II ⁽⁵⁾ Vulnerable ⁽⁶⁾	DA	WL; MWL; DA
Common Emerald Dove (<i>Chalcophaps indica</i>)	Scarce but widespread resident	Vulnerable ⁽⁶⁾	-	WL; MWL
Collared Crow ⁽⁹⁾ (<i>Corvus torquatus</i>)	Uncommon resident	LC ⁽⁴⁾ Near Threatened ⁽⁷⁾ Vulnerable ⁽⁸⁾	MWC	MWC
Little Egret ⁽⁹⁾ (<i>Egretta garzetta</i>)	Common resident	PRC (RC) ⁽⁴⁾	MWC; DA	MWC; RES; DA
Mountain Bulbul (<i>Ixos mcclllandii</i>)	Rare resident	-	-	WL
Black Kite ⁽⁹⁾ (<i>Milvus migrans</i>)	Common resident and winter visitor	Cap. 586 ⁽²⁾ (RC) ⁽⁴⁾ Class II ⁽⁵⁾	-	WL; VO; DA

Common Name (Scientific Name) ⁽¹⁾	Distribution in Hong Kong ⁽³⁾	Protection Status	Habitat Recorded ⁽¹⁰⁾	
			Within Project Site	Within 500m Assessment Area
Black-crowned Night Heron ⁽⁹⁾ (<i>Nycticorax nycticorax</i>)	Common resident and winter visitor	(LC) ⁽⁴⁾	MWC	MWC
Rufous-capped Babbler (<i>Stachyridopsis ruficeps</i>)	Common resident	LC ⁽⁴⁾	DA	WL; MWL

Notes:

- All wild birds are protected under Wild Animals Protection Ordinance (Cap. 170).
- Protected under the Protection of Endangered Species of Animals and Plants Ordinance (Cap. 586).
- AFCD (2020a). Hong Kong Biodiversity Database.
- Fellowes, *et al.* (2002): LC=Local Concern; PRC=Potential Regional Concern; RC=Regional Concern.
*Letters in parentheses indicate that the assessment is on the basis of restrictedness in nesting and/or roosting sites rather than in general occurrence.
- "List of Wild Animals Under State Protection" (promulgated by State Forestry Administration and Ministry of Agriculture on 14 January 1989).
- Zheng & Wang (1998). China Red Data Book of Endangered Animals: Aves.
- Jiang, *et al.* (2016). Red List of China's Vertebrates.
- IUCN (2022). IUCN Red List Version 2022-1
- Wetland-dependent species (including wetland-dependent species and waterbirds).

Habitat Type: **WL**: Woodland; **MWL**: Mixed Woodland; **MWC**: Modified Watercourse; **RES**: Reservoir; **VO**: Village/Orchard; **DA**: Developed Area/Wasteland.

9.5.2.4 Ardeid pre-roosting and night roosting behaviour was recorded at the downstream section of TWN and adjacent areas of Shing Mun River Channel. The concrete access ramps alongside downstream TWN from Man Lai Court Block 1 and 2 (Section 1) to Hong Kong Heritage Museum were observed to be pre-roosting site for ardeids, while various mature trees (white popinac, Chinese banyan, cuban bast and elephant's ear) on the northern bank of Shing Mun River Channel (from Block 3 of Man Lai Court to Sha Tin Government Secondary School) formed the night roosting site. The peak returning period of the ardeid to night roosting site was observed to be 15 - 45 mins before or after sunset is for night roosting site sunset. During the wet season, relatively few numbers of ardeid were observed using the night roost. This behaviour changed in the dry season, where larger numbers of ardeids were observed congregating at the pre-roost in the late afternoon before moving to the roost at dusk (**Table 9.14**).

Table 9.14 Number of Pre-roosting / Night Roosting Ardeids Recorded

Ardeid Species	Number of Ardeids Recorded		
	Wet Season (Pre-roost+ Night roost)	Dry Season (Pre-roost+ Night roost)	Dry Season (Additional Site Check on Night roost)
Great Egret (<i>Ardea alba</i>)	4	44	47
Grey Heron (<i>Ardea cinerea</i>)	-	4	3
Chinese Pond Heron (<i>Ardeola bacchus</i>)	-	-	1
Little Egret (<i>Egretta garzetta</i>)	11	60	57
Total	15	108	108

9.5.2.5 Flight paths of ardeids around the confluence of the TWN and Shing Mun River Channel were also recorded during the pre-roost/night roost surveys. It was noted the vast majority of recorded flights (84%) were along the Shing Mun River Channel, either to or from downstream sections of the channel. Relative percentages of ardeid usage of each flight path are presented in **Table 9.15** and results from flight path survey are presented in **Figure 9.4**.

Table 9.15 Relative Percentage of Ardeid Usage in each Flight Path

Flight Path (FP)	Number of Ardeids	Relative Percentage of Ardeid Usage
FP 1	38	46%
FP 2	5	6%
FP 3	23	28%
FP 4	3	4%
FP 5	13	16%

Note:

This table does not reflect the actual number of ardeids utilising TWN, as the number of ardeids recorded flying away from TWN may include those flew back and out again.

Butterflies

- 9.5.2.6 A total of 59 butterfly species were recorded from recent survey within the assessment area, with five species of conservation importance recorded (**Table 9.16**). The full list of butterfly species recorded, their protection status, and habitats recorded in are presented in **Appendix 9.5**. Four species of conservation importance, including danaid eggfly (*Hypolimnas misippus*), metallic cerulean (*Jamides alaya alocina*), malayan (*Megisba alaya sikkima*) and tiny grass blue (*Zizula hylax*) were recorded at developed area around the upstream stilling basin. While common archduke (*Lexias pardalis*) was recorded at village/orchard habitat in Heung Fan Liu.

Table 9.16 Butterfly Species of Conservation Importance Recorded within the Assessment Area during Recent Survey

Common Name (Scientific Name)	Distribution in Hong Kong ⁽¹⁾	Protection Status	Habitat Recorded ⁽³⁾	
			Within Project site	Within 500m Assessment Area
Danaid Eggfly (<i>Hypolimnas misippus</i>)	Uncommon	LC ⁽²⁾	MWC; DA	WL
Metallic Cerulean (<i>Jamides alecto alocina</i>)	Very rare	-	DA	-
Common Archduke (<i>Lexias pardalis</i>)	Unknown; First recorded in 2008, monitoring underway	-	-	VO
Malayan (<i>Megisba malaya sikkima</i>)	Very rare; Species of Conservation Concern	LC ⁽²⁾	DA	-
Tiny Grass Blue (<i>Zizula hylax</i>)	Very rare; Species of Conservation Concern	-	DA	-

Notes:

1. AFCD (2020a). Hong Kong Biodiversity Database.

2. Fellowes, *et al.* (2002): LC=Local Concern.

Habitat Type: **WL**: Woodland; **MWC**: Modified Watercourse; **VO**: Village/Orchard; **DA**: Developed Area/Wasteland.

Odonates

- 9.5.2.7 A total of 21 odonate species were recorded from recent survey within the assessment area, with two species of conservation importance recorded (**Table 9.17**). The full list of odonate species recorded, their protection status and habitats recorded in are presented in **Appendix 9.5**. Both species of conservation importance, Chinese cascader (*Zygonyx asahina*) and emerald cascader (*Zygonyx iris insignis*) were recorded at developed area near Lower Shing Mun Supply Basin. The Project site supported very low diversity and abundance of odonate species with only six abundant and widespread species recorded.

Table 9.17 Odonate Species of Conservation Importance Recorded within the Assessment Area during Recent Survey

Common Name (Scientific Name)	Distribution in Hong Kong ⁽¹⁾	Protection Status	Habitat Recorded ⁽³⁾	
			Within Project Site	Within 500m Assessment Area
Chinese Cascader (<i>Zygonyx asahinai</i>)	Uncommon; Scattered	GC ⁽²⁾	-	DA
Emerald Cascader (<i>Zygonyx iris insignis</i>)	Abundant; Widespread	PGC ⁽²⁾	-	DA

Notes:

1. AFCD (2020a). Hong Kong Biodiversity Database.
2. Fellowes, *et al.* (2002): PGC=Potential Global Concern; GC=Global Concern.

Habitat Type: **DA**: Developed Area/Wasteland.Herpetofauna

9.5.2.8 A total of ten reptile and seven amphibian species were recorded within the assessment area. The full list of herpetofauna species recorded, their protection status and habitats recorded in are presented in **Appendix 9.5**. The Project site supported very low diversity and abundance of herpetofauna with no species of conservation importance recorded. While most of the recorded species are widely distributed throughout Hong Kong (AFCD, 2020a), four reptile species of conservation importance were recorded (**Table 9.18**).

9.5.2.9 Both tokay gecko (*Gekko gekko*) and many-banded krait (*Bungarus multicinctus multicinctus*) were recorded in woodland habitat near Lower Shing Mun Reservoir. Mountain water snake (*Sinonatrix percarinata percarinata*) was recorded within section of S1 running within Heung Fan Liu Village while tadpoles of lesser spiny frog (*Quasipaa exilispinosa*) were recorded at smaller tributary of S1. Four-clawed gecko (*Gehyra mutilate*) was recorded within village habitat near Heung Fan Liu.

Table 9.18 Herpetofauna Species of Conservation Importance Recorded within the Assessment Area during Recent Survey

Common Name (Scientific Name)	Distribution in Hong Kong ⁽¹⁾	Protection Status	Habitat Recorded ⁽⁷⁾	
			Within Project Site	Within 500m Assessment Area
Amphibians				
Lesser Spiny Frog (<i>Quasipaa exilispinosa</i>)	Occurs throughout territory	PGC ⁽²⁾ Vulnerable ⁽⁵⁾	-	NWC
Reptiles				
Many-banded Krait (<i>Bungarus multicinctus multicinctus</i>)	Widely distributed throughout Hong Kong	PRC ⁽²⁾ Vulnerable ⁽³⁾ Endangered ⁽⁵⁾	-	WL
Four-clawed Gecko (<i>Gehyra mutilate</i>)	Widely distributed throughout Hong Kong	Vulnerable ⁽³⁾	-	VO
Tokay Gecko (<i>Gekko gekko</i>)	Distributed on Lamma Island, Lantau Island, Hong Kong Island, Lion Rock Country Park, Ma On Shan Country Park and Pat Sin Leng Country Park. Some population are considered as escaped from snake shops.	RC ⁽²⁾ Endangered ⁽³⁾ Class II ⁽⁴⁾ Critically Endangered ⁽⁵⁾		WL
Mountain Water Snake (<i>Sinonatrix percarinata percarinata</i>)	Distributed in streams in central New Territories (Shing Mun Country	LC ⁽²⁾ Vulnerable ⁽⁵⁾	-	NWC

Common Name (Scientific Name)	Distribution in Hong Kong ⁽¹⁾	Protection Status	Habitat Recorded ⁽⁷⁾	
			Within Project Site	Within 500m Assessment Area
	Park, Tai Po Kau Nature Reserve, Tai Lam Country Park)			

Notes:

1. AFCD (2020a). Hong Kong Biodiversity Database.
2. Fellowes, *et al.* (2002): LC=Local Concern; PRC=Potential Regional Concern; RC=Regional Concern; PGC=Potential Global Concern.
3. Zhao (1998). China Red Data Book of Endangered Animals. Amphibia and Reptilia.
4. "List of Wild Animals Under State Protection" (promulgated by State Forestry Administration and Ministry of Agriculture on 14 January 1989).
5. Jiang, *et al.* (2016). Red List of China's Vertebrates.
6. IUCN (2022). IUCN Red List Version 2022-1

Habitat Type: **WL**: Woodland; **NWC**: Natural Watercourse; **VO**: Village/Orchard

Mammals

9.5.2.10 Eight mammal species (**Table 9.19**) were recorded within the Assessment with all considered of conservation importance. The full list of mammal species recorded, their protection status and habitats recorded in are presented in **Appendix 9.5**. Most of the recorded species are common or very common in Hong Kong with only one uncommon species, least pipistrelle (*Pipistrellus tenuis*) and one rare species, Chinese pipistrelle (*Hypsugo pulveratus*) recorded. Only two species were recorded within the Project site. Day roost of short-nosed fruit bats (*Cynopterus sphinx*) was observed on Chinese fan-palm (*Livistona chinensis*) alongside Man Lai Court, while Chinese noctule (*Nyctalus plancyi*) was recorded at culvert near Heung Fan Liu Bridge in Section 5 of the Project site.

Table 9.19 Mammal Species of Conservation Importance Recorded within the Assessment Area during Recent Survey

Common Name (Scientific Name) ⁽¹⁾	Distribution in Hong Kong ⁽³⁾	Protection Status	Habitat Recorded ⁽⁸⁾	
			Within Project Site	Within 500m Assessment Area
Short-nosed Fruit Bat (<i>Cynopterus sphinx</i>)	Very Common	Indeterminate ⁽⁶⁾ Near Threatened ⁽⁷⁾	DA	DA
Himalayan Leaf-nosed Bat (<i>Hipposideros armiger</i>)	Very Common	(LC) ⁽⁴⁾	-	WL
Chinese Pipistrelle (<i>Hypsugo pulveratus</i>)	Rare; Species of Conservation Concern	(LC) ⁽⁴⁾ Near Threatened ⁽⁷⁾	-	DA
Rhesus Macaque (<i>Macaca mulatta</i>)	Common	Cap. 586 ⁽²⁾ Class II ⁽⁵⁾ Vulnerable ⁽⁶⁾	-	WL; MWL DA
Chinese Noctule (<i>Nyctalus plancyi</i>)	Common	PRC, (RC) ⁽⁴⁾	MWC	DA
Japanese Pipistrelle (<i>Pipistrellus abramus</i>)	Very Common	-	-	WL
Least Pipistrelle (<i>Pipistrellus tenuis</i>)	Uncommon	Near Threatened ⁽⁷⁾	-	WL; DA
Lesser Bamboo Bat (<i>Tylonycteris pachypus</i>)	Very Common	(LC) ⁽⁴⁾ Rare ⁽⁶⁾	-	WL

Notes:

1. All the recorded species are protected under Wild Animals Protection Ordinance (Cap. 170).
2. Protected under Protection of Endangered Species of Animals and Plants Ordinance (Cap. 586).
3. AFCD (2020a). Hong Kong Biodiversity Database.
4. Fellowes, *et al.* (2002): LC=Local Concern; PRC=Potential Regional Concern; RC=Regional Concern.
*Letters in parentheses indicate that the assessment is on the basis of restrictedness in nesting and/or roosting sites rather than in general occurrence.
5. "List of Wild Animals Under State Protection" (promulgated by State Forestry Administration and Ministry of Agriculture on 14 January 1989).
6. Wang (1998). China Red Data Book of Endangered Animals. Mammalia.

7. Jiang, *et al.* (2016). Red List of China's Vertebrates.
Habitat Type: **WL**: Woodland; **MWL**: Mixed Woodland; **MWC**: Modified Watercourse; **DA**: Developed Area/Wasteland.

Freshwater Communities

9.5.2.11 A total of 20 freshwater fauna species were recorded within the assessment area. The full list of freshwater species recorded, their protection status and habitats recorded in are presented in **Appendix 9.5**. Among the recorded species, there are two species of conservation importance with none recorded within the Project site (**Table 9.20**). Both crab species, stream crab (*Cryptopotamon anacoluthon*) and *Somanniathelphusa zanklon*, were recorded in S1 section within Heung Fan Liu Village.

9.5.2.12 An individual of rare pond snail (*Sinotaia quadrata*) and nymphs of three abundant odonate species: red-faced skimmer (*Orthetrum chrysis*), orange-tailed midget (*Agriocnemis femina oryzae*) and crimson dropwing (*Trithemis aurora*) were recorded in the stilling basin in Section 6.

Table 9.20 Freshwater Species of Conservation Importance Recorded within the Assessment Area during Recent Survey

Common Name (Scientific Name)	Distribution in Hong Kong ⁽¹⁾⁽²⁾⁽³⁾	Protection Status	Habitat Recorded ⁽⁶⁾	
			Within Project Site	Within 500m Assessment Area
Stream Crab (<i>Cryptopotamon anacoluthon</i>)	Endemic to Hong Kong; Very Common	PGC ⁽⁴⁾ Vulnerable ⁽⁵⁾	-	NWC
(<i>Somanniathelphusa zanklon</i>)	Considered endemic	GC ⁽⁴⁾ Endangered ⁽⁵⁾	-	NWC

Notes:

1. Lee, *et al.* (2004). Field Guide to the Freshwater Fish of Hong Kong.
2. AFCD (2020a). Hong Kong Biodiversity Database.
3. Dudgeon (2003). Hillstreams - Hong Kong Field Guides 2.
4. Fellowes, *et al.* (2002): PGC=Potential Global Concern; GC=Global Concern.
5. IUCN (2022). IUCN Red List Version 2022-1

Habitat Type: **NWC**: Natural Watercourse.

9.5.3 Marine Fauna

Coral Communities

9.5.3.1 Spot-check dives were carried out along two routes (DR1 to DR2, refer to **Figure 9.2**). The water depth along the dive routes ranges from 1 m to 4 m. The subtidal habitats at the dive routes mainly comprise artificial sloping boulders and concrete vertical seawall. Physical conditions of the two survey routes were similar but of different substrates. Bottom substrates along DR1 was mainly artificial sloping boulders while DR2 was mainly muddy and sandy substrate. Limited marine life was recorded from the spot-check dive, with two coral species recorded: *Oulastrea crispata* and *Porites lutea*. A very low coverage was recorded in DR1, while no coral was recorded at DR2. Details of coral recorded from spot-check dives are presented in **Table 9.21**.

Table 9.21 Species, Coverage and Size of Corals Found at the Spot-check Dive Sites

Site	Depth (m)	Approximate Coral Coverage (%)	Coral Species	Distribution in Hong Kong ⁽¹⁾
DR1	1.5 - 4	<1%	<i>Oulastrea crispata</i>	Common
			<i>Porites lutea</i>	Dominant
DR2	1 - 3.5	-	-	-

Note:

1. Chan, *et al.* (2005b).

9.5.3.2 Five REA transects (T1 to T5) were deployed, which corresponded to spot-check dive routes DR1 (refer to **Figure 9.2**). Results from the REA dive transects was similar to the spot-check dive survey, with low coverage of coral species recorded, including *Oulastrea crispata* and *Porites lutea*. While both recorded species are either dominant or common in Hong Kong,

they are species of conservation importance protected under the Protection of Endangered Species of Animals and Plants Ordinance (Cap. 586).

Benthic Communities

- 9.5.3.3 Benthic grab sampling surveys were conducted at sampling sites B1 and B2 (refer to **Figure 9.2**). A total of 8 and 85 specimens were collected during dry season and wet season respectively (refer to **Table 9.22**). A total of 8 species were identified, with Annelids recorded as the most abundant and diverse phylum. No species of conservation importance were recorded. The list of collected specimens during both dry and wet seasons of the benthic community are presented in **Appendix 9.6**.
- 9.5.3.4 No particular dominance was observed during dry and wet season at B1 while B2 was devoid of benthic fauna. At sampling location B1, lower Shannon Diversity Index (H') and higher Pielou's Evenness Index (J) were observed in dry season when compared with wet season (refer to **Table 9.23**).

Table 9.22 Total Abundance and Biomass of Each Faunal Group

Fauna Group	No. of individuals	Percentage (%)	Biomass (g)	Percentage (%)
Dry Season				
Annelida	8	100	0.01	100
Total	8	-	0.01	-
Wet Season				
Annelida	66	78	5.89	24
Mollusca	19	22	18.39	76
Total	85	-	24.28	-

Table 9.23 Total Abundance and Biomass Recorded from Each Sampling Sites

Sampling site	No. of individuals	Biomass (g)	Species Evenness (J)	Species Diversity (H')
Dry Season				
B1	8	0.01	0.89	0.97
B2	/	/	/	/
Total	8	0.01	-	-
Wet Season				
B1	85	24.28	0.54	1.30
B2	/	/	/	/
Total	85	24.28	-	-

Intertidal Communities

- 9.5.3.5 Intertidal communities were surveyed at three locations (N1 to N3) during both dry and wet seasons (refer to **Figure 9.2**). All of the sampled intertidal habitats comprised of artificial sloping rip-rap or artificial vertical seawall. A total of 13 and 15 intertidal species were recorded from dry and wet seasons respectively. All recorded intertidal species were either "common" or "very common" in Hong Kong with no records of any species of conservation importance. The lists of recorded intertidal species during both dry and wet seasons are presented in **Appendix 9.7**. Abundance and diversity of species were generally higher at sampling location N1 in both dry and wet seasons. Although overall species richness was generally low at all sampling locations.

9.6 Ecological Value

- 9.6.1.1 The ecological importance of recorded habitats was evaluated in accordance with the EIAO-TM Annex 8 criteria and presented in **Table 9.24** to **Table 9.33** below. Species of conservation importance identified from recent survey findings and literature review of previous study (DSD, 2019; AFCD, 2020c) are summarised in **Table 9.34**.

Woodland

- 9.6.1.2 Woodland habitat identified within the assessment area was considered to be of moderate to high value due to its naturalness, size, flora and fauna diversity, and its ecological linkage to natural streams. The habitat supported the greatest diversity and abundance of avifauna and butterflies amongst all recorded habitats.

Table 9.24 Ecological Evaluation of Woodland within the Assessment Area

Criteria	Woodland
Naturalness	High – habitat generated from natural succession
Size	Large (70.6 ha)
Diversity	<ul style="list-style-type: none"> ▪ Moderate to high floral diversity ▪ Moderate faunal diversity
Rarity	<ul style="list-style-type: none"> ▪ Common habitat in Hong Kong <p><u>Recent Survey</u></p> <ul style="list-style-type: none"> ▪ Seven flora, six avifauna, one butterfly, five mammals and two reptiles species of conservation importance recorded <p><u>Previous Study</u></p> <ul style="list-style-type: none"> ▪ Two flora, three avifauna, one butterfly, two amphibian and one mammal species of conservation importance recorded
Re-creatability	Low to moderate – decades needed for woodland to establish and mature
Fragmentation	Moderate – woodland habitats in assessment area are interspersed with developed area and villages/orchard
Ecological linkage	Structurally connected to adjacent natural watercourses
Potential value	Moderate to high (given protection for natural succession)
Nursery/ breeding ground	No record of nursery or breeding ground.
Age	N/A
Abundance/ Richness of wildlife	Moderate to High
Ecological value	Moderate to High

Mixed Woodland

- 9.6.1.3 Mixed woodland habitats within the assessment area were considered to be of moderate ecological value as this habitat is moderately natural, moderate in size with moderate to high floral diversity, time would also be needed for re-creation of the habitat once it is lost.

Table 9.25 Ecological Evaluation of Mixed Woodland within the Assessment Area

Criteria	Mixed Woodland
Naturalness	Moderate – Mostly from plantation and gradually undergo natural succession
Size	Moderate (29.4 ha)
Diversity	<ul style="list-style-type: none"> ▪ Moderate to high floral diversity ▪ Low to moderate faunal diversity
Rarity	<p>Common habitat in Hong Kong</p> <p><u>Recent Survey</u></p> <ul style="list-style-type: none"> ▪ Three flora, three avifauna and one mammal species of conservation importance recorded <p><u>Previous Study</u></p> <ul style="list-style-type: none"> ▪ No previous records of species of conservation importance
Re-creatability	Moderate – time needed to establish mixed woodland habitat
Fragmentation	Moderate – part of the mixed woodland habitat in assessment area are interspersed with developed area/wasteland and villages/orchard
Ecological linkage	Partially and structurally connected to adjacent woodland
Potential value	Moderate (given partially connected to woodland habitat and protection for natural succession)

Criteria	Mixed Woodland
Nursery/ breeding ground	No record of nursery or breeding ground.
Age	N/A
Abundance/ Richness of wildlife	Moderate
Ecological value	Moderate

Plantation

- 9.6.1.4 Plantation habitats within the assessment area were artificially created and mainly comprised exotic tree planting on slopes within developed areas with low floral, faunal diversity and wildlife richness. Only two fauna groups, avifauna and butterfly were recorded in the habitat. The ecological value of this habitat is low given its low diversity of flora and fauna and scattered nature. This habitat is considered as of low ecological value.

Table 9.26 Ecological Evaluation of Plantation within the Assessment Area

Criteria	Plantation
Naturalness	Low – artificial habitat
Size	Moderate (18.3 ha)
Diversity	<ul style="list-style-type: none"> ▪ Low floral diversity ▪ Low faunal diversity
Rarity	<ul style="list-style-type: none"> ▪ Common man-made habitat in Hong Kong. <u>Recent Survey</u> <ul style="list-style-type: none"> ▪ No species of conservation importance recorded <u>Previous Study</u> <ul style="list-style-type: none"> ▪ No previous records of species of conservation importance
Re-creatability	High
Fragmentation	Moderate – scattered plantation habitats in assessment area
Ecological linkage	Connected to adjacent woodland and mixed woodland
Potential value	Low
Nursery/ breeding ground	No records of nursery or breeding ground
Age	Young
Abundance/ Richness of wildlife	Low
Ecological value	Low

Grassland

- 9.6.1.5 Grassland habitats within the assessment area supported low floral diversity of predominately native herbs and shrubs. Only two fauna groups, avifauna and butterfly were recorded in the habitat. The ecological value of this habitat is considered as low due to its low naturalness, small in size, low rarity, high re-creatability and very low to low diversity of flora and fauna.

Table 9.27 Ecological Evaluation of Grassland within the Assessment Area

Criteria	Grassland
Naturalness	Low – man-made habitat
Size	Small (2.3 ha)
Diversity	<ul style="list-style-type: none"> ▪ Low floral diversity ▪ Very low faunal diversity
Rarity	<ul style="list-style-type: none"> ▪ Common habitat in Hong Kong. <u>Recent Survey</u> <ul style="list-style-type: none"> ▪ No species of conservation importance recorded <u>Previous Study</u> <ul style="list-style-type: none"> ▪ No previous records of species of conservation importance
Re-creatability	High

Criteria	Grassland
Fragmentation	Low
Ecological linkage	Structurally connected to adjacent woodland and mixed woodland
Potential value	Low
Nursery/ breeding ground	No records of nursery or breeding ground
Age	N/A
Abundance/ Richness of wildlife	Low
Ecological value	Low

Reservoir

- 9.6.1.6 Reservoir habitat within the assessment area supported low floral diversity of self-sowed and introduced exotic plant species. This habitat supported low abundance and diversity of fauna, mostly odonate, followed by herpetofauna and avifauna. Given that this is a man-made habitat, the ecological value of this habitat is considered as low.

Table 9.28 Ecological Evaluation of Reservoir within the Assessment Area

Criteria	Reservoir
Naturalness	Low – artificial habitat
Size	Small (8.7 ha)
Diversity	<ul style="list-style-type: none"> ▪ Low floral diversity ▪ Low faunal diversity
Rarity	<ul style="list-style-type: none"> ▪ Common man-made habitat in Hong Kong <p><u>Recent Survey</u></p> <ul style="list-style-type: none"> ▪ One flora, one avifauna species of conservation importance recorded <p><u>Previous Study</u></p> <ul style="list-style-type: none"> ▪ No previous records of species of conservation importance
Re-creatability	High
Fragmentation	Low
Ecological linkage	None observed
Potential value	Low
Nursery/ breeding ground	No record of any nursery or breeding ground
Age	About 56 years
Abundance/ Richness of wildlife	Low
Ecological value	Low

Village / Orchard

- 9.6.1.7 Village / Orchard habitat within the assessment area supported moderate to high floral diversity of predominantly herbs and shrubs. This habitat supported low abundance but low to moderate diversity of fauna, mostly avifauna and butterflies. Given that this is a man-made habitat which was disturbed by human activities, the ecology value of this habitat is considered as low to moderate.

Table 9.29 Ecological Evaluation of Village/Orchard within the Assessment Area

Criteria	Village/Orchard
Naturalness	Low – artificial habitat
Size	Small (5.6 ha)
Diversity	<ul style="list-style-type: none"> ▪ Moderate to high floral diversity ▪ Low to moderate faunal diversity

Criteria	Village/Orchard
Rarity	<ul style="list-style-type: none"> ■ Common man-made habitat in Hong Kong <u>Recent Survey</u> <ul style="list-style-type: none"> ■ One avifauna, one butterfly species of conservation importance recorded <u>Previous Study</u> <ul style="list-style-type: none"> ■ No previous records of species of conservation importance
Re-creatability	High
Fragmentation	Low
Ecological linkage	Structural linkage to the adjacent woodland
Potential value	Low
Nursery/ breeding ground	No records of nursely or breeding ground
Age	N/A
Abundance/ Richness of wildlife	Low
Ecological value	Low to Moderate

Developed Area / Wasteland

- 9.6.1.8 Developed areas within the Project site mainly comprised of pedestrian road, roadside planting and open space. Whereas developed area / wasteland out of Project site comprised of roads, roadside planting, residential areas, public facilities and public utilities. This habitat was subjected to high level of human disturbance. It supported low to moderate diversity but low abundance of flora species, with majority of them being exotic and/or ornamental species, as well as low to moderate faunal diversity and abundance. Ardeid night roosts were recorded on planted mature trees on the northern bank of Shing Mun River Channel (from Block 3 of Man Lai Court to Sha Tin Government Secondary School), just out of the Project site. This area has relatively higher ecological value of low to moderate due to the ecological function provided to ardeids. While the remaining area is highly re-creatable and has low ecological potential, ecological value of the remaining developed area habitat is therefore considered as low.

Table 9.30 Ecological Evaluation of Developed Area within the Assessment Area

Criteria	Developed Area/Wasteland
Naturalness	Low
Size	Very large (151.9 ha)
Diversity	<i>Project site</i> <ul style="list-style-type: none"> ■ Low floral diversity, but most are exotic and/or planted ■ Low to moderate faunal diversity <i>Assessment Area outside of Project site</i> <ul style="list-style-type: none"> ■ Low to moderate floral diversity, but most are exotic and/or planted ■ Low to moderate faunal diversity

Criteria	Developed Area/Wasteland
Rarity	<ul style="list-style-type: none"> ■ Common habitat in Hong Kong <u>Recent Survey</u> <i>Project site</i> <ul style="list-style-type: none"> ■ Three avifauna, one butterfly, one mammal species of conservation importance recorded <i>Assessment Area outside of Project site</i> <ul style="list-style-type: none"> ■ Five avifauna, two odonate, five mammal species of conservation importance recorded ■ Ardeid night roosts were recorded on planted trees on the northern bank of Shing Mun River Channel (from Block 3 of Man Lai Court to Sha Tin Government Secondary School) <u>Previous Study</u> <ul style="list-style-type: none"> ■ Two flora, two avifauna, one odonate, one reptile, one amphibian, one mammal species of conservation importance recorded ■ Ardeids were also recorded actively using the night roost at Tai Wai, along Shing Mun River near Caritas Lok Jun School
Re-creatability	High
Fragmentation	Low
Ecological linkage	None observed
Potential value	Low
Nursery/ breeding ground	No record of any nursery or breeding ground
Age	N/A
Abundance/ Richness of wildlife	Low to moderate
Ecological value	<p>Low to Moderate – for ardeid night roosting site on the northern bank of Shing Mun River Channel</p> <p>Low – for remaining developed area</p>

Natural Watercourse

9.6.1.9 The natural watercourse habitats (S1 – S5) within the assessment area supported low floral diversity of predominantly native herbs. This habitat supported low diversity of fauna, mainly odonate and freshwater community species. Given that S1 – S5 are very small in scale (0.4ha in total) and only four fauna of conservation importance recorded, its ecological value is considered as low to moderate.

Table 9.31 Ecological Evaluation of Natural Watercourse within the Assessment Area

Criteria	Natural Watercourse				
	S1	S2	S3	S4	S5
Naturalness	High	High	High at upstream Low at downstream	Low at upstream High at downstream	High
Size/ Length	Very small 1.39 km	Very small 0.26 km	Very small 0.22 km	Very small 0.40 km	Very small 0.18 km
Diversity	<ul style="list-style-type: none"> ■ Low floral diversity ■ Low faunal diversity 				
Rarity	<ul style="list-style-type: none"> ■ Common habitat in Hong Kong. <u>Recent Survey</u> <ul style="list-style-type: none"> ■ One amphibian, one reptile and two freshwater community species of conservation importance recorded <u>Previous Study</u> <ul style="list-style-type: none"> ■ One freshwater community species of conservation importance recorded 				

Criteria	Natural Watercourse				
	S1	S2	S3	S4	S5
Re-creatability	Low	Low	Low at upstream High at downstream	High at upstream Low at downstream	Low
Fragmentation	Low	Low	Low to moderate	Low to moderate	Low
Ecological linkage	Structurally connected to adjacent woodland	Structurally connected to adjacent mixed woodland and woodland	Structurally connected to adjacent mixed woodland	Structurally connected to adjacent woodland	
Potential value	Moderate	Moderate	Moderate	Moderate	Moderate
Nursery/ breeding ground	Tadpoles of lesser spiny frog recorded	No record of nursery or breeding ground.	No record of nursery or breeding ground.	No record of nursery or breeding ground.	No record of nursery or breeding ground.
Age	N/A				
Abundance / Richness of wildlife	Low to Moderate				
Ecological value	Low to Moderate				

Modified Watercourse

9.6.1.10 The modified watercourse habitats identified within the assessment area mainly included TWN and Shing Mun River Channel, in which both were completely lined with concrete and supported limited flora species. Whole area of TWN falls within the Project site, with flora species predominately recorded in the artificial wetland in upstream stilling basin, while most of the fauna species were recorded in tidally influenced Section 1. Overall, the flora diversity is low with mainly common ruderal vegetation along the nullah and wetland vegetation in the stilling basin. Most fauna were supported by stilling basin, including wetland dependent avifauna and odonate nymphs, and lower Section 1 of the nullah, which was recorded as ardeids pre-roosting site with significantly higher abundance of ardeids pre-roosting due to presence of overwintering avifauna during the dry season. Ecological value of the stilling basin and Section 1 (dry season) are therefore considered as low to moderate. Given that TWN is both hydrologically and functionally connected to Shing Mun River and Tolo Harbour, ecological value of Section 1 (wet season) and Sections 2 – 6 of TWN are considered as low.

Table 9.32 Ecological Evaluation of Modified Watercourse (Tai Wai Nullah) within the Assessment Area

Criteria	Modified Watercourse			
	Section 1	Sections 2 – 5	Section 6	Stilling Basin (Section 6)
Naturalness	Low – artificial habitat			
Size	Small (6.8 ha)			
Diversity	<ul style="list-style-type: none"> ■ Low floral diversity ■ Low to moderate faunal diversity 			

Criteria	Modified Watercourse				
	Section 1	Sections 2 – 5	Section 6	Stilling Basin (Section 6)	
Rarity	<ul style="list-style-type: none"> ■ Artificial wetland is common habitat in Hong Kong. ■ Modified watercourse is a typical and widespread habitat type in Hong Kong. <p><u>Recent Survey</u></p> <ul style="list-style-type: none"> ■ Six avifauna, one butterfly, one mammal species of conservation importance recorded ■ Ardeid pre-roost were recorded on concrete access ramps along Section 1 (Block 1 and 2 of Man Lai Court) <p><u>Previous Study</u></p> <ul style="list-style-type: none"> ■ Two avifauna, one reptile, one mammal species of conservation recorded 				
Re-creatability	High				
Fragmentation	Low				
Ecological linkage	Hydrologically and functionally connected to Shing Mun River and Tolo Harbour			None observed	
Potential value	Low				
Nursery/ breeding ground	No records of nursery or breeding ground			Nymphs of red-faced skimmer, orange-tailed midget, crimson dropwing recorded	
Age	River training works completed around 1970s				
Abundance/ Richness of wildlife	High abundance of avifauna, particularly wetland-dependent and overwintering species and exotic freshwater fish	Low	Low	Moderate, relatively high abundance of exotic freshwater fish	
Ecological value	Dry Season	Low to Moderate	Low	Low	Low to Moderate
	Wet Season	Low			

9.6.1.11 The Shing Mun River Channel is located at the eastern end of the assessment area and is connected to the Project site. The modified watercourse of the channel is permanently inundated even with daily tidal exchange, resulted in very limited diversity and very low abundance of flora species along the concrete / masonry banks. For fauna species, low diversity and high abundance of avifauna, particularly wetland-dependent and overwintering ardeidae species, were recorded pre-roosting on concrete access ramps along Shing Mun River Channel from Block 1 and 2 of Man Lai Court to Hong Kong Heritage Museum. Ecological value of the Shing Mun River Channel is therefore considered as low to moderate.

Table 9.33 Ecological Evaluation of Modified Watercourse (Shing Mun River Channel) within the Assessment Area

Criteria	Modified Watercourse
	Shing Mun River Channel
Naturalness	Low – artificial habitat
Size	Small (4.1 ha)
Diversity	<ul style="list-style-type: none"> ▪ Very low floral diversity ▪ Low faunal diversity
Rarity	<ul style="list-style-type: none"> ▪ Typical engineered channel habitat in Hong Kong <p><u>Recent Survey</u></p> <ul style="list-style-type: none"> ▪ Six avifauna species of conservation importance recorded ▪ Ardeid pre-roost were recorded on concrete access ramps along Shing Mun River Channel up till the Hong Kong Heritage Museum <p><u>Previous Study</u></p> <ul style="list-style-type: none"> ▪ No previous records of species of conservation importance
Re-creatability	High
Fragmentation	Low
Ecological linkage	Hydrologically and functionally connected to Shing Mun River and Tolo Harbour
Potential value	Low
Nursery/ breeding ground	No records of nursery or breeding ground
Age	River training works completed in early 1980s
Abundance/ Richness of wildlife	High abundance of avifauna, particularly wetland-dependent and overwintering species pre-roost along channel bank; and exotic freshwater fish
Ecological value	Low to Moderate

Table 9.34 Species of Conservation Importance Recorded within the Assessment Area during Recent Surveys and Previous Studies

Common Name (Scientific Name)	Distribution in Hong Kong ⁽¹⁾	Protection Status	Habitat Recorded		
			Previous Studies ⁽²⁾	Recent Survey	
				Within Project site	Within 500 m Assessment Area ⁽¹⁷⁾
Flora					
Incense Tree (<i>Aquilaria sinensis</i>)	Common	Cap. 586 ⁽³⁾ Near Threatened ^{(4) (9)} Category II ⁽⁵⁾ Vulnerable ^{(6) (7) (8)}	DA; WL	-	WL, RES
Silver-back Artocarpus (<i>Artocarpus hypargyreus</i>)	Common	Near Threatened ^{(4) (9)} Endangered ⁽⁷⁾ Vulnerable ⁽⁸⁾	-	-	WL, MWL
Butulang Canthium (<i>Canthium dicoccum</i>)	Common	Vulnerable ⁽⁸⁾	-	-	WL
Lamb of Tartary (<i>Cibotium barometz</i>)	Very common	Cap. 586 ⁽³⁾ Vulnerable ⁽⁴⁾ Category II ⁽⁵⁾	DA; WL	-	WL
Small Persimmon (<i>Diospyros vaccinioides</i>)	Very common	Endangered ⁽⁷⁾ Critically Endangered ⁽⁸⁾	-	-	WL
Luofushan Joint-fir (<i>Gnetum luofuense</i>)	Very common	Near Threatened ⁽⁸⁾	-	-	WL; MWL
Shrubby Ichnocarpus (<i>Ichnocarpus frutescens</i>)	Very rare	-	-	-	MWL
Hairy-fruited Ormosia (<i>Ormosia pachycarpa</i>)	Restricted	Endangered ⁽⁴⁾ Vulnerable ⁽⁷⁾	-	-	WL
Fauna					
Avifauna					
Great Egret ⁽¹⁶⁾ (<i>Ardea alba</i>)	Common resident and winter visitor	Cap. 170 ⁽³⁾ PRC (RC) ⁽¹⁰⁾	-	MWC	MWC; DA
Grey Heron ⁽¹⁶⁾ (<i>Ardea cinerea</i>)	Common winter visitor	Cap. 170 ⁽³⁾ PRC ⁽¹⁰⁾	-	MWC	MWC; DA
Chinese Pond Heron ⁽¹⁶⁾ (<i>Ardeola bacchus</i>)	Common resident	Cap. 170 ⁽³⁾ PRC (RC) ⁽¹⁰⁾	-	MWC	-
Eastern Buzzard ⁽¹⁶⁾ (<i>Buteo japonicus</i>)	Common winter visitor	Cap. 170 ⁽³⁾ Cap. 586 ⁽³⁾ Class II ⁽¹⁵⁾	-	-	WL

Common Name (Scientific Name)	Distribution in Hong Kong ⁽¹⁾	Protection Status	Habitat Recorded		
			Previous Studies ⁽²⁾	Recent Survey	
				Within Project site	Within 500 m Assessment Area ⁽¹⁷⁾
Greater Coucal (<i>Centropus sinensis</i>)	Common resident	Cap. 170 ⁽³⁾ Class II ⁽¹⁵⁾ Vulnerable ⁽¹¹⁾	DA	DA	WL; MWL; DA
Common Emerald Dove (<i>Chalcophaps indica</i>)	Scarce but widespread resident	Cap. 170 ⁽³⁾ Vulnerable ⁽¹¹⁾	DA	-	WL; MWL
Collared Crow ⁽¹⁶⁾ (<i>Corvus torquatus</i>)	Uncommon resident	Cap. 170 ⁽³⁾ LC ⁽¹⁰⁾ Vulnerable ⁽⁸⁾ Near Threatened ⁽¹²⁾	-	MWC	MWC
Little Egret ⁽¹⁶⁾ (<i>Egretta garzetta</i>)	Common resident	Cap. 170 ⁽³⁾ PRC (RC) ⁽¹⁰⁾	MWC	MWC; DA	MWC; RES; DA
Mountain Bulbul (<i>Ixos mccllellandii</i>)	Rare resident	Cap. 170 ⁽³⁾	-	-	WL
Black Kite ⁽¹⁶⁾ (<i>Milvus migrans</i>)	Common resident and winter visitor	Cap. 170 ⁽³⁾ Cap. 586 ⁽³⁾ (RC) ⁽¹⁰⁾ Class II ⁽¹⁵⁾	WL	-	WL; VO; DA
Black-crowned Night Heron ⁽¹⁶⁾ (<i>Nycticorax nycticorax</i>)	Common resident and winter visitor	Cap. 170 ⁽³⁾ (LC) ⁽¹⁰⁾	-	MWC	MWC
Collared Scops Owl (<i>Otus lettia</i>)	Common	Cap. 170 ⁽³⁾ Cap. 586 ⁽³⁾ Class II ⁽¹⁵⁾	DA; WL	-	-
Pygmy Cupwing (<i>Pnoepyga pusilla</i>)	Rare resident	Cap. 170 ⁽³⁾ LC ⁽¹⁰⁾	WL	-	-
Rufous-capped Babbler (<i>Stachyridopsis ruficeps</i>)	Common resident	Cap. 170 ⁽³⁾ LC ⁽¹⁰⁾	-	DA	WL; MWL
Butterflies					
Danaid Eggfly (<i>Hypolimnas misippus</i>)	Uncommon	LC ⁽¹⁰⁾	-	MWC; DA	WL
Metallic Cerulean (<i>Jamides alecto alocina</i>)	Very rare	-	-	DA	-
Common Archduke (<i>Lexias pardalis</i>)	Unknown; First recorded in 2008, monitoring underway	-	-	-	VO

Common Name (Scientific Name)	Distribution in Hong Kong ⁽¹⁾	Protection Status	Habitat Recorded		
			Previous Studies ⁽²⁾	Recent Survey	
				Within Project site	Within 500 m Assessment Area ⁽¹⁷⁾
Malayan (<i>Megisba malaya sikkima</i>)	Very rare; Species of Conservation Concern	LC ⁽¹⁰⁾	-	DA	-
Common Rose (<i>Pachliopta aristolochiae</i>)	Rare	-	WL	-	-
Tiny Grass Blue (<i>Zizula hylax</i>)	Very rare; Species of Conservation Concern	-	-	DA	-
Odonates					
Chinese Yellowface (<i>Agriomorpha fusca</i>)	Abundant; Scattered	LC ⁽¹⁰⁾	N/A	-	-
Hong Kong Clubtail (<i>Leptogomphus hongkongensis</i>)	Common; Scattered	LC ⁽¹⁰⁾	N/A	-	-
Small Dragonhunter (<i>Sieboldius alexanderi</i>)	Uncommon; Scattered / (Globally Restricted to Southeastern China and Hubei Province)	GC ⁽¹⁰⁾	N/A	-	-
Chinese Cascader (<i>Zygonyx asahinai</i>)	Uncommon; Scattered	GC ⁽¹⁰⁾	-	-	DA
Emerald Cascader (<i>Zygonyx iris insignis</i>)	Abundant; Widespread	PGC ⁽¹⁰⁾	DA	-	DA
Amphibian					
Brown Wood Frog (<i>Hylarana latouchii</i>)	Widely distributed	LC ⁽¹⁰⁾	DA; WL	-	-
Lesser Spiny Frog (<i>Quasipaa exilispinosa</i>)	Occurs throughout territory	PGC ⁽¹⁰⁾ Vulnerable ⁽¹²⁾	WL	-	NWC
Reptile					
Many-banded Krait (<i>Bungarus multicinctus multicinctus</i>)	Widely distributed throughout Hong Kong	PRC ⁽¹⁰⁾ Endangered ⁽¹²⁾ Vulnerable ⁽¹⁴⁾	-	-	WL
Four-clawed Gecko (<i>Gehyra mutilate</i>)	Widely distributed throughout Hong Kong	Vulnerable ⁽¹⁴⁾	-	-	VO
Tokay Gecko (<i>Gekko gekko</i>)	Distributed on Lamma Island, Lantau Island, Hong Kong Island, Lion Rock Country Park, Ma On Shan Country Park and Pat Sin Leng Country Park. Some population are considered as escaped from snake shops.	RC ⁽¹⁰⁾ Critically Endangered ⁽¹²⁾ Endangered ⁽¹⁴⁾ Class II ⁽¹⁵⁾	DA	-	WL

Common Name (Scientific Name)	Distribution in Hong Kong ⁽¹⁾	Protection Status	Habitat Recorded		
			Previous Studies ⁽²⁾	Recent Survey	
				Within Project site	Within 500 m Assessment Area ⁽¹⁷⁾
Mountain Water Snake (<i>Sinonatrix percarinata percarinata</i>)	Distributed in streams in central New Territories (Shing Mun Country Park, Tai Po Kau Nature Reserve, Tai Lam Country Park)	LC ⁽¹⁰⁾ Vulnerable ⁽¹²⁾	-	-	NWC
Common Water Monitor (<i>Varanus salvator</i>)	Rare	Cap. 170 ⁽³⁾ Cap. 586 ⁽³⁾ Class I ⁽¹⁵⁾ RC ⁽¹⁰⁾ Critically Endangered ⁽¹²⁾ Critically Endangered/Extinct in Wild ⁽¹⁴⁾	MWC	-	-
Mammal					
Short-nosed Fruit Bat (<i>Cynopterus sphinx</i>)	Very Common	Cap. 170 ⁽³⁾ Near Threatened ⁽¹²⁾ Indeterminate ⁽¹³⁾	-	DA	DA
Himalayan Leaf-nosed Bat (<i>Hipposideros armiger</i>)	Very Common	Cap. 170 ⁽³⁾ (LC) ⁽¹⁰⁾	-	-	WL
Chinese Pipistrelle (<i>Hypsugo pulveratus</i>)	Rare; Species of Conservation Concern	Cap. 170 ⁽³⁾ (LC) ⁽¹⁰⁾ Near Threatened ⁽¹²⁾	-	-	DA
Rhesus Macaque (<i>Macaca mulatta</i>)	Common	Cap. 170 ⁽³⁾ Cap. 586 ⁽³⁾ Vulnerable ⁽¹³⁾ Class II ⁽¹⁵⁾	DA; WL	-	WL; MWL DA
Chinese Noctule (<i>Nyctalus plancyi</i>)	Common	Cap. 170 ⁽³⁾ PRC, (RC) ⁽¹⁰⁾	-	MWC	DA
Japanese Pipistrelle (<i>Pipistrellus abramus</i>)	Very Common	Cap. 170 ⁽³⁾	MWC	-	WL
Least Pipistrelle (<i>Pipistrellus tenuis</i>)	Uncommon	Cap. 170 ⁽³⁾ Near Threatened ⁽¹²⁾	-	-	WL; DA
Lesser Bamboo Bat (<i>Tylonycteris pachypus</i>)	Very Common	Cap. 170 ⁽³⁾ (LC) ⁽¹⁰⁾ Rare ⁽¹³⁾	-	-	WL
Freshwater Fauna					
Stream Crab (<i>Cryptopotamon anacoluthon</i>)	Endemic to Hong Kong; Very Common	PGC ⁽¹⁰⁾ Vulnerable ⁽⁸⁾	NWC	-	NWC

Common Name (Scientific Name)	Distribution in Hong Kong ⁽¹⁾	Protection Status	Habitat Recorded		
			Previous Studies ⁽²⁾	Recent Survey	
				Within Project site	Within 500 m Assessment Area ⁽¹⁷⁾
(<i>Somaniathelphusa zanklon</i>)	Considered endemic	GC ⁽¹⁰⁾ Endangered ⁽⁸⁾	-	-	NWC

Notes:

- (1) Flora: Wu & Lee (2000), Xing, *et al.* (2000) and Siu (2000); Fauna: AFCD (2020a); Freshwater Fauna: Lee, *et al.* (2004), Dudgeon (2003) and AFCD (2020a)
- (2) DSD, 2019; AFCD (2020c).
- (3) Protected by the Wild Animals Protection Ordinance (Cap. 170)
Protected by the Protection of Endangered Species of Animals and Plants Ordinance (Cap. 586)
- (4) Hu, *et al.* (2003). Rare and Precious Plants of Hong Kong.
- (5) "List of Wild Plants under State Protection" (promulgated by the Ministry of Forestry in 1999).
- (6) Fu (1992). China Plant Red Data Book. Vol. 1 - Rare and Endangered Plants.
- (7) Qin, *et al.* (2017). Threatened Species List of China's Higher Plants.
- (8) IUCN (2022). IUCN Red List Version 2022-1
- (9) Feng, *et al.* (2002). Study on Rare and Endangered Plants and National Key Protected Plants in Guangdong.
- (10) Fellowes, *et al.* (2002): LC=Local Concern; PRC=Potential Regional Concern; RC=Regional Concern; PGC=Potential Global Concern; GC=Global Concern.
**Letters in parentheses indicate that the assessment is on the basis of restrictedness in nesting and/or roosting sites rather than in general occurrence.*
- (11) Zheng & Wang (1998). China Red Data Book of Endangered Animals: Aves.
- (12) Jiang, *et al.* (2016). Red List of China's Vertebrates.
- (13) Wang (1998). China Red Data Book of Endangered Animals. Mammalia.
- (14) Zhao (1998). China Red Data Book of Endangered Animals. Amphibia and Reptilia.
- (15) "List of Wild Animals Under State Protection" (promulgated by State Forestry Administration and Ministry of Agriculture on 14 January, 1989).
- (16) Wetland-dependent species (including wetland-dependent species and waterbirds).

Habitat Type: **WL**: Woodland; **MWL**: Mixed Woodland; **RES**: Reservoir; **VO**: Village/Orchard; **NWC**: Natural Watercourse; **MWC**: Modified Watercourse; **DA**: Developed Area/Wasteland.

9.7 Identification and Evaluation of Environmental Impacts

9.7.1.1 The main objective of this Project is to revitalise the existing degraded TWN, with ecological enhancement being a key consideration for the revitalisation works. Key elements that will improve the ecological value of the nullah will include:

- Reprofilng of the low flow channel and construction of in-stream weirs to create a meandering alignment along the nullah to mimic natural stream pattern where practicable, providing a series of microhabitats for wildlife in surrounding areas;
- Provision of DWFI system to improve water quality and hence support ecological enhancement;
- Provision of treatment wetlands (artificial wetland created to mimic processes in natural wetland ecosystems involving vegetation, soils, and their associated microbes through engineering design) at selected drainage outlets along TWN to remove pollutants and to improve stormwater quality (in terms of biochemical oxygen demand, ammonia, total suspended solids, total phosphorus, and pathogens), which can also serve as greening and ecological enhancement measures. General constructed wetland system of smaller scale for aesthetic and ecological enhancement purposes is also proposed;
- Greening of channel bed and along its banksides, such as provision of emergent wetland planting (e.g. reed and other aquatic herbs), mangroves, climbing plants, tree and / or grasscrete;
- Incorporation of planting designed to attract wildlife species (e.g. native host plant species for butterflies) during revamp of public open space along TWN;
- Provision of nest boxes / hunting perch for wildlife (e.g. birds) along TWN; and
- Modification of channel bank and existing vehicular access at downstream section of TWN into a mix of stepped terrace and slope at water edge to enhance foraging / pre-roosting habitats for waterbirds (e.g. ardeids).

9.7.1.2 As discussed in **Section 2**, major proposed works for the Project are outlined as follows:

- Channel bed modification;
- Improvement of existing walkways and riparian public open spaces.
- Construction of dry weather flow interceptor (DWFI) system;
- Landscaping and miscellaneous works;
- Desilting at downstream tidal zone; and
- Construction of mid-stream underground water pumps for ecological enhancement-associated water retention and supplement.

9.7.1.3 Construction works for the Project will be confined to developed area and modified watercourse within the Project site only. In terms of potential ecological impacts during construction phase, there will be direct loss of modified watercourse and developed area within Project site by TWN enhancement works. These works would lead to temporary impacts of pre-roosting and foraging ground for ardeids, especially in dry season. Whereas indirect impacts will include construction disturbance to sites and species of conservation importance, particularly to ardeids in dry season due to the high abundance and presence of overwintering species (e.g. great egret).

9.7.1.4 During operational phase of the Project, no significant adverse ecological impact is expected. On the contrary, the revitalisation works are expected to have a positive impact on the existing degraded TWN.

9.7.2 Construction Phase Impact Identification

Direct Impacts

No Direct Impact on Sites of Conservation Importance or Natural Habitats

9.7.2.1 The Project site is located within the existing TWN and walkways along both sides, which comprises of modified watercourses and developed area. All construction works would be confined to the boundary of Project site, avoiding direct impacts to any natural habitats. The construction works area comprises solely concrete lined channel and paved walkways with no

recognised sites of conservation importance identified within the terrestrial ecology assessment area.

- 9.7.2.2 Marine recognised sites of conservation importance within the assessment area include Kei Ling Ha Mangal SSSI, Ting Kok SSSI, and Hoi Ha Wan SSSI, all are located more than 10 km away from the Project site. Given the large distances from the Project site to these sites of conservation importance and that there would be no disturbance to marine or riverbed sediments under the Project, no direct impact to these sites are anticipated.

No Direct Impact on Marine Habitats

- 9.7.2.3 The Project will only involve land-based construction works, therefore will have no disturbance to marine or riverbed sediments. Given large the distance (>5.5 km) of marine habitats from the Project site, no direct impacts to marine habitats are anticipated.

Impact on Habitats within Project Site

- 9.7.2.4 Temporary loss of habitat arising from the Project only involve highly disturbed habitats comprising modified watercourse and developed area of low or low to moderate ecological value (**Table 9.30** for developed area and **Table 9.32** for modified watercourse). Both habitats support low species diversity with only common species recorded. Given that such loss is only temporary in nature and the habitat will be ecologically enhanced, no impacts are anticipated even unmitigated.

- 9.7.2.5 The wetland vegetation within the stilling basin would be directly impacted by the proposed works. Given the small area of habitat affected, low diversity and lack of species of conservation species affected by the works, this impact is considered minor. Moreover, as enhancement works would include creation of larger and more diverse wetland habitats in the upstream of TWN, habitat loss in this area would only be temporary in nature.

Impact on Ardeid Pre-roost / Night-roost

- 9.7.2.6 The eastern boundary of the Project site falls partly within the pre-roosting sites of ardeids, alongside channel bank adjacent to and opposite of Man Lai Court Block 1 and 2. The pre-roosting site is mainly used by ardeids for pre-roosting and foraging, with higher abundances recorded in the dry season. The temporary loss of pre-roosting and foraging habitat due to the channel modification works would affect the corresponding activities of the ardeids, especially in dry season (detailed in **Table 9.46**).

- 9.7.2.7 Regarding the night roosting site, as the existing mature trees along TWN banks would be retained – of particular note is the preservation of the peripheral trees alongside Man Lai Court to Hong Kong Heritage Museum within and outside the Project site, and the works area will be approximately 30m away from the night roost (over 250m away from Sha Tin Government Secondary School), no direct impact of habitat loss is anticipated on night roosting sites of ardeids during the construction phase.

Direct Injury / Wildlife Mortality

- 9.7.2.8 In addition to direct impact due to temporary habitat loss of pre-roosting and foraging ground, construction activities could also potentially cause direct injury / mortality to wildlife. A total of eight avifauna, four butterflies and two mammal (bat) species of conservation importance were recorded within the Project site. As all the recorded species of conservation importance are highly mobile and expected to utilise the large area of alternative habitats outside the Project site, they are not anticipated to be significantly impacted.

- 9.7.2.9 Fauna species with low mobility such as amphibians and aquatic fauna would be subjected to higher risk of damage or mortality and could be injured or killed by construction activities. As only low abundance and diversity of either common or exotic freshwater species were recorded along the channel, no significant impacts are expected on their population locally. In the wetland habitat within the stilling basin, high abundance of exotic fish species (Mozambique tilapia (*Oreochromis mossambicus*) and mosquito fish (*Gambusia affinis*)) with an individual of rare pond snail (*Sinotaia quadrata*) and nymphs of abundant odonate species (red-faced skimmer, orange-tailed midget and crimson dropwing) were recorded. Although an individual of rare pond snail and breeding ground of odonate were recorded in the stilling basin, no significant impacts are expected on their population due to low abundance of pond snail and locally abundant odonate species.

9.7.2.10 Day roosting of short-nosed fruit bat on trees (Chinese fan-palm) was also observed within Project site alongside Man Lai Court. All the trees along Man Lai Court to Hong Kong Heritage Museum will be retained, and no direct impact is expected on the habitat for day roosting of short-nosed fruit bat.

Indirect Impacts

Disturbance from Construction Activities

9.7.2.11 The proposed revitalisation works would be constructed by traditional open-cut and *in-situ* concreting methods that mainly involve site clearance, soil excavation, sheet-piling, piling, formwork, concreting, backfilling, and reinstatement. While the works area would be restricted within the existing TWN and developed area alongside, the temporary increase in disturbance (including noise, dust emission, glare, and other human activities) induced by construction at the Project site may pose indirect impacts to nearby ecological resources.

9.7.2.12 While these impacts are of potential concern, it should be noted that the Project site is in a densely urbanised district and is already subjected to high levels of disturbance from pedestrian traffic, vehicular traffic (along smaller roads, major highways and MTR), recently completed works (e.g., Tai Wai Soccer Pitch) and on-going constructions (e.g. property development (Pavilia Farm) adjacent to Tai Wai Station). Furthermore, the Project site will be divided into six sections to be constructed in sequence starting from downstream TWN (**Figure 2.2** and **Appendix 2.2** refer) to reduce the construction impacts on nearby sensitive receivers comparing with constructing simultaneously in adjoining sections. The construction works along the nullah within each section will not be undertaken at the entire section at the same time. In this way, only a small fraction of the Project site would be subject to additional disturbance impacts at any one time. The construction works will start at downstream Section 1, move towards upstream Section 6 and would last for approximately 1 year within each section, tentatively scheduled to commence in 2024 (Section 1) for completion in 2029 (Section 6).

No Disturbance Impacts on Sites of Conservation Importance

9.7.2.13 No recognised sites of conservation importance were identified within the terrestrial ecology assessment area. Given the large distances from the Project site to marine sites of conservation importance, no disturbance impact on sites of conservation importance are anticipated.

Construction Noise Disturbance to Waterbirds and Bats

9.7.2.14 Construction noise disturbance could cause minor response from waterbirds like temporary displacement to less disturbed areas, depending on sensitivity of the waterbirds and level of disturbance. As avifauna are highly mobile animals expected to utilise a larger area of the habitats instead of confining to a particular locality plus the highly disturbed surrounding area, it is unlikely to have significant adverse disturbance impacts on ardeids in wet season.

9.7.2.15 As mentioned in **Section 9.5.2.4**, areas along downstream Section 1 near Man Lai Court provides pre-roosting sites for ardeids, particularly during the dry season. Construction phase disturbance impacts would therefore be expected if works are conducted in the lower reaches of TWN during the dry season due to presence of overwintering avifauna and significantly higher abundance of ardeids pre-roosting, as discussed in **Section 9.7.2.6** (detailed in **Table 9.46**).

9.7.2.16 For ardeids night roosting site along the channel bank of Shing Mun River Channel (**Section 9.5.2.4** refers), the works area will be located approximately 30m away from the night roost. Given that the night roosting site is already surrounded by highly disturbed developed area, it is unlikely to have significant disturbance impact on the night roost.

9.7.2.17 Disturbance impacts to collared crow are expected to be minor. The two individuals recorded during recent surveys were observed in the downstream reaches of TWN (just within the Project site), as well several locations along Shing Mun River Channel. It is therefore likely this species will temporarily move to slightly less impacted areas of the Shing Mun River Channel in response to any disturbance impacts.

9.7.2.18 As mentioned in **Section 9.5.2.10**, two mammal species of conservation importance were recorded within the Project site, which are short-nosed fruit bat and Chinese noctule.

Disturbance impacts could cause potential behaviour of roost abandonment, avoidance of foraging areas and signal masking on bat species when interference with information transfer during echolocation is significant (CDT, 2016). However, the existing habitat is already subjected to high disturbance and no night-time construction would be carried out for the Project, which would not overlap with bat species' foraging time. In addition, construction noise does not share the same frequency with most bat echolocation calls or their hearing, it is therefore unlikely to have significant disturbance impact on the recorded bat species (CDT, 2016) (detailed in **Table 9.46**).

Disturbance to Waterbirds Due to Increased Human Activities

- 9.7.2.19 In addition to construction noise, disturbance to waterbirds caused by construction activities could also be attributed to the increased number of people or visual stimuli associated with activities like movement of plants (Cutts *et al.*, 2013). Since the surrounding areas of the Project site is already highly disturbed, it is unlikely to have significant disturbance impact on waterbirds due to increased human activities within the assessment area.

Artificial Lighting / Glare

- 9.7.2.20 Artificial lighting/ glare could potentially affect light sensitive / nocturnal wildlife by attracting, disorienting or disrupting their light-sensitive cycles (e.g. bats and ardeids roosting on trees). This could subsequently affect their migration, foraging/ predation and breeding success and causing reduction of faunal density in the area. However, the Project site are already urbanised and surrounding developed area habitats were under high level of disturbance by artificial lighting from existing nearby industrial, residential building, roads and public facilities. Given that no night-time construction works or additional lighting would be required for the Project, and recorded nocturnal species are common and habituated to various levels of disturbance, no unexpected disturbance impacts by glare are anticipated.

Disturbance to Ardeid Night Roost

- 9.7.2.21 Night roosting behaviours of ardeids were observed during the surveys before and after sunset from Block 3 of Man Lai Count to Sha Tin Government Secondary School. Given that ardeids currently using the site are already tolerant of disturbance (**Section 9.7.2.16** refers) unmitigated impacts from the construction noise disturbance are expected to be minor.

Disturbance Impacts on Terrestrial Habitats, Vegetation and other Fauna

- 9.7.2.22 Dust generated during the construction phase (e.g. construction machinery, improper storage or dumping of construction materials) could degrade habitats adjacent to works areas. Construction dust could cover leaves in nearby habitats and may affect photosynthesis, respiration and transpiration of the plant, which could reduce the quality of nearby habitats (Farmer, 1993). With implementation of mitigation measures and good site practices as detailed in **Section 3** to minimise potential dust impact during construction, no adverse air quality impact on nearby terrestrial habitats, vegetation and other fauna due to the Project is anticipated.

Impact on Water Quality within Watercourses

- 9.7.2.23 Indirect impacts to water quality of modified watercourse habitats, both within and out of the Project site, could be caused by construction works as detailed in the following sections.

Channel Bed Modification Works

- 9.7.2.24 Channel bed of TWN will be modified under the Project. Such modification works include excavation of the existing concrete channel followed by re-surfacing and greening along the nullah. The proposed works could potentially impact downstream water quality and affect aquatic communities in the area, which in turn could decrease the value of these habitats to foraging avifauna. These potential impacts are considered relatively minor; aquatic communities within the Project site are of limited ecological value, and downstream sections of the TWN along with the Shing Mun River Main Channel are already subjected to extremely poor water quality. Moreover, according to the construction programme, channel bed modification work will only be undertaken during dry season when water is limited to low flow channel. In addition, site demarcation and flow diversion will be implemented to avoid release of sediments/other pollutants into the receiving waters. As such, no unacceptable ecological impact on water quality within TWN is anticipated.

Discharge and Runoff from Land-based construction works

- 9.7.2.25 General construction works activities (e.g. cleaning and polishing, wheel washing, dust suppression, materials storage etc.) along TWN could potentially release wastewater discharge and contaminated construction site runoff into the waters which generally consist of high concentration of suspended solids (SS) and elevated pH. Uncontrolled release of these construction waste would result in increased SS levels and turbidity in the nearby aquatic environment. The high SS level could lead to clogging of respiratory and feeding systems in aquatic organisms, while increased turbidity would reduce photosynthetic rate of aquatic plants and hinder vision of fauna in turn affecting their activities. Accidental spillage of chemicals such as engine oil, fuel and lubricants could potentially follow the uncontrolled runoff into the water, affecting the aquatic communities. These chemicals would lead to lethal (direct mortality) or sublethal (reproductive retardation) impacts on aquatic organisms.
- 9.7.2.26 With the implementation of appropriate measures to control runoff from construction site, as well as adoption of good site practices for handling and disposal of construction discharges (refer to **Section 5**), unacceptable impacts on water quality of TWN and nearby natural watercourse (S1) are not expected. Therefore, ecological impacts arising from water quality deterioration by land-based construction works of the Project are not anticipated.

9.7.3 Operational phase Impact Identification

Direct Impact

- 9.7.3.1 During operational phase of the Project, similar to the existing maintenance practices at TWN, regular maintenance desilting works along the nullah would be carried out by the DSD to remove excessive silts, debris and any obstructions to safeguard the hydraulic capacity of the nullah. Maintenance desilting of the nullah would tentatively be carried out on an annual basis during dry season (November to March) when the water flow is low, except during emergency situations where the accumulated silt would adversely affect the hydraulic capacity of the nullah or where flooding risk is imminent, or when complaints on environmental nuisance associated with the accumulated silt are received. These works could potentially have direct impact on the modified watercourse and water quality. However, given that desilting works are already undertaken regularly during the baseline condition and would be temporary in small scale, no unacceptable direct ecological impacts are anticipated.

Indirect Impacts

Potential Beneficial Impact due to Water Quality Improvement and Ecological Enhancement-associated Water Retention and Replenish Methods

- 9.7.3.2 Under operation of the Project, with the implementation of the proposed DWFI system and treatment wetlands, the existing polluted dry weather flows from the drainage outlets along TWN will either be intercepted and discharged to the existing sewerage system via gravity mains (i.e. no DWFI pumping station required) for conveying to Shatin Sewage Treatment Works for treatment by the DWFI system, or be discharged into the treatment wetlands installed at drainage outlets for in-situ polishing, reducing level of pollutants (e.g., SS, BOD, total phosphorus, total nitrogen) being discharged into Shing Mun River Channel. The modification of existing stilling basin (part of channel bed modification works) and the underground water pumps installed by the bankside near mid-stream of TWN would also serve to retain and supplement freshwater for the proposed ecological enhancement. Freshwater input into TWN will therefore be of improved water quality with constant flow throughout the year, benefiting flora and fauna utilising the modified watercourse, as well as local communities in the area.

Potential Beneficial Impact due to Ecological Enhancement

- 9.7.3.3 The Project will create wetland habitats and install ecological enhancement features within the TWN to improve aquatic habitats as compared to the baseline condition. The riverbed will be planted with various types of riparian and wetland plants while the river embankment will be covered by climbers. At downstream Section 1, the low flow channel will be increased in width, with blue-green elements extending from Man Lai Court Tower 1 to 3. As such, the Project

will result in positive ecological impacts by providing an enhanced habitat in the modified watercourse.

Potential Water Quality Impacts from Maintenance Works and Desilting Works

- 9.7.3.4 Regular maintenance works will be required for the DWFI system installed along Sections 1 to 5 of TWN during operation of the Project. These maintenance works could potentially increase SS levels in water due to disturbance to nullah bed. Disturbance impacts caused by these works are expected to be temporary and only affect the works area of small scale with no unacceptable impacts to water quality. As such, no unacceptable indirect ecological impacts are anticipated.

Disturbance to Species of Conservation Importance

- 9.7.3.5 During routine maintenance desilting works, there will be potential disturbances to avifauna species of conservation importance (i.e. ardeids) in the dry season. As discussed in **Section 9.5.2.4**, Section 1 of TWN and adjacent areas of Shing Mun River Channel is utilised as foraging and roosting habitats by ardeids, particularly in dry season. Maintenance works such as desilting may disturb the ardeids and prevent them from using the habitat. However, given that ardeids in the area are relatively disturbance-tolerant, the works are temporary in nature of small scale and already being carried out regularly, no unacceptable impacts from maintenance works on species of conservation importance are anticipated.
- 9.7.3.6 Under operation of the Project, there may also be potential human disturbances to ardeids recorded pre-roosting on the concrete access ramps alongside Section 1 of TWN and adjacent areas of Shing Mun River Channel. As shown in **Appendix 2.1**, revitalisation of Section 1 aims to promote ecological enhancement and would not involve any recreation / leisure and public access. Design of the section will reinstate the access ramps with greening elements, and therefore would not result in disturbance impacts to the waterbirds utilising the nullah.

Potential Water Quality Impacts from Maintenance Works and Desilting Works

- 9.7.3.7 In addition to routine maintenance desilting tentatively be carried on an annual basis during dry season as detailed in **Section 9.7.3.1**, similar to the existing practices, regular maintenance works for the drainage and sewerage systems along TWN, including maintenance to the DWFI system installed along sections 1 to 5 of TWN (**Figure 2.2** refers), would also be carried out by the DSD to safeguard the hydraulic capacity of the nullah during operation of the Project. The maintenance practices and frequency would be similar to the existing maintenance works undertaken by the DSD. For the minor maintenance to the DWFI system will only be undertaken on an as-needed basis and frequent maintenance (i.e. monthly) will not be required. Diversion of the dry weather flow to the nearby sewerage system can be adopted during maintenance of DWFI system so that the water quality at TWN would not be adversely affected. The maintenance / desilting would be carried out by hand-held or light machinery during low tide. The maintenance desilting could potentially increase SS levels in water due to disturbance to nullah bed. Disturbance impacts caused by these works are expected to be temporary and only affect the works area of small scale with no unacceptable impacts on water quality with proper design of site drainage and implementation of Best Management Practices (BMPs) for storm water discharge as detailed in **Section 5**. As such, no unacceptable indirect ecological impacts are anticipated.

Potential Changes in Hydrodynamic Properties and Hydrology

- 9.7.3.8 During operation of the Project, DWFI system will be in place along the nullah to intercept and convey the flow with heavily polluted discharges from some of the drainage outlets along the nullah to Sha Tin Sewage Treatment Works for treatment, which would inevitably lead to reduced flowrate and amount of freshwater input into TWN and downstream receiving water (Shing Mun River Main Channel). With the provision of treatment wetland for in-situ polishing of non-intercepted flow with less polluted discharges as discussed in **Section 2**, the polished flow could serve as a part of the environmental flow to sustain the ecological function of the flora and fauna and habitat processes present within the revitalised TWN. Furthermore, with the incorporation of water retention and replenish designs and ecological enhancement features (e.g. wetland habitats created) within the nullah (see **Section 2**), average flow rate will remain similar to baseline condition while supporting the created habitats. Given that salinity in the main channel varied significantly from wet season to dry season (HKBU, 2011), such reduction in freshwater input resulting from Project operation is not likely to cause impacts

to fauna species utilising it and thus no unacceptable impacts on hydrodynamics properties and hydrology are anticipated.

9.7.4 Evaluation of Ecological Impact

9.7.4.1 Potential ecological impacts on the identified habitats within the assessment area associated with the construction and operation of the Project have been evaluated in accordance with the Annex 8 of the EIAO-TM as given in **Table 9.35** to **Table 9.45**. Evaluation of potential major ecological impacts to species of conservation importance has been evaluated in **Table 9.46**.

Woodland

9.7.4.2 Woodland would experience no direct impacts and minor indirect impacts due to disturbance and increase in human activities arising from the Project. Considering the large distance between majority of woodland and the Project site and no dust impacts are anticipated (as detailed in **Section 9.7.2.22**), impacts on woodland habitat resulting from the Project are anticipated to be *Negligible*.

Table 9.35 Evaluation of Ecological Impact to Woodland within the Assessment Area

Evaluation Criteria	Woodland
Habitat quality	Moderate to High
Species	<ul style="list-style-type: none"> ■ Moderate to high floral diversity and moderate faunal diversity ■ Seven flora, six avifauna, one butterfly, five mammals and two reptile species of conservation importance recorded from recent survey. ■ Two flora, three avifauna, one butterfly, two amphibian and one mammal species of conservation importance recorded previously.
Size / Abundance	<ul style="list-style-type: none"> ■ Habitat would not be directly affected ■ Indirect impacts due to disturbance and increased human activities only expected to affect very small portion of woodland within the assessment area
Duration	<ul style="list-style-type: none"> ■ Construction phase indirect impacts due to disturbance and increased human activities would be temporary ■ Operational phase indirect impacts due to disturbance and increased human activities would be permanent
Reversibility	<ul style="list-style-type: none"> ■ Construction phase indirect impacts due to disturbance and increased human activities would be reversible ■ Operational phase indirect impacts due to disturbance and increased human activities would be irreversible
Magnitude	Negligible, given large distance between majority of woodland habitat and the Project site
Overall impact evaluation	Negligible

Mixed Woodland

9.7.4.3 Mixed Woodland would experience no direct impact and minor indirect impacts due to disturbance and increase in human activities arising from the Project. Considering the large distance between majority of the mixed woodland and the Project site and no dust impacts are anticipated (as detailed in **Section 9.7.2.22**), impacts to mixed woodland habitat resulting from the Project are anticipated to be *Negligible*.

Table 9.36 Evaluation of Ecological Impact to Mixed Woodland within the Assessment Area

Evaluation Criteria	Mixed Woodland
Habitat quality	Moderate
Species	<ul style="list-style-type: none"> ■ Moderate to high floral diversity and low to moderate faunal diversity ■ Three flora, three avifauna and one mammal species of conservation importance recorded from recent survey. ■ No previous records of species of conservation importance

Evaluation Criteria	Mixed Woodland
Size/Abundance	<ul style="list-style-type: none"> ▪ Habitat would not be directly affected ▪ Indirect impacts due to disturbance and increased human activities only expected to affect very small portion of mixed woodland within the assessment area
Duration	<ul style="list-style-type: none"> ▪ Construction phase indirect impacts due to disturbance and increased human activities would be temporary ▪ Operational phase indirect impacts due to disturbance and increased human activities would be permanent
Reversibility	<ul style="list-style-type: none"> ▪ Construction phase indirect impacts due to disturbance and increased human activities would be reversible ▪ Operational phase indirect impacts due to disturbance and increased human activities would be irreversible
Magnitude	Negligible, given large distance between majority of mixed woodland habitat and the Project site
Overall impact evaluation	Negligible

Plantation

- 9.7.4.4 Plantation would experience no direct impact and minor indirect impacts due to disturbance and increase in human activities arising from the Project. Considering the large distance between majority of the plantation and the Project site and no dust impacts are anticipated (as detailed in **Section 9.7.2.22**), impacts to plantation habitat resulting from the Project are anticipated to be *Negligible*.

Table 9.37 Evaluation of Ecological Impact to Plantation within the Assessment Area

Evaluation Criteria	Plantation
Habitat quality	Low
Species	<ul style="list-style-type: none"> ▪ Low floral diversity and faunal diversity ▪ No species of conservation importance recorded from recent surveys and previous records
Size/Abundance	<ul style="list-style-type: none"> ▪ Habitat would not be directly affected ▪ Indirect impacts due to disturbance and increased human activities only expected to affect very small portion of plantation habitat within the assessment area
Duration	<ul style="list-style-type: none"> ▪ Construction phase indirect impacts due to disturbance and increased human activities would be temporary ▪ Operational phase indirect impacts due to disturbance and increased human activities would be permanent
Reversibility	<ul style="list-style-type: none"> ▪ Construction phase indirect impacts due to disturbance and increased human activities would be reversible ▪ Operational phase indirect impacts due to disturbance and increased human activities would be irreversible
Magnitude	Negligible, given large distance between majority of plantation habitat and the Project site
Overall impact evaluation	Negligible

Grassland

- 9.7.4.5 Grassland would experience no direct impact and negligible level of indirect impact due to disturbance and increase in human activities arising from the Project. Considering the large distance between the grassland and Project site, impacts to grassland habitat resulting from the Project are anticipated to be *Negligible*.

Table 9.38 Evaluation of Ecological Impact to Grassland within the Assessment Area

Evaluation Criteria	Grassland
Habitat quality	Low
Species	<ul style="list-style-type: none"> ■ Low floral diversity and very low faunal diversity ■ No species of conservation importance recorded from recent surveys and previous records
Size/Abundance	<ul style="list-style-type: none"> ■ Habitat would not be directly affected ■ Indirect impact due to disturbance and increased human activities
Duration	<ul style="list-style-type: none"> ■ Construction phase indirect impacts due to disturbance and increased human activities would be temporary ■ Operational phase indirect impacts due to disturbance and increased human activities would be permanent
Reversibility	<ul style="list-style-type: none"> ■ Construction phase indirect impacts due to disturbance and increased human activities would be reversible ■ Operational phase indirect impacts due to disturbance and increased human activities would be irreversible
Magnitude	Negligible, given large distance between grassland habitat and the Project site
Overall impact evaluation	Negligible

Reservoir

9.7.4.6 Reservoir would experience no direct impact and negligible level of indirect impact due to disturbance and increase in human activities arising from the Project. Considering the large distance between the reservoir and the Project site, impacts to reservoir habitat resulting from the Project are anticipated to be *Negligible*.

Table 9.39 Evaluation of Ecological Impact to Reservoir within the Assessment Area

Evaluation Criteria	Reservoir
Habitat quality	Low
Species	<ul style="list-style-type: none"> ■ Low floral diversity and faunal diversity ■ One flora and one avifauna species of conservation importance recorded from recent surveys ■ No previous records of species of conservation importance
Size/Abundance	<ul style="list-style-type: none"> ■ Habitat would not be directly affected ■ Indirect impact due to disturbance and increased human activities
Duration	<ul style="list-style-type: none"> ■ Construction phase indirect impacts due to disturbance and increased human activities would be temporary ■ Operational phase indirect impacts due to disturbance and increased human activities would be permanent
Reversibility	<ul style="list-style-type: none"> ■ Construction phase indirect impacts due to disturbance and increased human activities would be reversible ■ Operational phase indirect impacts due to disturbance and increased human activities would be irreversible
Magnitude	Negligible, given large distance between reservoir habitat and the Project site
Overall impact evaluation	Negligible

Village / Orchard

9.7.4.7 Village / Orchard would experience no direct impact and minor levels of indirect impact due to disturbance and increase in human activities arising from the Project. As discussed in **Section 9.7.2.22**, no adverse dust impact is anticipated with mitigation measures implemented. Impacts to village / orchard habitats resulting from the Project are anticipated to be *Negligible*.

Table 9.40 Evaluation of Ecological Impact to Village/Orchard within the Assessment Area

Evaluation Criteria	Village/Orchard
Habitat quality	Low
Species	<ul style="list-style-type: none"> ▪ Moderate to high floral diversity and low to moderate faunal diversity ▪ One avifauna and one butterfly species of conservation importance recorded from recent surveys ▪ No previous records of species of conservation importance
Size/Abundance	<ul style="list-style-type: none"> ▪ Habitat would not be directly affected ▪ Indirect impact due to disturbance and increased human activities only expected to affect very small portion of village/orchard habitat within the assessment area
Duration	<ul style="list-style-type: none"> ▪ Construction phase indirect impacts due to disturbance and increased human activities would be temporary ▪ Operational phase indirect impacts due to disturbance and increased human activities would be permanent
Reversibility	<ul style="list-style-type: none"> ▪ Construction phase indirect impacts due to disturbance and increased human activities would be reversible ▪ Operational phase indirect impacts due to disturbance and increased human activities would be irreversible
Magnitude	Negligible
Overall impact evaluation	Negligible

Developed Area / Wasteland

9.7.4.8 The main impact to developed area / wasteland arising from the Project is temporary loss of approximately 4.3 ha of habitats in the Project site. Developed area within the assessment area is subjected to high level of existing disturbance from nearby residential areas, transportation infrastructure and recreational areas, indirect impacts to this habitat from construction activities are thus insignificant. Considering the low ecological value of the habitat, temporary loss of habitats is anticipated to result in *Minor* ecological impacts.

9.7.4.9 Disturbance impacts to developed areas adjacent to the Project site (excluding the ardeid night roosting site) are considered as *Minor*. Whereas disturbance impacts to the ardeid night roosting site are considered *Minor to Moderate* due to its habitat quality. Although avifauna, butterfly and mammal (bat) species of conservation importance were recorded from developed areas, these species were in low abundance, highly mobile, and already habituated to high levels of disturbance.

Table 9.41 Evaluation of Ecological Impact to Developed Area/Wasteland within the Assessment Area

Evaluation Criteria	Developed Area/Wasteland
Habitat quality	Low to Moderate – for ardeid night roosting site on the northern bank of Shing Mun River Channel Low – for remaining developed area
Species	<p><u>Project site</u></p> <ul style="list-style-type: none"> ▪ Low floral diversity and low to moderate faunal diversity ▪ Three avifauna, one butterfly and one mammal species of conservation importance recorded from recent surveys <p><u>Assessment Area outside of Project site</u></p> <ul style="list-style-type: none"> ▪ Five avifauna, two odonate and five mammal species of conservation importance recorded from recent surveys ▪ Ardeid night roosts were recorded on planted trees on the northern bank of Shing Mun River Channel (from Block 3 of Man Lai Court to Sha Tin Government Secondary School) ▪ Two flora, two avifauna, one odonate, one reptile, one amphibian and one mammal species of conservation importance recorded from previous study ▪ Ardeids were also recorded actively using the night roost at Tai Wai, along Shing Mun River near Caritas Lok Jun School previously

Evaluation Criteria	Developed Area/Wasteland
Size/Abundance	<ul style="list-style-type: none"> Direct habitat loss of temporary nature of ~4.3 ha of developed area / wasteland Indirect impact to developed areas outside the Project site due to disturbance and increased human activities
Duration	<ul style="list-style-type: none"> Construction phase temporary loss of ~4.3 ha developed area / wasteland and indirect impacts (noise and vibration, air/dust, disturbance to ardeid night roosting site) due to increased disturbance and increased human activities would be temporary Operational phase positive ecological impacts due to ecological enhancement and improved water quality would be permanent
Reversibility	<ul style="list-style-type: none"> Construction phase temporary habitat loss of developed area/ wasteland and indirect impacts due to increased disturbance and human activities would be reversible Operational phase indirect impacts due to disturbance and increased human activities would be irreversible
Magnitude	Low
Overall impact evaluation	<p>Minor to Moderate – for ardeid night roosting site on the northern bank of Shing Mun River Channel</p> <p>Minor – for remaining developed area</p>

Natural Watercourse

9.7.4.10 Natural watercourse (S1) with two tributaries are located upstream of TWN. While other natural watercourses (S2 – S5) are located at the north-western side of assessment area within woodland or mixed woodland habitats. As no construction works will be conducted within all these natural watercourses, no direct impacts are anticipated by the Project on natural watercourse habitat.

9.7.4.11 Indirect impact from the Project on natural watercourse would arise from surface runoff, disturbance and increased human activities from construction activities. Given the geographically upstream location of the natural watercourse (S1) and distance from works area (S2, S3, S4, S5), no indirect ecological impact from the Project by surface runoff would be expected on the habitat. As discussed in **Section 9.7.2.26**, the nearest natural watercourse S1 is not expected to subject to adverse water quality impact from land-based construction with the implementation of appropriate measures (refer to **Section 5**). Therefore, indirect impact on all natural watercourses by the Project is anticipated to be *Negligible*.

Table 9.42 Evaluation of Ecological Impact to Natural Watercourse within the Assessment Area

Evaluation Criteria	Natural Watercourse				
	S1	S2	S3	S4	S5
Habitat quality	Low to Moderate				
Species	<ul style="list-style-type: none"> Low floral diversity and faunal diversity One amphibian, one reptile and two freshwater community species of conservation importance recorded from recent surveys One freshwater community species of conservation importance recorded previously 				
Size / Abundance	<ul style="list-style-type: none"> Habitat would not be directly affected Indirect impact due to disturbance and increased human activities 				
Duration	<ul style="list-style-type: none"> Construction phase indirect impacts due to site runoff, disturbance and increased human activities would be temporary Operational phase indirect impacts due to disturbance and increased human activities would be permanent 				
Reversibility	<ul style="list-style-type: none"> Construction phase indirect impacts due to disturbance and increased human activities would be reversible Operational phase indirect impacts due to disturbance and increased human activities would be irreversible 				

Evaluation Criteria	Natural Watercourse				
	S1	S2	S3	S4	S5
Magnitude	Negligible	Negligible (at least 200m from S2 to the closest Project site)	Negligible (at least 300m from S3 to the closest Project site)	Negligible (at least 200m from S4 to the closest Project site)	Negligible (at least 300m from S5 to the closest Project site)
Overall impact evaluation	Negligible	Negligible	Negligible	Negligible	Negligible

Modified Watercourse

- 9.7.4.12 The main impact to modified watercourse by the Project is temporary habitat loss due to modification of channel bed and construction of water quality treatment elements within the Project site. These impacts are considered *Minor* along most sections of the channel due to existing poor habitat quality. Temporary impacts at the stilling basin (which supported limited wetland vegetation) and Section 1 of the channel in dry season (which was utilised by ardeids and other avifauna as a foraging/pre-roosting site, with especially high abundance of overwintering ardeids recorded during dry season) are considered *Minor to moderate* in scale.
- 9.7.4.13 Indirect impact from the Project on TWN would arise from surface runoff, disturbance and increased human activities from construction activities. As works would be restricted to smaller sections of the channel (approximately 200m in length), the area of TWN subject to disturbance impacts at any one time would be relatively small. In addition, the affected habitats of TWN would be of relatively low ecological value. Indirect impacts are considered relatively *Minor* in scale.

Table 9.43 Evaluation of Ecological Impact to Modified Watercourse (Tai Wai Nullah) within the Assessment Area

Evaluation Criteria	Modified Watercourse				
	Section 1	Sections 2-5	Section 6	Stilling Basin (Section 6)	
Habitat quality	Low to moderate	Low	Low	Low to moderate	
Species	<ul style="list-style-type: none"> ▪ Low floral diversity and low to moderate faunal diversity ▪ Six avifauna, one butterfly and one mammal species of conservation importance recorded from recent surveys ▪ Two avifauna, one reptile and one mammal species of conservation recorded previously 				
Size/Abundance	<ul style="list-style-type: none"> ▪ Direct impact to ~6.8 ha of modified watercourse within Project site in temporary nature due to modification (excavation, re-surfacing and greening) works of channel bed and construction of water quality treatment elements ▪ Indirect impact due to disturbance and increased human activities within Project site 				
Duration	<ul style="list-style-type: none"> ▪ Construction phase temporary loss of ~6.8 ha modified watercourse and indirect impacts due to site runoff, disturbance and increased human activities of temporary nature ▪ Operational phase disturbance and increased human activities would be permanent 				
Reversibility	<ul style="list-style-type: none"> ▪ Construction phase temporary habitat loss and indirect impacts due to disturbance and increased human activities would be reversible. ▪ Operational phase indirect impacts due to disturbance and increased human activities would be irreversible 				
Magnitude	Low	Low	Low	Low	
Overall impact evaluation	Dry Season	Minor to Moderate	Minor	Minor	Minor to Moderate
	Wet Season	Minor			

9.7.4.14 Modified watercourse of Shing Mun River Channel is located out of the Project site. Despite the high abundance of avifauna, particularly wetland-dependent and overwintering species' pre-roosting site along channel bank and night roosting site near Sha Tin Government Secondary School, the habitat is of low quality with existing low to moderate ecological value caused by high level of disturbance from surrounding habitat. As the habitat supports low species diversity with no habitat fragmentation expected, indirect disturbance impact on Shing Mun River Channel by the Project is anticipated to be *Minor*.

Table 9.44 Evaluation of Ecological Impact to Modified Watercourse (Shing Mun River Channel) within the Assessment Area

Evaluation Criteria		Modified Watercourse	
		Shing Mun River Channel	
Habitat quality		Low to Moderate	
Species		<ul style="list-style-type: none"> ▪ Very low floral and low faunal diversity ▪ Five avifauna species of conservation importance recorded from recent surveys ▪ No species of conservation importance recorded previously 	
Size/Abundance		<ul style="list-style-type: none"> ▪ Habitat would not be directly affected ▪ Indirect impact due to disturbance and increased human activities outside of Project site 	
Duration		<ul style="list-style-type: none"> ▪ Construction phase indirect impacts to the channel and ardeids pre/night roosting sites along the channel bank due to site runoff, disturbance and increased human activities would be temporary ▪ Operational phase indirect impacts due to disturbance and increased human activities to the channel and ardeids pre/ night roosting sites along the channel bank would be permanent 	
Reversibility		<ul style="list-style-type: none"> ▪ Construction phase indirect impacts to the channel and ardeids pre/night roosting sites along the channel bank due to disturbance and increased human activities would be reversible ▪ Operational phase indirect impacts due to disturbance and increased human activities to the channel and ardeids pre/night roosting sites along the channel bank would be irreversible 	
Magnitude		Low	
Overall impact evaluation	Dry Season	Minor	
	Wet Season	Minor	

Subtidal Hard Substrate, Soft Bottom and Intertidal Habitat

9.7.4.15 The Project only involves land-based construction works, no direct loss of marine habitat is expected. Considering the large distance between Project site and the marine habitats, indirect impacts to marine habitats resulting from the Project are anticipated to be *Negligible*.

Table 9.45 Evaluation of Ecological Impact to Marine Subtidal Hard Substrate, Soft Bottom and Intertidal Habitats within the Marine Assessment Area

Evaluation Criteria	Marine Habitat		
	Subtidal Hard Substrate Habitat	Soft Bottom Habitat	Intertidal Habitats
Habitat quality	Low	Low	Low
Species	<ul style="list-style-type: none"> ▪ Two coral species of conservation importance recorded at low abundance 	<ul style="list-style-type: none"> ▪ No species of conservation importance were recorded 	<ul style="list-style-type: none"> ▪ No species of conservation importance were recorded
Size/Abundance	<ul style="list-style-type: none"> ▪ Habitat would not be directly affected ▪ Indirect impact due to sewage effluent, site runoff, and effluent bypass 		

Evaluation Criteria	Marine Habitat		
	Subtidal Hard Substrate Habitat	Soft Bottom Habitat	Intertidal Habitats
Duration	<ul style="list-style-type: none"> Construction phase indirect water quality impacts due to sewage effluent, site runoff, and effluent bypass would be temporary 		
Reversibility	<ul style="list-style-type: none"> Construction phase indirect water quality impacts due to site runoff would be temporary 		
Magnitude	Negligible	Negligible	Negligible
Overall impact evaluation	Negligible	Negligible	Negligible

Species of Conservation Importance

9.7.4.16 Potentially significant impacts to species of conservation importance recorded within the assessment area are described in above sections. A summary and evaluation of potential impacts from construction and operational phases of the Project on all species of conservation importance recorded within the assessment area is presented in **Table 9.46**.

Table 9.46 Overall Impacts on Species of Conservation Importance within the Assessment Area

Species of Conservation Importance	Construction and Operational phases Impacts	
Common name (scientific name)	Description	Evaluation
FLORA	As all flora species of conservation importance was recorded out of Project site, no impacts are expected.	No impact
FAUNA		
Avifauna		
Great Egret (<i>Ardea alba</i>) Grey Heron (<i>Ardea cinerea</i>) Chinese Pond Heron (<i>Ardeola bacchus</i>) Little Egret (<i>Egretta garzetta</i>)	<p>Four ardeid species were recorded pre-roosting along bankside near the confluence of Shing Mun River Channel and TWN with night roosting behavior observed on trees in developed area along Block 3 of Man Lai Court to Sha Tin Government Secondary School (out of Project site). Little egret was recorded in all sections of the Project site, except Section 2.</p> <p>Construction phase Direct loss of habitat (modified watercourse) would be temporary and given that there are other pre-roosting and foraging ground along the Shing Mun River Channel, <i>Minor</i> impact is expected on these four ardeids, except Section 1 in dry season with <i>Minor</i> to <i>Moderate</i> impact due to higher abundance of pre-roosting ardeids. Mitigation measures should be provided during dry seasons to provide compensatory pre-roosting site temporarily.</p> <p>As all existing trees alongside TWN will be retained and given the distance from the works area will be approximately 30m, no direct impact on night roosting habitat of ardeids is expected.</p> <p>Construction noise may disturb ardeids from utilising habitat for pre-roosting, especially during dry seasons with high abundance of overwintering ardeids species (e.g. great egret) pre-roosting and foraging in Section 1 of the Project site. Given that the surrounding area of the pre-roosting site is already highly disturbed by human activities and disturbance from construction is temporary, impacts of construction disturbance on these four ardeids are therefore expected to be <i>Minor</i> to <i>Moderate</i> during dry season and <i>Minor</i> during wet season if unmitigated.</p> <p>Operational phase No unacceptable indirect ecological impacts are anticipated from desilting works as it is a regular practice in the existing condition, it is also expected to be temporary and in small scale.</p> <p>No unacceptable indirect disturbance impacts are anticipated from operation of the Project as revitalisation design of the TWN has seek to find a balance</p>	<p><u>Wet season</u> Minor</p> <p><u>Dry season</u> Minor to Moderate</p> <p>Negligible</p>

Species of Conservation Importance	Construction and Operational phases Impacts	
Common name (scientific name)	Description	Evaluation
	<p>between design for local communities' needs and ecological enhancements. Where Section 1 aims to promote ecological enhancement and would not involve any recreation / leisure and public access.</p> <p>Positive impact would be resulted from operation of the Project as wetland habitat will be enhanced and created within TWN with ecological enhancement measures provided.</p>	
<p>Black-crowned Night Heron (<i>Nycticorax nycticorax</i>)</p>	<p>Individuals were recorded within the Project site, on concrete channel of Section 6 TWN.</p> <p>Construction phase Direct loss of habitat (modified watercourse) would be temporary and given that there is other foraging ground along the Shing Mun River Channel, ecological impact on this species is considered as <i>Minor</i>.</p> <p>Construction noise may disturb ardeids from utilising habitat for foraging. Given that surrounding area of the Project site is already highly disturbed by human activities and disturbance from construction disturbance is temporary, impacts of construction disturbance on this species are therefore expected to be <i>Minor</i> if unmitigated.</p> <p>Operational phase No unacceptable indirect ecological impacts are anticipated from desilting works as it is a regular practice in the existing condition, it is also expected to be temporary and in small scale.</p> <p>No unacceptable indirect disturbance impacts are anticipated from operation of the Project as revitalisation design of the TWN has seek to find a balance between design for local communities' needs and ecological enhancements. Where Section 1 aims to promote ecological enhancement and would not involve any recreation / leisure and public access.</p> <p>Positive impact would be resulted from operation of the Project as wetland habitat will be enhanced and created within TWN with ecological enhancement measures provided.</p>	<p>Minor</p> <p>Negligible</p>
<p>Collared Crow (<i>Corvus torquatus</i>)</p>	<p>Two individuals were recorded within the Project site, at concrete platform near TWN downstream Project site.</p> <p>Construction phase Reconstruction of concrete platform would cause displacement due to loss of habitat and potential water quality impact from construction. As there are other</p>	<p>Minor</p>

Species of Conservation Importance	Construction and Operational phases Impacts	
Common name (scientific name)	Description	Evaluation
	<p>habitats along the Shing Mun River Channel for this highly mobile species and good site practice will be implemented, ecological impact on this species is considered as <i>Minor</i>.</p> <p>Operational phase No unacceptable indirect ecological impacts are anticipated from desilting works as it is a regular practice in the baseline condition, it is also expected to be temporary and in small scale.</p> <p>No unacceptable indirect disturbance impacts are anticipated from operation of the Project as revitalisation design of the TWN has seek to find a balance between design for local communities' needs and ecological enhancements. Where Section 1 aims to promote ecological enhancement and would not involve any recreation / leisure and public access.</p> <p>Positive impact would be resulted from operation of the Project as wetland habitat will be enhanced and created within TWN with ecological enhancement measures provided.</p>	<p>Negligible</p>
Greater Coucal (<i>Centropus sinensis</i>)	<p>Two individuals were recorded on trees within Project site at upstream stilling basin (Section 6) adjacent to Heung Fan Liu.</p> <p>Construction phase The construction noise and increase in human activities may cause avoidance of habitat. This species is commonly found in the shrubland or grassland. It is unlikely to have significant adverse impact on this species due to availability of other habitats nearby and the Project would not pose any direct impact on its habitat.</p> <p>Operational phase No impact</p>	<p>Negligible</p> <p>No impact</p>
Rufous-capped Babbler (<i>Stachyridopsis ruficeps</i>)	<p>An individual was recorded on trees within Project site at upstream stilling basin (Section 6) adjacent to Heung Fan Liu.</p> <p>Construction phase The construction noise and increase in human activities may cause avoidance of habitat. This species is commonly found in the woodland or mixed woodland. It is unlikely to have significant adverse impact on this species due to availability of other habitats nearby and the Project would not pose any direct impact on its habitat.</p> <p>Operational phase No impact</p>	<p>Negligible</p> <p>No impact</p>

Species of Conservation Importance		Construction and Operational phases Impacts	
Common name (scientific name)	Description	Evaluation	
Eastern Buzzard (<i>Buteo japonicus</i>) Common Emerald Dove (<i>Chalcophaps indica</i>) Mountain Bulbul (<i>Ixos mccllellandii</i>) Black Kite (<i>Milvus migrans</i>)	As these species were either recorded in flight or out of works area, no impact is expected. Positive impact would be resulted from operation of the Project for some of the wetland dependent species (i.e. black kite) as wetland habitat will be enhanced and created within TWN with ecological enhancement measures provided.	No impact	
Butterfly			
Danaid Eggfly (<i>Hypolimnas misippus</i>) Metallic Cerulean (<i>Jamides alecto alocina</i>) Malayan (<i>Megisba malaya sikkima</i>) Tiny Grass Blue (<i>Zizula hylax</i>)	Low abundance of these butterfly species was recorded within developed area/ modified watercourse within Project site near the stilling basin.	No impact	
	Construction phase No adverse impacts are expected as it is unlikely to be their key habitat and availability of other suitable habitats nearby.		
	Operational phase No impact	No impact	
Odonate			
Chinese Cascader (<i>Zygonyx asahinai</i>) Emerald Cascader (<i>Zygonyx iris insignis</i>)	As these species were recorded out of Project site, no impact is expected.	No impact	
Mammal			
Short-nosed Fruit Bat (<i>Cynopterus sphinx</i>)	Low abundance of short-nosed fruit bat was recorded at developed area within and out of the Project site near Man Lai Court. Day roosting site of the species was also observed on trees in developed area within Project site near Man Lai Court.	No impact	
	Construction phase Given that all the trees along Man Lai Court to Hong Kong Heritage Museum will be retained under the Project and the existing habitat is already subjected to high level of disturbance by human activities, no major adverse impact is expected on this species from day roosting.		
	Operational phase No impact	No impact	
Chinese Noctule (<i>Nyctalus plancyi</i>)	Low abundance of Chinese noctule was recorded within the modified watercourse habitat within Project site (Section 5 of TWN).	No impact	
	Construction phase No adverse disturbance impacts are expected as it is unlikely to be their key habitat and there are other habitats nearby for the highly mobile species.		
	Operational phase No impact	No impact	

Species of Conservation Importance	Construction and Operational phases Impacts	
Common name (scientific name)	Description	Evaluation
Himalayan Leaf-nosed Bat (<i>Hipposideros armiger</i>) Chinese Pipistrelle (<i>Hypsugo pulveratus</i>) Rhesus Macaque (<i>Macaca mulatta</i>) Japanese Pipistrelle (<i>Pipistrellus abramus</i>) Least Pipistrelle (<i>Pipistrellus tenuis</i>) Lesser Bamboo Bat (<i>Tylonycteris pachypus</i>)	As these species were recorded out of the Project site, no impact is expected.	No impact
Herpetofauna		
Mountain Water Snake (<i>Sinonatrix percarinata percarinata</i>)	Individual of Mountain Water Snake was recorded in natural watercourse S1, in proximity to Project site of Section 6.	
	<p>Construction phase Land-based construction runoff and accidental spillage of chemicals may lead to lethal (direct mortality) or sublethal (reproductive retardation) impacts on this water snake. No adverse impacts on this species are expected with the implementation of appropriate measures to control runoff from construction site, as well as adoption of good site practices for handling and disposal of construction discharges (refer to Section 5).</p> <p>Operational phase No impact</p>	Negligible
Lesser Spiny Frog (<i>Quasipaa exilispinosa</i>) Many-banded Krait (<i>Bungarus multicinctus multicinctus</i>) Tokay Gecko (<i>Gekko gekko</i>)	As these species were recorded out of the Project site, no impact is expected.	No impact
Freshwater communities		
Stream Crab (<i>Cryptopotamon anacoluthon</i>) <i>Somanniathelphusa zanklon</i>	Low abundance of these freshwater species was recorded in natural watercourse S1, in proximity to Project site Section 6.	
	<p>Construction phase No direct impact (i.e. habitat loss) is anticipated for these freshwater species as no works will be carried out in the natural watercourse habitat.</p> <p>Land-based construction runoff and accidental spillage of chemicals may lead to lethal (direct mortality) or sublethal (reproductive retardation) impacts on these aquatic organisms. No adverse impacts on these species are expected with the implementation of appropriate measures to control runoff from construction site, as well as adoption of good site practices for handling and disposal of construction discharges (refer to Section 5).</p> <p>Operational phase No impact</p>	Negligible

9.7.5 Cumulative Impacts

- 9.7.5.1 According to the preliminary construction programme of the Project (**Appendix 2.2** refers), construction works would be undertaken in sections along TWN (**Figure 2.1** refers), between Q1 2024 and Q4 2029 starting from downstream Section 1 to upstream Section 6. Four concurrent projects are identified in the vicinity of the Project site or within Shing Mun River and its tributaries as discussed in **Section 2**, including:
- “Revised Trunk Road T4” in Sha Tin,
 - Box culverts along Chui Tin Street under “Drainage Improvement Works in Sha Tin and Sai Kung;”
 - “Revitalisation of Fo Tan Nullah”; and
 - “Joint-user complex at Tsuen Nam Road”, Tai Wai.
- 9.7.5.2 Works areas for planned box culverts along Chui Tin Street under “Drainage Improvement Works in Sha Tin and Sai Kung” and Joint-user complex at Tsuen Nam Road, Tai Wai covers mainly existing carriage way along Chui Tin Street by Shing Mun River and existing playground in Tai Wai respectively. Since the surrounding environments are already under high degree of disturbances, cumulative ecological impacts during both construction and operational phases are anticipated to be insignificant.
- 9.7.5.3 For “Revised Trunk Road T4”, based on the approved EIA report (AEIAR-231/2021), in view that the construction works of the concurrent project within the site area of overlapping with this Project during construction phase would be the foundation works for the Revised Trunk Road T4 viaducts, and that the construction works along the nullah will not be undertaken at the entire work section at the same time (see **Section 2**), the tentative construction programme and works at the interface area between the two projects could be arranged efficiently, e.g. scheduling works to be carried out during dry season, through close liaison between DSD’s and CEDD’s contractors of this Project and the concurrent project respectively in order to avoid construction works of respective works contracts to be carried out concurrently at the same interfacing areas and CEDD has agreed to include this requirement in the respective works contract. With such arrangement in place, cumulative construction environmental impacts, and water quality impacts upon the downstream water body could be minimised. For the construction of bridge piers within Shing Mun River under “Revised Trunk Road T4 in Sha Tin”, the construction activities for bridge piers would be conducted by phases and all piling and excavation works in river would be fully enclosed by cofferdam/watertight steel casing and with deployment of silt curtains to completely enclose the cofferdam/watertight steel casing prior to setting up piling works, hence, the potential water quality impacts could be mitigated and controlled by implementing the recommended mitigation measures. As such, cumulative ecological impacts to downstream areas in Shing Mun River Channel and Tolo Harbour during construction phase are anticipated to be insignificant.
- 9.7.5.4 Based on the tentative construction programme of potential concurrent projects as detailed in **Section 2.8**, the construction of “Revitalisation of Fo Tan Nullah” would overlap with that of the Project during 2024 to 2029. The concurrent project is located over 2 km from the Project boundary. Potential water quality impacts from this concurrent project are expected to be similar to this Project and localised that significant cumulative water quality impacts would not be expected given the large separation distance. With proper implementation of mitigation measures and good site practices, potential water quality impacts to downstream areas in Shing Mun River Channel would be well controlled.

9.8 Mitigation of Adverse Environmental Impacts

- 9.8.1.1 According to the EIAO-TM Annex 16 and EIAO Guidance Note 3/2010, ecological impacts to important habitats and associated wildlife caused by the proposed Project should be mitigated, in priority order of, avoidance, minimisation, and compensation approaches to the maximum practical extent.

9.8.2 Avoidance

Avoidance of Ardeid Roosting Site

- 9.8.2.1 The Project site is designed to avoid encroachment of the night roosting sites for ardeids. Thus, no direct impact on night roosting sites is anticipated.

Protection of Mature Vegetation along Nullah

- 9.8.2.2 There are existing mature trees along TWN on pedestrian road within the Project site. Although these tree species are not of conservation importance, the tree specimens are mature with good foliage and tree crown that can potentially provide habitat for fauna species, for instance, day roosting of short-nosed fruit bats was observed on mature tree Chinese fan-palm alongside Man Lai Court. These mature trees will therefore be retained under the revitalisation design.

Restriction of Construction Hours

- 9.8.2.3 Ardeid night roost was recorded nearby the Project site, the most recent records (at the time of the preparation of this report) of the roosting location was at the mature trees alongside Man Lai Court and Sha Tin Government Secondary School, east of the Project site (refer to **Figure 9.4**). Taking the varying timing of sunset throughout the year and the peak returning period of the roosting ardeids (**Section 9.5.2.4** refers), no construction works within the nullah in Section 1 (channel bed modification and desilting at downstream tidal zone) should be undertaken from 16:30 to 07:30 during dry season (October to March) and from 17:00 to 07:00 during wet season (April to September) in order to minimise the potential disturbance to pre-roosting / night-roosting ardeids.
- 9.8.2.4 A pre-construction ardeid survey should be conducted no earlier than 3 months before the commencement of construction works for each sections of TWN, for areas within 100m from the Project site, to confirm the location and status of the night roost. The surveys should be conducted covering the ardeid pre-roosting and night roosting sites to record the location of ardeid roosting trees, the ardeid species and abundance utilizing the pre-roosting and night roosting sites. A plan detailing the survey methodology should be submitted to and approved by AFCD prior to the pre-construction ardeid survey. The findings should also be submitted and approved by AFCD.
- 9.8.2.5 Likewise, no noisy construction works with power mechanical equipment (PME) in areas within 100m away from any night roost confirmed by the survey should be undertaken from 16:30 to 07:30 during dry season (October to March) and from 17:00 to 07:00 during wet season (April to September) to avoid disturbance for all work sections 1 – 6 of TWN.

9.8.3 Minimisation

Phasing of Construction Activities

- 9.8.3.1 Construction programme for the Project has been carefully phased and will take place separately along TWN. The Project site will be divided into six sections to be constructed in sequence starting from downstream TWN to reduce the construction impacts on nearby sensitive receivers comparing with constructing simultaneously in adjoining sections. The construction works along the nullah within each section would last for approximately 1 year and will not be undertaken at the entire section at the same time. All works within the nullah (nullah bed modification, construction of DWFI system along the nullah, underground water pipes along the nullah, construction of riparian walkway and amenity areas, and desilting works at downstream tidal zone) would be undertaken during dry season to reduce the potential water quality impacts. Likewise, works outside the nullah (such as walkway improvement) would be scheduled to avoid overlapping with works within the nullah to avoid heavy construction activities concentrating in a certain area over any period. This could localise the construction disturbance within and reduce the duration of disturbances to surrounding habitats.
- 9.8.3.2 Regarding to reconstruction of wetland habitat in the stilling basin at Section 6, construction will be divided into parts depending on the site constraints (i.e. reconstruct half of the basin at a time) to minimise disturbance and mortality of existing freshwater community within the basin.

Minimisation of Disturbance Impacts during Construction Phase

- 9.8.3.3 Through the implementation of mitigation measures and good site practices on air quality and noise control as recommended in **Section 3** and **Section 4**, construction disturbances to surrounding habitats and associated wildlife could also be further minimised. Relevant measures include but not limited to the followings.
- 9.8.3.4 Noise impacts during construction phase could be minimised, hence reducing disturbance impacts to adjacent habitats and associated fauna by:
- Good site practices;
 - Use of Quality Powered Mechanical Equipment (QPME) / quieter construction method; and
 - Use of temporary movable noise barrier.
- 9.8.3.5 Construction dust could cover leaves of vegetation, affecting their photosynthetic rate and in turn suppressing health and growth. Relevant dust suppression measures include:
- Regular site watering;
 - Proper covering of construction materials; and
 - Provision of hoardings along the site boundary.

Minimising Impacts to Hydrodynamics Properties and Water Quality during Construction Phase

- 9.8.3.6 Design of ecological-friendly riverbed lining should be considered with reference to DSD PN No. 3/2021 “Guidelines on Design for Revitalisation of River Channel” to minimise impacts to hydrological properties of the watercourse habitat. For instance, the original bed substrates within the nullah in the stilling basin at Section 6 could be stockpiled and preserved off-site temporarily during construction phase for reuse in wetland vegetation planting in the nullah as far as practicable.
- 9.8.3.7 All works within the TWN (channel bed modification, construction of DWFI system along the nullah, underground water pipes along the nullah, construction of riparian walkway and amenity areas, and desilting works at downstream tidal zone) should arrange to be conducted in dry season. Works within the nullah should be restricted to an enclosed dry zone of the watercourse, with physical containment measures such as barriers installed before the commencement of works to minimise water quality impacts on the downstream. Surface runoff should be directed towards silt / sediment traps and oil/ grease separators before discharge into storm drains. Sandbags / approximate temporary partition should be provided to isolate works area in close proximity to watercourse. Procedures promulgated under ProPECC PN 1/94 “Construction Site Drainage” should also be adopted, where applicable, and good site practices should be adopted to avoid pollution of waterbodies and to minimise water quality impacts. Detailed water pollution control measures are presented in **Section 5**.

Minimisation of Lighting / Glare during Construction and Operational Phases

- 9.8.3.8 Lightings installed along the revitalised TWN shall be minimised or incorporate wildlife-friendly lighting to avoid light spill. Intensity of light should be controlled to the lowest level possible and long wavelength lights such as amber lamps, which is visible to human but invisible to most animals, are recommended. The lights should be installed with a shield and at level as close to the ground as possible to prevent extensive light casting up into the sky. Lights with motion sensors can also be considered to further minimise disturbance to surrounding habitats as lights that are not in use would be automatically turn off.

Minimising Impacts on Hydrodynamics Properties and Water Quality during Operational Phase

- 9.8.3.9 As detailed in **Section 5**, design of site drainage and Best Management Practices (BMPs) for storm water discharge should follow the relevant guidelines and practices as given in the ProPECC PN 5/93 to avoid and minimise surface runoff from the Project, whilst precautionary measures and good site practices in planning maintenance works should be followed to

minimise the potential impacts on water quality to the nearby waterbodies from surface run-off / maintenance works and the associated ecological impacts.

- 9.8.3.10 No adverse ecological impact is expected during the operational phase with positive outcome would be resulted from the ecologically enhanced TWN. As such, no other specific ecological mitigation measure is necessary during operation of the Project.

9.8.4 Compensation

Compensation of Temporary Loss of Pre-roosting Site

- 9.8.4.1 Under the revitalisation design, ardeids pre-roosting habitat at downstream Section 1 would be reinstated into a mix of stepped terrace and slope at water edge to enhance foraging / pre-roosting habitats for waterbirds (e.g. ardeids). To compensate for the temporary loss of pre-roosting site for ardeids during reconstruction of the concrete platforms at Section 1 in dry seasons (i.e. November to March), floating pontoons of similar areas could be provided at downstream of the works area as far as practicable, along southern bank out of Project site, as an alternative assembly point for ardeids.
- 9.8.4.2 These floating pontoons should be installed by October before the start of every dry season within the construction programme and disassemble in April upon end of dry season. Installation of the floating pontoons in early dry season can help in maximising usage of ardeids, by allowing them to get familiar with these floating platforms earlier and thereby increase the percentage of usage. The proposed extend and location of the floating pontoon should be submitted and approved by AFCDD together with the pre-construction ardeid survey methodology as stated in **Section 9.8.2.4**. Ardeid's usage of the temporary floating pontoon should be monitored in the monthly ecological monitoring (**Section 9.10** refers).

9.8.5 Enhancement Opportunities and Environmental Benefit

- 9.8.5.1 Ecological enhancement designs incorporated into the revitalisation plan to promote ecological value of the Project are discussed in following paragraphs.

Habitat Creation

- 9.8.5.2 One of the focus for the revitalisation plan of TWN is to enhance overall ecological value of the Project site. Various types of wetland and freshwater habitats should be incorporated into the revitalisation design. In order to re-create / restore the original stream / river like habitats of the nullah, the highly modified concrete lined channel should be reinstated with natural substrates to greatest practical extent. Enhancement elements to promote usage of nearby fauna should also be studied and installed within TWN.

Greening Opportunities (Detailed in **Section 12**)

- 9.8.5.3 Greening opportunities, including wetland and roadside planting within TWN, along pedestrian road and in public areas, would be explored in the Project's revitalisation plan to further promote ecological value of TWN. Further details of the relevant greening opportunities are discussed in the Landscape and Visual Impact Assessment (**Section 12**) of this EIA Report.

Improvement on Water Quality

- 9.8.5.4 With the implementation of the proposed DWFII system and treatment wetlands, the existing polluted dry weather flows from the drainage outlets along TWN will either be intercepted and discharged to the existing sewerage system via gravity mains (i.e. no DWFII pumping station required) for conveying to Shatin Sewage Treatment Works for treatment by the DWFII system, or be discharged into the treatment wetlands installed at drainage outlets for in-situ polishing. Freshwater input into TWN would be of improved water quality compared to scenario without the Project. General constructed wetland system of smaller scale created within the channel under the revitalisation plan could also potentially further improve water quality within the nullah.

Preservation of Fauna Species of Conservation Importance

- 9.8.5.5 Some species of conservation importance were recorded within footprint of the proposed work areas. While no major adverse impacts are expected on these fauna species with high to moderate mobility, the revitalisation design of TWN should enhance conditions for these species in the long term.

Wetland Dependent Avifauna and Bat Species

- 9.8.5.6 Revitalisation of the nullah have seek to find a balance between design for local communities' needs (e.g. aesthetics, recreation/ leisure and access) and ecological enhancements. The design should not result in disturbance impacts to the waterbirds utilising the nullah as well as bats' foraging and commuting habitats.

Post-enhancement Ecological Monitoring Programme

- 9.8.5.7 Upon completion of revitalisation for TWN, ecological value of the Project site should be improved by ecological enhancement measures incorporated into the design. To ensure the effectiveness of these enhancement measures (e.g. creation of wetland habitats, vegetation planting and specific enhancement measures for identified species), a post-enhancement ecological monitoring programme should be developed and implemented by the DSD. The programme should aim to record the overall ecological condition of the Project site, including but not limited to the followings: quality of the created habitats and enhancement elements, usage by targeted fauna species and vegetation conditions. Maintenance and management requirements for TWN should be adjusted accordingly based on the monitoring results.

9.9 Evaluation of Residual Impacts

9.9.1 Construction Phase

- 9.9.1.1 With the proposed avoidance/mitigation measures in place, no unacceptable ecological impacts due to construction works are expected.

9.9.2 Operational phase

- 9.9.2.1 No adverse ecological impact is expected with positive outcome would be resulted from the ecologically enhanced TWN. As such, no residual impact is anticipated during operational phase of the Project.

9.10 Environmental Monitoring and Audit

- 9.10.1.1 A pre-construction ardeid survey should be conducted no earlier than 3 months before the commencement of construction works for each section of TWN, for areas within 100m from the Project site to confirm the location and status of the night roost. Ecological monitoring of ardeid is recommended to monitor the ardeid usage of the active pre-roosting and roosting sites (as confirmed by the pre-construction ardeid survey), and of the proposed temporary floating pontoons. A plan detailing the monitoring methodology should be submitted to and approved by AFCD prior to the monitoring. Monthly counts of species composition and abundance should be undertaken to monitor the effectiveness of proposed mitigation measures and detect any unpredicted indirect ecological impacts arising from the proposed Project. The ecological monitoring / surveys should be undertaken by experience ecologist(s) with relevant working experience. The detail monitoring data should be reported in the monthly EM&A report. In case of any unforeseen ecological impacts identified, remedial actions should then be recommended, where appropriate, in consultation with relevant authorities.
- 9.10.1.2 Monthly site audit should also be carried out throughout the construction phase to ensure recommended mitigation measures described in **Section 9.8** are fully implemented. Details of environmental monitoring and audit (EM&A) requirements are discussed in the separate EM&A Manual.
- 9.10.1.3 No EM&A programme is required during operational phase.

9.11 Conclusion

- 9.11.1.1 Literature review and ecological field surveys were conducted for the Project with no recognised sites of conservation importance identified within the assessment area. Ecological impact assessment for the revitalisation of Tai Wai Nullah has been conducted following the guidelines of the EIAO-TM Annex 8 and 16. A total of nine habitat types were recorded within the 500 m assessment area from recent surveys, including woodland, mixed woodland,

plantation, grassland, reservoir, village/ orchard, developed area/ wasteland, natural and modified watercourses. Dominant habitat types recorded within the Project site included developed area and modified watercourse, which are of low ecological values except for limited sections of the TWN found to support some wetland vegetation and/or support pre-roost congregation of ardeids and other wetland birds. These habitats were considered of low to moderate ecological value.

- 9.11.1.2 For habitats outside the Project site, woodland and mixed woodland are of moderate or moderate to high ecological value. Other habitats (plantation, grassland, reservoir, village/ orchard, developed area/ wasteland and modified watercourse) except natural watercourse, which is of low to moderate ecological value, are considered of low ecological value. Species of conservation importance recorded within the assessment area included eight flora, twelve avifauna, eight mammals, four herpetofauna, five butterflies, two odonates and two freshwater species. Among these species, only eight avifauna, two mammal, four butterfly species of conservation importance were recorded within the Project site.
- 9.11.1.3 Marine habitats within the assessment area included subtidal hard substrata, soft bottom, and intertidal habitats, which are all of low ecological value. As the Project site is located far from marine habitats (>5.55 km), no direct impacts to marine habitats are anticipated, and indirect impacts are considered negligible.
- 9.11.1.4 Modified watercourses within the assessment area (especially alongside downstream TWN from Man Lai Court Block 1 and 2 (Section 1) to Hong Kong Heritage Museum) supported large number of wetland birds dominated by ardeids, with over 100 individuals congregating on the concrete access ramps as a pre-roost in the dry season.
- 9.11.1.5 Whereas ardeid night roost is located within developed areas within the assessment area, on mature trees on the northern bank of Shing Mun River Channel (from Block 3 of Man Lai Court to Sha Tin Government Secondary School). Significantly lower abundance of ardeids were recorded during wet season. No breeding or nursery behaviour of any wetland avifauna species was identified within the assessment area.
- 9.11.1.6 No direct impacts to natural habitats within the assessment area are anticipated for the Project. Direct impacts arising from the proposed works would be limited to the temporary loss (about 11.1ha) of modified watercourse and developed area. Given the relatively low to moderate ecological value of affected habitats, the small area affected, and the temporary nature of the impact, direct impacts are expected to be *Minor* except for minor-moderate scale impacts to two small stretches of the TWN supporting some wetland vegetation and ardeid pre-roosting site. All affected areas will be reinstated and enhanced in terms of ecological value as part of the project. Avoidance measures (e.g. restriction of construction hours, protection of mature trees along the nullah and avoidance of encroachment of ardeids night roosting sites) would be implemented to preserve the day roosting and night roosting habitats for bats and ardeids respectively. Floating platforms would be installed downstream of the Project site (in the Shing Mun River Channel) to compensate for temporary loss of the pre-roosting site.
- 9.11.1.7 Indirect impacts during the construction phase would comprise of human disturbance, construction noise, dust and site run-off. With proper implementation of the recommended mitigation measures and good site practices, no significant adverse ecological impact is anticipated. With ecological enhancement measures incorporated into revitalisation design of TWN and with restriction of public access in Section 1, nature of disturbance during operational phase would be minimal compared to existing baseline condition. Net positive ecological outcome would be result from the created and enhanced wetland habitats. No unacceptable adverse residual impacts would therefore be expected during both construction and operational phase.
- 9.11.1.8 Ecological monitoring of ardeid usage of the active pre-roosting and roosting sites confirmed by the pre-construction ardeid survey, and of the proposed temporary floating sites pontoons has also been recommended. Remedial actions can then be recommended, where appropriate, based on the impact monitoring results. Monthly site audit should also be carried out throughout the construction phase to ensure recommended avoidance / pollution control measures are fully implemented.
- 9.11.1.9 Ecological enhancement designs have been incorporated into the revitalisation plan to promote ecological value of the Project, as well as enhancement measures and good site

practices to further minimise any potential environmental impacts. The proposed revitalisation plan for TWN should seek to find a balance between design for local communities' requirements (e.g. aesthetics, recreation/leisure and access) and ecological enhancement. Ecological enhancement could be achieved by incorporating habitat creation within and along the TWN to improve the overall ecological value of the Project site. The design should not result in disturbance impacts on surrounding habitats and fauna utilising the nullah. Upon completion of revitalisation for TWN, ecological value of the Project site is anticipated to be improved by ecological enhancement measures incorporated into the design. A post-enhancement ecological monitoring programme would be developed and implemented by the DSD to review effectiveness of these enhancement measures (e.g. creation of wetland habitats, vegetation planting and specific enhancement measures for identified species). The programme shall aim to record the overall ecological condition of the Project site, including but not limited to the followings: quality of the created habitats and enhancement elements, usage by targeted fauna species and vegetation conditions. Maintenance and management requirements for TWN would be adjusted accordingly based on the monitoring results.

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10 FISHERIES IMPACT

10.1 Introduction

10.1.1.1 This section presents the baseline conditions for fisheries in the assessment area and long-term impacts on fisheries during the construction and operation phases of the Project, which has been conducted in accordance with the requirements stated in Clause 3.4.11 and Appendix I of the EIA Study Brief (No. ESB-320/2019). Potential direct, indirect, cumulative and residual impacts on fisheries resources during construction and operation phases of the Project were identified and evaluated. Mitigation measures have been recommended where necessary, and residual impacts assessed.

10.2 Environmental Legislations, Standards and Guidelines

10.2.1.1 This fisheries impact assessment was conducted according to criteria and guidelines set out in the Annex 9 and Annex 17 of the EIAO-TM in order to provide complete and objective identification, prediction and evaluation of potential fisheries impacts arising from the Project. EIAO-TM Annex 17 sets out the methodology for assessment of fisheries impacts and Annex 9 provides the evaluation criteria.

10.2.1.2 Other local legislation relevant to the fisheries impact assessment include:

- *Fisheries Protection Ordinance (Cap. 171)* – promotes the conservation of fish and other forms of aquatic life within Hong Kong waters by regulating fishing practices to prevent detrimental activities to the fisheries industry. The authority may also make rules for the management and control of fishing in any fisheries protection area, including but not limited to the specification of any zone within any fisheries protection area and the prohibition of any fishing in the specified zone.
- *Marine Fish Culture Ordinance (Cap. 353)* – regulates and protects marine fish cultured by designating areas of fish culture zone, granting licenses, prohibiting unauthorized vessels and any deposition of chemicals or other substances which are likely to cause injury to fish in a fish culture zone.
- *Water Pollution Control Ordinance (Cap. 358)* – aims to control water pollution in waters of Hong Kong. Water Control Zones (WCZs) are designated with individual water quality objectives to promote the conservation and best use of those waters in the public interest. The most updated water quality objectives for the Junk Bay WCZ, Eastern Buffer WCZ and Victoria Harbour WCZ were revised in June 1997.
- *EIAO-TM – Annex 17* sets out the methodology for assessment of fisheries impacts, in order to provide objective identification, prediction and evaluation of potential fisheries impacts arising from the Project. *Annex 9* provides evaluation criteria.

10.3 Assessment Methodology

10.3.1 Assessment Area

10.3.1.1 According to Clause 3.4.11.2 of the EIA Study Brief, the assessment area for fisheries impact assessment is the same as the assessment area for water quality impact assessment, and include any other areas likely to be impacted by the Project. This includes areas within 500 m from the boundary of the Project, Shing Mun River Main Channel, Tolo harbour and Channel WCZs as designated under the Water Pollution Control Ordinance. The boundary of Tolo harbour and Channel WCZs is shown in **Figure 10.1**. Special attention was given to Yim Tin Tsai Fish Culture Zone, Yim Tin Tsai (East) Fish Culture Zone, Lo Fu Wat Fish Culture Zone and Yung Shue Au Fish Culture Zone.

10.3.2 Assessment Approach and Methodology

10.3.2.1 Collation and desktop review of available relevant fisheries baseline data (e.g. AFCD Port Survey 2016/2017, EIAs and other available relevant studies) within or in vicinity to the assessment area were conducted.

10.3.2.2 Potential direct/indirect, short-term/long-term fisheries impacts arising from the Project were identified and evaluated where possible in the EIA report. Mitigation measures, monitoring

and audit programme were recommended, where necessary. Special attention was given to Yim Tin Tsai Fish Culture Zone, Yim Tin Tsai (East) Fish Culture Zone, Lo Fu Wat Fish Culture Zone and Yung Shue Au Fish Culture Zone.

- 10.3.2.3 The criteria and guidelines as stated in Annexes 9 and 17 of the EIAO-TM were followed in the EIA report for evaluating and assessing fisheries impact arising from the construction and operation of the Project.

10.4 Baseline Conditions

10.4.1 Literature Review

- 10.4.1.1 Relevant literature on capture and culture fisheries within the assessment area used in the impact assessment are listed in **Table 10.1** below.

Table 10.1 Baseline Information of Fisheries Resources in the Assessment Area

Relevant Literature Describing Fisheries Baseline Information in the Assessment Area
AFCD Port Survey 2016/2017 (AFCD, 2018a)
Aquaculture and Capture Fisheries data available from AFCD website and Hong Kong Year Book reports (AFCD, 2020a and 2020b; HKYB, 2011-2019)
AFCD Annual Report 2017 – 2019 (AFCD, 2017; 2018b; 2019)
Report on Survey of Fisheries Resources in Hong Kong (2010 – 2015) (AFCD, 2020c)
Fisheries Resources and Fishing Operations in Hong Kong Waters (ERM, 1998)
EIA report of Sha Tin Cavern Sewage Treatment Works (DSD, 2016)

- 10.4.1.2 The relevant desktop information reviewed is considered sufficient for evaluating the importance of potentially impacted fisheries resources within the assessment area. Therefore, no information gap on fisheries baseline conditions within the assessment area was identified and fisheries surveys are not required for the EIA study.

10.4.2 Sites of Fisheries Importance

- 10.4.2.1 There are four mariculture areas identified in the assessment area, Lo Fu Wat Fish Culture Zone (FCZ), Yung Shue Au FCZ, Yim Tin Tsai FCZ and Yim Tin Tsai (East) FCZ, which are located approximately 14.0 km, 11.3 km, 9.0 km and 9.6 km away from the Project site. According to the AFCD Port Survey 2006 report, fish fry production ranging 100 – 500 tails/ha was recorded in Three Fathoms Cove within the assessment area (located at least 11.4 km east away from the Project site). The locations of the key fisheries resources within the assessment area are shown in **Figure 10.1**. Based on the findings of the literature review, Sha Tin Hoi was not identified as an important nursery area or spawning ground (ERM, 1998).

10.4.3 Capture Fisheries

- 10.4.3.1 In 2020, Hong Kong's capture fisheries' fishing fleet comprised about 5040 fishing vessels, operated by approximately 10,150 local fishermen. In terms of production in 2020, the capture fisheries industry produced an estimated 116,000 tonnes of fisheries valued at about \$2.7 billion (AFCD, 2020b). Fishing activities in the waters of Hong Kong are mainly conducted by sampans using multiple fishing gears as well as other smaller non-trawler vessels, such as gill netters, long liners, purse seiners. Trawlers and other larger non-trawlers are generally operating in the adjacent waters of the South China Sea. Trawling landed majority of the catch in Hong Kong waters prior to 31 December 2012, after which a ban on trawling was implemented with the aim to protect marine resources and ecosystem, so that the damaged seabed and depleted marine resources can rehabilitate. Some recent data on local capture fisheries industry are summarized in **Table 10.2** below.

Table 10.2 Recent Figures of Hong Kong Capture Fisheries Industry

Parameter	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Fishing fleet size (No. of vessels)	4,030	3,990	3,980	4,540	5,050	5,160	5,150	5,050	5,030	5,040
Local Fishermen engaged in capture fisheries	8,500	8,800	8,800	9,400	10,500	10,800	10,600	10,200	10,100	10,150
Production (tonnes)	171,000	155,230	170,129	160,789	145,193	142,775	127,554	124,300	122,900	116,000
Values of production (HK\$ million)	2,360	2,320	2,340	2,530	2,340	2,600	2,600	2,800	2,800	2,700

Note:

- Sources: AFCD, 2017, 2018b, 2019, 2020b; HKYB, 2011-2019

10.4.3.2 The latest AFCD Port Survey 2016/2017 (AFCD, 2018a) provides the most updated information on capture fisheries in Hong Kong waters, including both fishing operation and fisheries production. In general, the highest fish yields in Hong Kong were obtained in the southeastern waters (e.g. Po Toi) and the southwestern waters (e.g. Cheung Chau, Soko Islands and Shek Kwu Chau). The top 10 families/groups of fish catch in Hong Kong waters were Mugilidae (mullet), Clupeidae (sardine and shad), Carangidae (scad and jack), Sparidae (seabream), Sciaenidae (croaker), Mixed squid (squid), Mixed crab (crab), Siganidae (rabbitfish), Mixed shrimp (shrimp) and Platycephalidae (flathead). According to the Report on Survey of Fisheries Resources in Hong Kong 2010 – 2015 (AFCD, 2020c), major composition of commercially important fisheries resources within the Assessment Area (North-eastern waters) included families of Leiognathidae, Clupeidae, Sparidae, Carangidae and Polynemidae.

10.4.3.3 The fishing operation within the assessment area was mainly conducted by sampans using multiple gears as well as smaller non-trawler vessels (AFCD, 2019b). Sampans were the dominant fishing vessels but other vessels such as gill netters, long liners and purse seiner were also operated within the assessment area. The capture fisheries data within the assessment area are summarised in **Table 10.3**. It is found to be similar to the Sha Tin Cavern Sewage Treatment Works (STW) EIA report, with low levels of capture fisheries particularly around Sha Tin Hoi (AFCD, 2018a).

Table 10.3 Summary of Capture Fisheries Data in the Assessment Area

Parameter	Sha Tin Hoi	Tolo Harbour	Plover Cove	Three Fathoms Cove	Tolo Channel
Overall fishing operations (no. of vessels)	>0-50	>100-400	>50-100	>0-400	>200-600
Overall fisheries production (kg/ha)	>0-50	>50-200	>0-50	>0-200	>200-300

Note:

- Source: AFCD, 2018a

10.4.3.4 The number of fishing vessels operating within the assessment area was generally between >0 and 600 vessels, with very low numbers (>0 - 50 vessels) in Sha Tin Hoi, the area nearest to the Project site.

10.4.3.5 In terms of weight, >0 – 300 kg/ha fish was produced within the assessment area. The weight of fish production in Sha Tin Hoi, the area nearest to the Project site, was low (>0 – 50 kg/ha). Overall fish production increased towards the Tolo Channel, in which the fish production in Tolo Channel ranged from >200 - 300 kg/ha (AFCD, 2018a). However, this area is relatively distant (approximately 17.0 km) from the Project site.

10.4.3.6 Tolo Harbour is not considered as important spawning or nursery areas for commercial fisheries resources (ERM, 1998). Although reproductive individuals of pony fish (*Leiognathus brevisrostris*) have been collected in Tolo Harbour, this species does not appear to have a

specific spawning ground as reproductive individuals were collected in areas ranging from Tolo Harbour and northeastern waters, to Junk Bay and as far west as South Lantau (ERM, 1998). In Port Survey 2016/2017, fish fry collection was found to be negligible (AFCD, 2018a). According to the AFCD Port Survey 2006 report, low level of fish fry production (>0 – 50 tails/ha) was recorded in Tolo Harbour.

- 10.4.3.7 Tolo Channel has been identified as a potential fish nursery ground of Seabream species (*Chrysophrys major*, *Rhabdosargus sarba* and *Sparus* spp.), Shrimp (*Metapenaeopsis palmensis*) and *Lutjanus* fry (ERM, 1998). In Port Survey 2016/2017, fish fry collection was found to be negligible (AFCD, 2018a). According to the AFCD Port Survey 2006 report, fish fry production ranging from >0 – 100 tails/ha and 100 – 500 tails/ha was recorded in Tolo Channel and Three Fathoms Cove respectively.
- 10.4.3.8 In addition, important spawning and nursery grounds within Hong Kong waters are proposed to designate as Fisheries Protection Areas (FPAs) to protect fish fry, juvenile and spawning fish, which helps to restore fisheries resources in Hong Kong waters and promote their sustainable growth in the long run (LegCo, 2013). There are two proposed FPAs in the eastern waters including “Tolo Channel and Long Harbour” and “Port Shelter”. The closest one – “Tolo Channel and Long Harbour” is located approximately over 17 km from the Project site.

10.4.4 Culture Fisheries

- 10.4.4.1 Marine culture fisheries in Hong Kong include marine fish culture and oyster culture. Mariculture areas for marine fish included 26 FCZs located in various sheltered coastal areas across Hong Kong waters and occupied about 209 ha of sea area with some 925 licensed operators in 2020 (AFCD, 2020a). The majority of licensed farms are small, family-based and consisting of one to two rafts with average total area of 302m². Culture of oyster has been practiced along the intertidal mudflat of Deep Bay for at least 200 years. Production from oyster culture in 2020 was about 119 tonnes (meat only) valued at \$15 million (AFCD, 2020a).
- 10.4.4.2 There are four FCZs but no oyster culture present in the assessment area. Lo Fu Wat FCZ, Yung Shue Au FCZ, Yim Tin Tsai FCZ and Yim Tin Tsai (East) FCZ are located approximately 14.0 km, 11.3 km, 9.0 km and 9.6 km away from the proposed Project site. The locations of the FCZs are shown in **Figure 10.1**.
- 10.4.4.3 Although no figures are available for the individual production of FCZs, it was estimated that culture fisheries of marine fish production in 2020 weighed 687 tonnes and was valued at \$52 million, which catered about 5 per cent of local demand for live marine fish (AFCD, 2020a). Recent figures are present in **Table 10.4**.

Table 10.4 Recent Figures of Hong Kong Culture Fisheries Industry

Parameter	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Licensed operator	1,015	1,008	987	968	969	949	938	931	923	925
Production (tonnes)	1,185	1,299	1,005	1,255	1,219	1,031	1,004	850	890	687
Values of production (HK\$ million)	94	117	94	115	105	86	78	71	72	52

Note:

1. Sources: AFCD, 2020b; HKYB, 2011-2019

- 10.4.4.4 The types of species produced from culture fisheries depend on the availability of imported fry. Common species cultured include green grouper, brown-spotted grouper, giant grouper, Russell’s snapper, mangrove snapper, goldlined seabream, and star snapper (AFCD, 2019a).

10.5 Identification and Evaluation of Environmental Impacts

10.5.1 Construction Phase

Direct Impact

No Direct Impact on Sites of Fisheries Importance

- 10.5.1.1 The proposed works would be confined to boundary of the Project site (existing Tai Wai Nullah and developed area alongside). There would be no loss of mariculture areas or fishing ground resulting from these works.

Indirect Impact

Construction Run-off and Land-based Construction

- 10.5.1.2 Wastewater generated from construction site runoff (e.g. runoff and erosion of exposed bare soil and earth, earth working area and stockpiles, etc.) as well as general land-based construction works (e.g. general cleaning and polishing, wheel washing, dust suppression, etc.) could potentially pose indirect impacts on water quality of within Tai Wai Nullah (TWN), adjoining Shing Mun River Main Channel and Sha Tin Hoi. Given that the closest fishing ground (i.e. Sha Tin Hoi) and mariculture area (i.e. Yim Tin Tsai (East) FCZ) are at least 5.5 km and 9.0 km away from downstream of the Project site, together with the implementation of mitigation measures and good site practices mentioned in **Section 5**, no unacceptable adverse water quality impact due to the Project works is anticipated. Fisheries impacts arising from water quality deterioration due to land-based construction works are expected to be negligible.

Accidental Spillage and Potential Contamination of Surface Water

- 10.5.1.3 The use of chemicals such as engine oil and lubricants, and their storage as waste materials are potential sources that could affect water quality if spillage occurs and enters the adjacent water environment. Accidental spillage and potential contamination of surface water could potentially pose indirect impacts on water quality of the TWN, adjoining Shing Mun River Main Channel and Sha Tin Hoi. Given that the closest fishing ground (i.e. Sha Tin Hoi) and mariculture area (i.e. Yim Tin Tsai (East) FCZ) are at least 5.5 km and 9.0 km away from downstream of the Project site together with the implementation of mitigation measures and good site practices mentioned in **Section 5**, no unacceptable adverse water quality impact due to Project works is anticipated. Fisheries impacts arising from water quality deterioration due to accidental spillage and potential surface water are therefore expected to be negligible.

10.5.2 Operational Phase

Indirect Impact

No Indirect Water Quality Impacts during Normal Operation

- 10.5.2.1 No unacceptable water quality impact from normal operation of the Project on marine waters would be expected. As such, no unacceptable adverse impacts on mariculture areas and fishing grounds due to deterioration of water quality are anticipated.

Changes in Water Quality

- 10.5.2.2 With the implementation of dry weather flow interceptor (DWFI) system and specific treatment wetlands (**Section 2** refers), water quality in the nullah would be improved. Aquatic wildlife at downstream could potentially benefit from improved water quality of the nullah. Although there will be slight water quality improvement from operation of the Project, considering the small volume of treated effluent compared to nearby marine habitat, the improvement would be considered as insignificant. Together with the large distance between the Project site and marine habitats (fishing grounds and mariculture areas), the slight improvement in water quality from the Project is thus considered as insignificant.

Potential Fisheries Impacts from Maintenance Works and Desilting Works

- 10.5.2.1 During the operational phase, similar to the existing practices, regular maintenance works for the drainage and sewerage systems along TWN, including desilting along the nullah and

minor maintenance to the DWFI system installed along part of Section 1 (from north of Tsuen Nam Road near Tai Wai Soccer Pitch) to Section 5 of TWN (**Figure 2.2** refers), would be carried out by the DSD to remove excessive silts, debris and any obstructions to safeguard the hydraulic capacity of the nullah. The maintenance practices and frequency would be similar to the existing maintenance works undertaken by the DSD. It is expected that minor maintenance to DWFI system will only be undertaken on an as-needed basis and frequent maintenance (i.e. monthly) will not be required. Maintenance desilting of the nullah should be carried out on an annual basis during dry season (November to March) when the water flow is low, except during emergency situations where the accumulated silt would adversely affect the hydraulic capacity of the nullah or where flooding risk is imminent, or when complaints on environmental nuisance associated with the accumulated silt are received. These works are expected to be carried out temporarily, affecting only works area of small scale with no unacceptable impacts to water quality. With proper design of site drainage and implementation of Best Management Practices (BMPs) for stormwater discharge (detailed in **Section 5**), together with the large distance between the Project site and marine habitats, deterioration of water quality would be minimal and no unacceptable adverse impacts on mariculture areas and fishing grounds are anticipated.

10.6 Mitigation of Adverse Environmental Impacts

10.6.1.1 According to the guidelines in Annex 17 of EIAO-TM, general policy for mitigating fisheries impacts are in priority order of avoidance, minimisation and compensation.

10.6.2 Construction Phase

10.6.2.1 As discussed in **Section 10.5.1**, with the mitigation measures in place to control potential impacts on water quality (**Section 5** refers), the Project is unlikely to have indirect impacts on fisheries resources (i.e. fishing ground and mariculture areas). Thus, no mitigation measures for fisheries impact are considered necessary.

10.6.3 Operational Phase

10.6.3.1 As discussed in **Section 10.5.2**, no unacceptable water quality impact on marine water under normal operation of the TWN would be expected. Thus, no mitigation measures are considered necessary.

10.6.4 Overall Summary of Fisheries Impact

10.6.4.1 In accordance with the EIAO-TM Annex 9 criteria, assessment of potential fisheries impacts in the absence of mitigation within the assessment area are provided in **Table 10.5** and **Table 10.6**.

Table 10.5 Fisheries Impact on Fishing Ground within Assessment Area

Criteria	Fishing Ground			
	Near Sha Tin Hoi	Near Tolo Harbour	Near Tolo Channel	Near Three Fathoms Cove
Nature of impact	<ul style="list-style-type: none"> ▪ No direct fisheries impact ▪ No indirect water quality impacts on fishing grounds 			
Size of affected area	<p>Direct Impact</p> <ul style="list-style-type: none"> ▪ No loss of fishing ground is anticipated <p>Indirect Impact</p> <ul style="list-style-type: none"> ▪ The nearest fishing ground is more than 5.5 km from the Project site. No unacceptable indirect water quality impacts on fishing ground during construction and operational phases are expected 			
Loss of fisheries resources / production	<p>Direct Impact</p> <ul style="list-style-type: none"> ▪ No direct loss of fisheries resources/ aquaculture production during construction and operational phases <p>Indirect Impact</p> <ul style="list-style-type: none"> ▪ The nearest fishing ground is more than 5.5 km from the Project site. No unacceptable indirect water quality impacts on fishing ground during construction and operational phases are expected 			
Destruction and disturbance of nursery and spawning grounds	No important nursery and spawning grounds of commercial fisheries species were recorded		Negligible, no important nursery and spawning grounds of commercial fisheries species would be disturbed or destroyed during construction and operational phases	
Impact on fishing activity	Negligible			
Impact on aquaculture activity	N/A			
Overall impact before mitigation	Negligible	Negligible	Negligible	Negligible

Table 10.6 Fisheries Impact on Mariculture Areas within the Assessment Area

Criteria	Yim Tin Tsai FCZ	Yim Tin Tsai (East) FCZ	Lo Fu Wat FCZ	Yung Shue Au FCZ
Nature of impact	<ul style="list-style-type: none"> ▪ No direct fisheries impact ▪ No indirect water quality impacts on mariculture areas 			
Size of affected area	<p>Direct Impact</p> <ul style="list-style-type: none"> ▪ No loss of mariculture areas <p>Indirect Impact</p> <ul style="list-style-type: none"> ▪ All 4 mariculture areas are more than 9.0 km away from the Project site. No unacceptable indirect water quality impacts on mariculture areas during construction and operational phases are expected 			
Loss of fisheries resources / production	<p>Direct Impact</p> <ul style="list-style-type: none"> ▪ No direct loss of aquaculture production during construction and operational phases <p>Indirect Impact</p> <ul style="list-style-type: none"> ▪ All 4 mariculture areas are more than 9.0 km away from the Project site. No unacceptable indirect water quality impacts on mariculture areas during construction and operational phases are expected 			
Destruction and disturbance of nursery and spawning grounds	N/A			
Impact on fishing activity	N/A			
Impact on aquaculture activity	Negligible, given the large distance between Project site and aquaculture activity (>9.0 km)			
Overall impact before mitigation	Negligible	Negligible	Negligible	Negligible

10.7 Evaluation of Residual Impacts

10.7.1.1 No loss of fishing ground and mariculture areas will be result from the Project. With the implementation of mitigation measures detailed in **Section 5**, no unacceptable water quality impacts on fisheries (i.e. fishing ground and mariculture areas) are expected during the construction phase. No unacceptable water quality impact from normal operation of the Project on marine water would be expected. Thus, no unacceptable residual impacts on fisheries resources due to water quality deterioration are anticipated.

10.8 Environmental Monitoring and Audit

10.8.1.1 As no unacceptable adverse fisheries impacts are anticipated during both construction and operational phases, no specific environmental monitoring and audit programme for fisheries impact is required.

10.8.1.2 Regular weekly site inspection during the construction phase has been proposed in **Section 5** to inspect the construction activities and works area to ensure the recommended water pollution control measures are properly implemented.

10.9 Conclusion

10.9.1.1 A study based on existing information on fisheries resources and activities within the assessment area has been undertaken, following the criteria and guidelines for evaluating and assessing fisheries impact as stated in Annexes 9 and 17 of the EIAO-TM.

10.9.1.2 The Project would only involve construction works within the Project site (existing TWN and developed area alongside). No loss of fishing grounds and mariculture areas are anticipated within the assessment area. With the implementation of mitigation measures recommended to control water quality impacts, the Project would not cause any unacceptable indirect impacts to fishing grounds and mariculture areas within the assessment area during both construction and operational phases. Thus, no further mitigation measures and environmental monitoring and audit programme are required.

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11 CULTURAL HERITAGE

11.1 Introduction

11.1.1.1 This section presents the Cultural Heritage Impact Assessment (CHIA) for the construction and operation of the Project, which has been conducted in accordance with the criteria and guidelines as stated in Annexes 10 and 19 of the *Technical Memorandum on Environmental Impact Assessment Process* (EIAO-TM) as well as the requirements given in Clause 3.4.13 and Appendix K of the EIA Study Brief (No. ESB-320/2019). Appropriate mitigation measures are recommended as necessary.

11.2 Environmental Legislations, Standards and Guidelines

11.2.1.1 Legislation and standards that are relevant to the cultural heritage impact assessment under this EIA include the following:

- Antiquities and Monuments Ordinance (A&MO) (Cap.53)
- Environmental Impact Assessment Ordinance (EIAO) (Cap.499) and Technical Memorandum on Environmental Impact Assessment Process (EIAO-TM)
- Guidance Note on Assessment of Impact on Sites of Cultural Heritage in Environmental Impact Assessment Studies
- Hong Kong Planning Standards and Guidelines (HKPSG)
- Guidelines for Cultural Heritage Impact Assessment (GCHIA)

Antiquities and Monuments Ordinance (A&MO) (Cap.53)

11.2.1.2 The *Ordinance* provides the statutory framework for the preservation of objects of historical, archaeological and palaeontological interest and for matters ancillary thereto or connected therewith. The *Ordinance* contains the statutory procedures for the Declaration of Monuments. Under the *Ordinance*, a “monument” means a place, building, site or structure which is declared to be a monument, historical building or archaeological or paleontological site or structure under Section 3 of the Ordinance.

Environmental Impact Assessment Ordinance (EIAO) and EIAO-TM Annexes 10, 18 and 19

11.2.1.3 The EIAO was implemented on 1 April 1998. It aims to avoid, minimise and control the adverse impacts on the environment of designated projects, through the EIA process and the Environmental Permit (EP) system.

11.2.1.4 Annexes 10 and 19 of EIAO-TM provide general criteria and guidelines for evaluating the impacts to sites of cultural heritage. It is stated in Annex 10 that all adverse impacts to Sites of Cultural Heritage shall be kept to an absolute minimum and that the general presumption of impact assessment shall be in favour of the protection and conservation of all Sites of Cultural Heritage. Annexes 19 provides the scope and methodology for undertaking Cultural Heritage Impact Assessment, including baseline study, impact assessment and mitigation measures. Annex 18 describes the methodology for assessment of landscape and visual impacts. Historic landscapes, sites or buildings of culture heritage are landscape features that may contribute to the landscape character of a site, which shall be considered when assessing impacts on landscape elements.

Guidance Note on Assessment of Impact on Sites of Cultural Heritage in Environmental Impact Assessment Studies

11.2.1.5 The *Guidance Note* assists the understanding of the requirements of the *EIAO-TM* in assessing impact on sites of cultural heritage in EIA studies

Hong Kong Planning Standards and Guidelines (HKPSG)

11.2.1.6 Chapter 10 of *HKPSG* covers planning considerations relevant to conservation. It also details the principles of conservation, the conservation of natural landscape and habitats, declared monuments, historic buildings, sites of archaeological interest and other heritage items, and addresses the issue of enforcement. The appendices list the legislation and administrative controls for conservation, other conservation related measures in Hong Kong, and Government departments involved in conservation.

Guidelines for Cultural Heritage Impact Assessment (GCHIA)

11.2.1.7 The document outlines the technical requirements for conducting terrestrial built heritage and archaeological impact assessments. A comprehensive CHIA comprises of a baseline study including both desk-top research and field evaluation, an impact assessment associated with appropriate mitigation measures. The evaluation of impacts based upon five levels of significance, including beneficial impact, acceptable impact, acceptable impact with mitigation measures, unacceptable impact and undetermined impact.

11.3 Assessment Methodology

11.3.1 General

11.3.1.1 The CHIA is carried out in accordance with GCHIA, the requirements as stated in Annexes 10, 18 and 19 of the *EIAO-TM* and the EIA Study Brief, as well as considerations in other relevant guidelines. The assessment methodology for archaeological and built heritage impact assessments is described in the following sections.

11.3.2 Assessment Area for this Cultural Heritage Impact Assessment

11.3.2.1 The assessment area for the CHIA of this EIA Study covers the area within 300 m from the Project boundary as illustrated in **Figure 11.1**.

11.3.3 Built Heritage

11.3.3.1 A desktop review has been conducted to identify any built heritage resources based on examination on the following resources:

- List of Proposed and Declared Monuments¹;
- List of the 1,444 Historic Buildings²;
- List of new items for grading assessment³;
- Government Historic Sites⁴;
- Previous related EIA studies, publications and monographs on relevant historical and geographical issues;
- Unpublished archival papers and records, and collection and libraries of tertiary institutions; and
- Geological and historical maps, aerial photos and relevant visual archives.

11.3.3.2 Site visits have been conducted in the assessment area on 26 August 2020, 28 December 2020, 6 January 2021 and 27 January 2021, to evaluate the current condition of the built heritage resources and identify any additional built heritage resources that have not been covered by the desktop review. The results are recorded in **Appendix 11.2**.

11.3.3.3 The potential direct and indirect impacts that may affect the built heritages were assessed by following the procedures and requirements of GCHIA and Annexes 10 and 19 of the *EIAO-TM*. The potential impacts are classified into five levels of significance in accordance to GCHIA:

- a) Beneficial impact: the impact is beneficial if the Project will enhance the preservation of the heritage site(s);
- b) Acceptable impact: if the assessment indicates that there will be no significant effects on the heritage site(s);
- c) Acceptable impact with mitigation measures: if there will be some adverse effects, but these can be eliminated, reduced or offset to a large extent by specific measures, such as conducting a follow-up Conservation Proposal or Conservation Management Plan for

¹ Antiquities and Monuments Office. *Declared Monuments in Hong Kong (as at 22 May 2022)*.

https://www.amo.gov.hk/filemanager/amo/common/form/DM_Mon_List_e.pdf.

² Antiquities Advisory Board. *List of the 1,444 Historic Buildings with Assessment Results (as at 8 Sept 2022)*.

https://www.aab.gov.hk/filemanager/aab/en/content_29/AAB-SM-chi.pdf.

³ Antiquities Advisory Board. *List of New Items for Grading Assessment with Assessment Results (as at 8 Sept 2022)*.

https://www.aab.gov.hk/filemanager/aab/en/content_29/list_new_items_assessed.pdf.

⁴ Antiquities and Monuments Office. *Government Historic Sites Identified by AMO (as at May 2022)*.

https://www.amo.gov.hk/filemanager/amo/common/form/build_hia_government_historic_sites.pdf.

- the affected heritage site(s) before the commencement of work in order to avoid any inappropriate and unnecessary interventions to the buildings;
- d) Unacceptable impact: if the adverse effects are considered to be too excessive and are unable to mitigate practically; and
- e) Undetermined impact: if the significant adverse effects are likely, but the extent to which they may occur or may be mitigated cannot be determined from the HIA Study. Further detailed study will be required for the specific effects in question.
- 11.3.4 Assessment of impacts on cultural heritage shall also take full account of, and allow where appropriate, the Guidelines for Landscape and Visual Impact Assessment of Annex 18 of the EIAO-TM in accordance with the EIA Study Brief (No. ESB-320/2019).
- 11.3.5 Mitigation measures are proposed in the CHIA for all affected built heritage resources to minimise any adverse impacts when necessary.
- 11.3.6 Archaeology**
- 11.3.6.1 A desktop review has been conducted to identify any potential existence of archaeological resources based on examination on the following resources:
- List of Sites of Archaeological Interest⁵;
 - Previous related EIA studies and archaeological reports;
 - Related publications and monographs on relevant archaeological, historical and geographical issues;
 - Unpublished archival papers and records, and collection and libraries of tertiary institutions; and
 - Geological and historical maps, aerial photos and relevant visual archives.
- 11.3.6.2 The potential impacts that may affect the possible archaeological resources during the construction and operational phases are assessed in the CHIA by following the procedures and requirements of GCHIA and Annexes 10 and 19 of the TM.
- 11.3.6.3 In case adverse impacts on archaeological resources cannot be avoided, appropriate mitigation measures were designed and recommended in this CHIA to minimise the impacts.

11.4 Background of the Assessment Area

11.4.1 Geological Background

- 11.4.1.1 Tai Wai Nullah is located at Sha Tin valley. Needle Hill is located to the northwest of Tai Wai Nullah. Lower Shing Mun Reservoir is located to the west of Tai Wai Nullah. To Fung Shan is located to the north of Tai Wai Nullah. The nullah discharges into Shing Mun River which flows into Tide Cove (also known as “Sha Tin Hoi”).
- 11.4.1.2 The assessment area is mainly formed of coarse-grained biotite granite (“Jkt_gc” as shown in **Figure 11.3**). The superficial deposits in the assessment area generally include colluvium (“Qd” and “Qcd” as shown in **Figure 11.3**) on the hilly ground and alluvium (“Qfa” as shown in **Figure 11.3**) in the main valley⁶.
- 11.4.1.3 The Project site was once part of the natural watercourse flowing into Shing Mun River (Plate 1 in **Appendix 11.1**). Due to the development Sha Tin New Town in 1970s, the coast of Tide Cove was largely reclaimed and Shing Mun River was channelised and extended. The river at the Project site was also channelised along with the Shing Mun River since 1970s and had turned into a concrete nullah (Plate 2 in **Appendix 11.1**).

⁵ Antiquities and Monuments Office. *List of Sites of Archaeological Interest in Hong Kong (as at Nov 2012)*.

https://www.amo.gov.hk/filemanager/amo/common/form/list_archaeolog_site_eng.pdf.

⁶ Geotechnical Control Office. (1986). *Hong Kong Geological Survey Memoir No. 1: Geology of Sha Tin*. Civil Engineering Services Department. Hong Kong.

11.4.2 Historical Background

- 11.4.2.1 Clues of human settlements in Hong Kong region can be found in historic textual records such as *Lushi Chunqiu*⁷ and *Hanshu*⁸ written in the first century BC to first century AD. These records describe that Yue ethnic groups scattered in south China. During Qin dynasty (211-206BC), the region was subordinated to Panyu County. And later Hong Kong region had been subordinated to Xin'an County since AD1573⁹ until AD1912 Xin'an was renamed to Bao'an County.
- 11.4.2.2 Since the 9th century onwards, Pearl River delta was an important salt production centre. Hong Kong was one of the salt production centres in Southern Song dynasty (AD1127-1279). Historic textual records *Yudi Jisheng* and *Songhuiyao Jilu* describe smuggling related to salt production. Five major clans including the Pangs, Lius, Haus, Mans and Tangs, settled in the New Territories since the Southern Song dynasty¹⁰. Village settlements in Sha Tin can be dated no later than *Wanli* reign of the Ming dynasty. During Ming dynasty, Sha Tin was famous for production of fragrant wood as recorded in *Xin'an Gazetteer*¹¹.
- 11.4.2.3 In 1661, the Coastal Evacuation Order was implemented by the Qing government. People lived in the coastal area of Guangdong including the New Territories, were forced to move 25km inland. People were allowed to move back to the New Territories in 1684 but the coastal population severely dropped. Thus, Hakka people were encouraged to move to the New Territories in the late 17th century. They developed villages at the hillside and practiced agriculture. *Sha Tin Kau Yeuk* ("Alliance of Nine Districts") was founded in late Qing dynasty. The alliance built the Che Kung Temple in Sha Tin to commemorate Che Kung, who pacified the plague that killed many Sha Tin people at that time.
- 11.4.2.4 The villages of *Sha Tin Kau Yeuk* in vicinity of the Project include Chik Chuen Wai (also known as Tai Wai) of *Tai Wai Yeuk*, Tung Lo Wan of *Pai Tau Yeuk*, San Tin of *Tin Sam Yeuk*¹². Chik Chuen Wai was said to be built in the 2nd year of *Wanli* (1574), which is a village of multi surnames with Wai as the majority. The villagers worship *Yeung Hau* at the Hau Wong Temple inside the village. Tung Lo Wan is a Hakka village of multiple surnames, including the Yau and Tse clans. The Tse clan moved to Hong Kong 1850s during the Taiping Rebellion. They settled in Daam Hon Po and then moved Tung Lo Wan in the early 20th century. Moreover, San Tin is a single-clan Hakka village of the Laus. The Lau clan moved from Huizhou to Au Pui Wan Tsuen in Fo Tan and gradually moved to Kek Tin, Tin Sam and San Tin when their population increased. San Tin Village was established in the late 1890s.
- 11.4.2.5 During the post-war period, population increases rapidly due to the immigration from the Mainland and post-war baby booms. To alleviate the crowding problems in the urban areas, the Public Works Department (predecessor of the Development Bureau) prepared a comprehensive development scheme to propose the development of a new town in Sha Tin in 1965. With the large-scale reclamation along Tide Cove and Shing Mun River since the early 1970s, Sha Tin was developed into a new town with population over 500,000.

11.5 Cultural Heritage Sites within the Assessment Area

11.5.1 Built Heritage

- 11.5.1.1 Ten built heritage resources are located within 300 m from the Project site, including one Grade 1 Historic Building, three Grade 2 Historic Buildings, five Grade 3 Historic Buildings, one new item pending for grading assessment. Their locations are presented on **Figure 11.1**.

⁷ 呂不韋 (秦)·《呂氏春秋·待君覽》·載《諸子集成》第六冊 (1954)·北京：中華書局。

⁸ 班固 (漢)·《漢書·地理志》·載《中華書局點校本二十五史》(1962)·北京：中華書局。

⁹ 舒懋官 (1819)·《嘉慶新安縣志》·載張一兵編《深圳舊誌三種》(2006)·深圳：海天出版社。

¹⁰ 陳國成 (2006)·《香港地區史研究之三：粉嶺》·香港：三聯書店。

¹¹ 劉蜀永 (2016)·《簡明香港史 (第三版)》·香港：三聯書店。

¹² 沙田區議會編 (1997)·《沙田古今風貌》·香港：沙田區議會。

11.5.1.2 A Declared Monument, the Old House, Wong Uk Village, is located within 300 m from the discharge area of Tai Wai Nullah, and it is located about 1.8km from the Project boundary (**Figure 11.2**).

11.5.1.3 The identified built heritage resources are summarised in **Table 11.1** and the details of the identified built heritage resources are presented in **Appendix 11.2**.

Table 11.1 Summary of Cultural Heritage Resources

Cultural Heritage	Historic Building Grading	Approximate Horizontal Distance from the Project boundary
Gatehouse of Pok Ngar Villa	New item pending for grading assessment	Within the Project boundary
Li Cottage	Grade 1	47 m
No. 1 First Street, Tai Wai	Grade 3	65 m
No. 2 First Street, Tai Wai	Grade 3	
No. 3 First Street, Tai Wai	Grade 3	
Entrance Gate, Chik Chuen Wai	Grade 2	96 m
Che Kung Temple (Sha Tin)	Grade 2	137 m
Lower Shing Mun Reservoir, Dam	Grade 3	143 m
Lower Shing Mun Reservoir, Weir	Grade 2	150 m
Lower Shing Mun Reservoir, Supply Basin	Grade 3	155 m
Old House, Wong Uk Village	Declared Monument	1.8 km from the Project boundary; within 300 m of the discharge area of Tai Wai Nullah

11.5.2 Archaeology

11.5.2.1 No Site of Archaeological Interest (SAI) is identified within 300m from the Project boundary.

11.5.2.2 The Project site is located at the current Tai Wai Nullah, which was once part of the natural watercourse of Shing Mun River. According to the topographic maps of 1956 to 1958^{13 14 15 16} (**Figure 11.4**), Shing Mun River was mainly a natural watercourse with signs of basic channelisation in between Pak Tin and Tai Wai. Due to the development Sha Tin New Town in the 1970s, the river was significantly channelised and extended in the 1970s and had turned into a concrete nullah (Plate 2 in **Appendix 11.1**). Any archaeological deposits in the Project site would have been either destroyed by the river channelisation or non-existent due to its location at the watercourse. Therefore, no archaeological potential would be anticipated within the Project site.

11.5.2.3 Furthermore, historical villages in Tai Wai, including Chik Chuen Wai, Tung Lo Wan and San Tin, are located away from the Project site and remain intact from construction (see Tai Wai, Tung Lo Wan and San Tin Tsuen in **Figure 11.4**). The Project would not encroach on these historical villages that might have archaeological potentials due to antiquity.

11.6 Identification of Environmental Impacts

11.6.1 Construction Phase

Built Heritage

11.6.1.1 As the proposed works are mostly situated within the nullah and there is a substantial separation distance between the Old House, Wong Uk Village (Declared Monument) and the proposed works, no direct and indirect impact would be anticipated for the Old House, Wong Uk Village (Declared Monument) during the construction phase.

¹³ Crown Lands and Survey Office (1956). 1:1 200 145-NE-D (Ed 1956). Survey and Mapping Office, Lands Department.

¹⁴ Crown Lands and Survey Office (1957). 1:1 200 145-SE-B (Ed 1957). Survey and Mapping Office, Lands Department.

¹⁵ Crown Lands and Survey Office (1957). 1:1 200 145-NE-C (Ed 1958). Survey and Mapping Office, Lands Department.

¹⁶ Crown Lands and Survey Office (1957). 1:1 200 145-SE-A (Ed 1958). Survey and Mapping Office, Lands Department.

- 11.6.1.2 Gatehouse of Pok Ngar Villa (new item pending for grading assessment) is located within Project site. Direct impacts due to damages through contacting with construction machineries and site negligence by enhancement of existing walkways, landscaping and utility works or channel bed modifications, might be anticipated for Gatehouse of Pok Ngar Villa.
- 11.6.1.3 Gatehouse of Pok Ngar Villa (new item pending for grading assessment), Li Cottage (Grade 1), Nos. 1-3 First Street, Tai Wai (Grade 3) and Entrance Gate, Chik Chuen Wai (Grade 2) are located within 100m from the Project boundary. Due to the close proximity from the construction works, indirect impacts of ground-borne vibration would be anticipated from the Project during construction phase.
- 11.6.1.4 Located between 137m and 255m from the Project site, no adverse impacts would be anticipated for the following built heritage during the construction phase due to the substantial distance from the Project site:
- Che Kung Temple (Sha Tin) (Grade 2);
 - Lower Shing Mun Reservoir, Dam (Grade 3);
 - Lower Shing Mun Reservoir, Weir (Grade 2); and
 - Lower Shing Mun Reservoir, Supply Basin (Grade 3).

Archaeology

- 11.6.1.5 As no archaeological potential exists within the Project boundary, and no SAI is identified within 300 m from the Project boundary, no impact to archaeology would be anticipated during the construction phase of the Project.

11.6.2 Operational Phase

Built Heritage

- 11.6.2.1 The Project site is located along the current Tai Wai Nullah. No significant alteration of the current landscape which might affect the built heritage would be expected. Therefore, no adverse impact would be anticipated for built heritage during the operational phase.

Archaeology

- 11.6.2.1 As no archaeological potential exists within the Project boundary, and no SAI is identified within 300m from the Project boundary, no impact to archaeology would be anticipated during the operational phase of the Project.

11.7 Mitigation of Environmental Impacts

11.7.1 Construction Phase

Built Heritage

- 11.7.1.1 Pre and post condition survey of Gatehouse of Pok Ngar Villa (new item pending for grading assessment), Li Cottage (Grade 1), Nos. 1-3 First Street, Tai Wai (Grade 3) and Entrance Gate, Chik Chuen Wai (Grade 2) should be conducted to inspect the buildings' structural integrity and record the buildings' conditions by professional qualified building surveyor or engineer before and after the construction works, respectively. The survey results shall be submitted to AMO for record. Protective measures shall be provided to the built heritage subject to the results of the pre-condition survey. Post-condition survey should be conducted after the construction works to identify any damages that have occurred or caused by the construction. If damages to these built heritage resources are identified, AMO shall be informed immediately.
- 11.7.1.2 A buffer zone of 5 m from Gatehouse of Pok Ngar Villa (new item pending for grading assessment) should be set up, in which no construction machineries and construction storage should trespass the buffer zone. Fencing should also be set up to clearly demarcate the buffer zone to avoid potential damage due to site negligence.
- 11.7.1.3 Monitoring of vibration, settlement and tilting incorporated with a set of Alert, Alarm and Action (AAA) system shall be employed for Gatehouse of Pok Ngar Villa (new item pending for grading assessment), Li Cottage (Grade 1), Nos. 1-3 First Street, Tai Wai (Grade 3) and Entrance Gate, Chik Chuen Wai (Grade 2) during the construction phase. If the alert level is

exceeded, the monitoring frequency should be increased. If the alarm level is exceeded, the design of the construction may need to be amended. If the action level is exceeded, all works should be stopped. The proposed AAA limiting criteria are presented in **Table 11.2**. The actual limiting criteria should be further agreed with the AMO. A monitoring proposal, including type of monitoring, checkpoint locations, distribution of monitoring points, installation details, frequency of monitoring and proposed actions to be taken when reaching respective monitoring limits, should be submitted to AMO for comments before commencement of the works. Prior agreement and consent should be sought from the owner(s), stakeholder(s) and relevant Government department(s) for the installation of monitoring points before commencement of the works. Record of monitoring should be submitted regularly to AMO during the construction. AMO should be alerted in case any irregularities are observed.

Table 11.2 Proposed AAA Limiting Criteria for Vibration, Settlement and Tilting Level Monitoring during Construction

Built Heritages	Historic Building Grading	Alert, Alarm and Action (AAA) Values ^[1]		
		Vibration	Settlement	Tilting
Li Cottage	Grade 1	3 / 4 / 5 mm/s	6 / 8 / 10 mm	1/2000, 1/1500, 1/1000
Gatehouse of Pok Ngar Villa	New item pending for grading assessment	5 / 6 / 7.5 mm/s	6 / 8 / 10 mm	1/2000, 1/1500, 1/1000
Nos. 1-3 First Street, Tai Wai	Grade 3			
Entrance Gate, Chik Chuen Wai	Grade 2			

Note:

[1] Monitoring criteria would be subjected to review upon updates of grading status of heritage sites.

11.7.1.4 No mitigation measure would be required for the following built heritages as no impact is anticipated:

- Che Kung Temple (Sha Tin) (Grade 2);
- Lower Shing Mun Reservoir, Dam (Grade 3);
- Lower Shing Mun Reservoir, Weir (Grade 2);
- Lower Shing Mun Reservoir, Supply Basin (Grade 3); and
- Old House, Wong Uk Village (Declared Monument)

11.7.1.5 The assessment of impacts to the cultural heritage resources from the Project during construction phase and proposed mitigation measures are summarised in **Table 11.3**.

Table 11.3 Summary of Assessment of Impacts of Cultural Heritage Resources and Mitigation Measures

Cultural Heritage	Impact Assessment	Levels of Significance of Impact	Mitigation Measures
Gatehouse of Pok Ngar Villa	<p>Potential direct impacts due to damages through contacting with construction machineries and site negligence would be anticipated.</p> <p>Indirect impacts of ground-borne vibration, tilting and settlement</p>	Acceptable impact with mitigation measures	<p>Pre- and post-condition surveys.</p> <p>A buffer zone of 5 m from Gatehouse of Pok Ngar Villa should be set up, in which no construction machineries and construction storage should trespass the buffer zone. Fencing should also be set up to clearly demarcate the buffer zone.</p> <p>Monitoring of vibration, settlement and tilting incorporated with AAA system shall be employed. A monitoring proposal should be</p>

Cultural Heritage	Impact Assessment	Levels of Significance of Impact	Mitigation Measures
	would be anticipated.		submitted to AMO for comments before commencement of the works.
Li Cottage	Direct impacts would not be anticipated.	Acceptable impact with mitigation measures	Pre- and post-condition surveys. Monitoring of vibration, settlement and tilting incorporated with AAA system shall be employed. A monitoring proposal should be submitted to AMO for comments before commencement of the works.
No. 1 First Street, Tai Wai	Indirect impacts of ground-borne vibration, tilting and settlement would be anticipated.		
No. 2 First Street, Tai Wai			
No. 3 First Street, Tai Wai			
Entrance Gate, Chik Chuen Wai			
Che Kung Temple (Sha Tin)	Located at a substantial distance from the constructions, no impact would be anticipated.	No impact	No mitigation measure required
Lower Shing Mun Reservoir, Dam			
Lower Shing Mun Reservoir, Weir			
Lower Shing Mun Reservoir, Supply Basin			
Old House, Wong Uk Village			

Archaeology

11.7.1.6 No archaeological impact would be anticipated during the construction phase. Therefore, no mitigation measure would be required for archaeology during the construction phase.

11.7.2 Operation Phase

Built Heritage

11.7.2.1 No adverse impact would be anticipated for built heritage during the operational phase. Therefore, no mitigation measure would be required for built heritage during the operational phase.

Archaeology

11.7.2.2 No adverse impact would be anticipated for archaeology during the operational phase. Therefore, no mitigation measure would be required for archaeology during the operational phase.

11.8 Environmental Monitoring and Audit

11.8.1 Construction Phase

Built Heritage

11.8.1.1 Pre and post condition survey of Gatehouse of Pok Ngar Villa (new item pending for grading assessment), Li Cottage (Grade 1), Nos. 1-3 First Street, Tai Wai (Grade 3) and Entrance Gate, Chik Chuen Wai (Grade 2) shall be carried out. The survey reports shall be submitted to AMO for record.

11.8.1.2 A buffer zone of 5 m from Gatehouse of Pok Ngar Villa (new item pending for grading assessment) should be set up, in which no construction machineries and construction storage should trespass the buffer zone. Fencing should also be set up to clearly demarcate the buffer zone to avoid potential damage due to site negligence.

11.8.1.3 Monitoring of vibration, settlement and tilting incorporated with a set of AAA system shall be employed for Gatehouse of Pok Ngar Villa (new item pending for grading assessment), Li Cottage (Grade 1), Nos. 1-3 First Street, Tai Wai (Grade 3) and Entrance Gate, Chik Chuen

Wai (Grade 2) during the construction phase. The proposed AAA limiting criteria are presented in **Table 11.2**. The actual limiting criteria should be further agreed with the AMO. A monitoring proposal, including type of monitoring, distribution of monitoring points and proposed actions to be taken when reaching respective monitoring limits, should be submitted to AMO for comments before commencement of the works. Record of monitoring should be submitted regularly to AMO during the construction. AMO should be alerted in case any irregularities are observed.

Archaeology

11.8.1.4 No Environmental Monitoring and Audit (EM&A) would be required for archaeology during the construction phase.

11.8.2 Operation Phase

11.8.2.1 No EM&A would be required for built heritage and archaeology during the operational phase.

11.9 Conclusion

11.9.1.1 Direct impacts from damages through contacting with construction machineries and site negligence might be anticipated for Gatehouse of Pok Ngar Villa (new item pending for grading assessment) within the Project site during construction phase. Indirect impacts of ground-borne vibration would also be anticipated for Gatehouse of Pok Ngar Villa (New Item Pending for Grading Assessment), Li Cottage (Grade 1), Nos. 1-3 First Street, Tai Wai (Grade 3) and Entrance Gate, Chik Chuen Wai (Grade 2) during construction phase. Appropriate mitigation measures including pre- and post-condition surveys, buffer zone and monitoring of vibration, settlement and tilting incorporated with AAA system for the concerned buildings have been recommended for the built heritages impacted by the Project.

11.9.1.2 A Declared Monument, Old House, Wong Uk Village, is located within 300m of the discharge area from the revitalised TWN, and located at about 1.8km from the nearest Project boundary. As the proposed works are mostly situated within the TWN and there is substantial separation distance between the Old House and the proposed works, no direct and indirect impacts on the Old House would be anticipated during the construction and operation phases of the Project.

11.9.1.3 As no archaeological potential exists within the Project boundary, and no SAI is identified within 300m from the Project boundary, no impact to archaeology would be anticipated during the construction and operational phases of the Project.

11.10 Bibliography and Glossary

11.10.1 Bibliography

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Map

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11.10.2 Glossary

Au Pui Wan Tsuen	坳背灣村
Bao'an	寶安
Che Kung Temple	車公廟
Chik Chuen Wai	積存圍
Coastal Evacuation Order	遷界令
Daam Hon Po	擔桿鋪
Fragrant wood	香木
Hakka	客家
Hanshu	漢書
Haus	侯
Lau Ancestral Hall	劉氏家祠
Li Cottage	玉山艸堂
Lius	廖
Lower Shing Mun Reservoir	下城門水塘
Lushi Chunqiu	呂氏春秋
Mans	文
Ming dynasty	明朝
Pai Tau Yeuk	排頭約
Pangs	彭
Panyu	番禺
Pok Ngar Villa	博雅山莊
Qin dynasty	秦朝
Qing	清朝
San Tin	新田
Sha Tin Hoi	沙田海
Sha Tin Kau Yeuk	沙田九約
Shing Mun River	城門河
Song dynasty	宋朝
Songhuiyao Jilu	宋會要輯錄
Tai Wai Yeuk	大圍約
Tangs	鄧
Tin Sam Yeuk	田心約
Tse Ancestral Hall	謝氏祠堂
Tung Lo Wan	銅鑼灣
Wai	韋
Wanli	萬曆
Wong Uk Village	王屋村
Xin'an	新安
Xin'an Gazetteer	新安縣誌
Yudi Jisheng	輿地紀勝
Yue	越

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12 LANDSCAPE AND VISUAL

12.1 Introduction

- 12.1.1.1 This section identifies and assesses the potential landscape and visual impacts arising from the proposed Project. Based on the impact identified, landscape and visual mitigation measures are proposed to alleviate any potential adverse impact.
- 12.1.1.2 Landscape and visual impacts assessment are assessed in accordance with the criteria and guidelines as stated in Annexes 10 and 18 of the *Technical Memorandum on Environmental Impact Assessment Process* (EIAO-TM) and the *EIAO Guidance Note No. 8/2010* on “*Preparation of Landscape and Visual Impact Assessment under the Environmental Impact Assessment Ordinance*”, as well as the requirements given in Clause 3.4.12 and Appendix J of the EIA Study Brief (No. ESB-320/2019).
- 12.1.1.3 The assessment area for landscape impact assessment shall include areas within a 100m distance from the Project boundary and any other areas likely to be impacted by the Project. The assessment area for the visual impact assessment shall be defined by the visual envelope of the Project. The assessment area and the visual envelope are shown in **Figure 12.1** and **Figure 12.6** respectively.
- 12.1.1.4 The site location and the details of the Project are described in **Section 2** of this Report. The details of the revitalisation works would be subject to detailed design stage, including actual alignment of the low flow channel and dimensions of proposed above-ground structures [[e.g. viewing decks, revamp of existing footbridges/bridges, revamp/provision of footpaths, pavilions (in form of sheltered benches / seating) and visitor facilities for amenity areas (e.g. riparian walkway, UV disinfection system, toilet and management office)]. Finish level and top level of proposed structures for enhancement of public open spaces based on the latest design are provided in below **Table 12.1**.

Table 12.1 Elevation of Proposed Features

Feature	Elevation of Finished Level (mPD)	Elevation of Top Level (mPD)
New revamped bridge (Mei Tin Estate)	+10.0	+13.0
New revamped bridge (Mei Lam Estate)	+7.5	+10.5
Cantilever decking platforms near Mei Tin Estate	+10.0	-
Pavilions (in form of sheltered benches / seating)	+10.0	+12.5
Visitor facilities beneath Shing Mun Tunnel Road (UV disinfection system, toilet and management office)	+7.2	+10.2 to +13.2

12.2 Environmental Legislation, Standards and Assessment Criteria

- 12.2.1.1 Legislation and standards that are relevant to the consideration of landscape and visual impacts under this assessment include the following:
- Environmental Impact Assessment Ordinance (Cap. 499) and the Technical Memorandum on EIA Process (EIAO-TM), particularly Annexes 10 and 18;
 - Environmental Impact Assessment Ordinance Guidance Note No. 8/2010;
 - Town Planning Ordinance (Cap. 131);
 - Country Park Ordinance (Cap 208);
 - Animals and Plants (Protection of Endangered Species) Ordinance (Cap 187A);
 - Protection of Endangered Species of Animals and Plants Ordinance (Cap. 586);
 - Hong Kong Planning Standards and Guidelines Chapters 4, 10 and 11;
 - Agriculture, Fisheries and Conservation Department (AFCD) Nature Conservation Practice Note No. 2 - Measurement of Diameter at Breast Height (DBH);
 - DEVB TC(W) No. 6/2015 - Maintenance of Vegetation and Hard Landscape Features;
 - DEVB TC(W) No. 4/2020 - Tree Preservation;

- DEVB TC(W) No. 5/2020 – Registration and Preservation of Old and Valuable Trees;
 - ETWB TC(W) No. 5/2005 - Protection of Natural Streams/Rivers from Adverse Impacts Arising from Construction Works;
 - Geotechnical Engineering Office (GEO) Publication No. 1/2011 – Technical Guidelines on Landscape Treatment and Bioengineering for Man-Made Slopes and Retaining Walls;
 - Guidelines on Industry Best Practices for External Lighting Installations;
 - Guidelines on Tree Transplanting (September 2014) issued by Greening, Landscape and Tree Management (GLTM) Section of Development Bureau (DEVB);
 - Guidelines on Tree Preservation during Development (April 2015) issued by GLTM Section of DevB; and
 - Landscape Value Mapping of Hong Kong.
- 12.2.1.2 The Outline Zoning Plan (OZP) gazetted under the Town Planning Ordinance provides the statutory framework for land use development. Reference has been made to the Approved Sha Tin OZP No. S/ST/36 (gazetted on 18 November 2022).

12.3 Assessment Methodology

12.3.1 Landscape Impact Assessment Methodology

- 12.3.1.1 The methodology for the landscape impact assessment during the construction and operational phases shall include the followings.
- 12.3.1.2 Identification of the baseline landscape resources (LRs), landscape character areas (LCAs) and Visually Sensitive Receivers (VSRs) within the Assessment Area was achieved by a desk-top study of topographical maps, information databases and aerial photographs, as well as undertaking site visits and broad-brush tree survey at the Project site.
- 12.3.1.3 **Assessment of the sensitivity of the LRs and LCAs identified.** This is influenced by a number of factors including whether the resource / character is common or rare, whether it is considered to be of local, regional, national or global importance, whether there are any statutory or regulatory limitations / requirements relating to the resource, the quality of the resource / character, the maturity of the resource and the ability of the resource / character to accommodate change. The sensitivity of each LR and LCA is classified as follows:
- High:** Important landscape character or resource of particularly distinctive character or high importance, sensitive to relatively small change.
- Medium:** Landscape character or resource of moderately valued landscape characteristics reasonably tolerant to change.
- Low:** Landscape character or resource, the nature of which is largely tolerant to change.
- 12.3.1.4 **Identification of potential sources of landscape changes.** These are the various elements of the construction works and operation procedures that would generate landscape impacts.
- 12.3.1.5 **Identification of the magnitude of landscape change.** The magnitude of change on LR and LCA is classified as follows:
- Large:** The landscape character or landscape resource would incur a major change.
- Intermediate:** The landscape character or landscape resource would incur a moderate change.
- Small:** The landscape or landscape resource would incur slight or barely perceptible change.
- Negligible:** The landscape or landscape resource would incur no discernible change.
- 12.3.1.6 **Recommendation of landscape mitigation measures.** These may take the form of adopting basic engineering design to prevent and/or minimise adverse landscape impacts before adopting other mitigation or compensatory measures to alleviate the impacts. Potential mitigation measures shall also include the preservation of vegetation and natural landscape resources, transplanting trees in good condition and value, provision of screen planting, re-vegetation of disturbed lands, compensatory planting, woodland restoration,

aesthetic design of aboveground structures including provision of finishes, colour scheme, texture of materials used and any measures to mitigate the impact on the existing and planned land use and visually sensitive receivers (VSRs). A programme for the mitigation measures is provided. The agencies responsible for the funding, implementation, management and maintenance of the mitigation measures are identified.

12.3.1.7 **Prediction of the significance of residue landscape impacts with mitigation measures.** By synthesizing the magnitude of the various impacts and the sensitivity of the various landscape resources, it is possible to categorise impacts in a logical, well-reasoned and consistent fashion. The following **Table 12.2** shows the rationale in assessing the potential significances of landscape impacts.

Table 12.2 Relationship between Landscape Sensitivity and Impact Magnitude in Defining Impact Significance

		Sensitivity of LRs / LCAs		
		Low	Medium	High
Magnitude of Change	Large	Moderate	Moderate / Substantial	Substantial
	Intermediate	Slight / Moderate	Moderate	Moderate / Substantial
	Small	Slight	Slight / Moderate	Moderate
	Negligible	Insubstantial	Insubstantial	Insubstantial

12.3.1.8 The significant thresholds of landscape impacts are categorised as follows:

- Substantial:** Adverse / beneficial impact where the proposal would cause significant deterioration or improvement in existing landscape quality.
- Moderate:** Adverse / beneficial impact where the proposal would cause a noticeable deterioration or improvement in existing landscape quality.
- Slight:** Adverse / beneficial impact where the proposal would cause a barely perceptible deterioration or improvement in existing landscape quality.
- Insubstantial:** No discernible change in the existing landscape quality.

12.3.1.9 **Prediction of Acceptability of Impacts.** An overall assessment of the acceptability, or otherwise, of the impacts according to the five criteria set out in Annex 10 of the *EIAO-TM*.

12.3.2 Visual Impact Assessment Methodology

12.3.2.1 Reference is made to EIAO Guidance Note No. 8/2010 - Preparation of Landscape and Visual Impact Assessment Under the Environmental Impact Assessment Ordinance. The methodology for visual impact assessment during the construction and operational phases shall include the followings.

12.3.2.2 **Identification of the Visual Envelope during the construction and operational phases of the Project.** This is achieved by site visit and desktop study of topographic maps, photographs and preparation of cross-sections to determine visibility of the Project from various locations. Size, distance and other factors will be considered, to determine the visual envelope of the Project. The visual envelope is expected to cover the fields of views from sensitive viewers in direct sight of the proposed development; usually defined by natural ridgeline, man-made features, or road infrastructure, etc.

12.3.2.3 **Identification of the VSRs within the Visual Envelope at construction and operational phases.** These are the people who would reside within, work within, play within, or travel through, the visual envelope that would be potentially affected by the proposed Project site.

12.3.2.4 **Identification of the viewpoints (VPs) within the Visual Envelope.** These VPs are representative view of the adjacent VSRs. The visual impact assessment is prepared based on VSR approach.

12.3.2.5 **Assessment of the degree of sensitivity of the VSRs identified.** Assessment of the degree of sensitivity of change of the VSRs will take into consideration the following factors:-

- The type of VSRs, which is classified according to whether the person is at home, at work, at play, or travelling. Those who view the change from their homes are considered to be highly sensitive as the attractiveness or otherwise of the outlook from their home will have a substantial effect on their perception of the quality and acceptability of their home environment and their general quality of life. Those who view the impact from their workplace are considered to be only moderately sensitive as the attractiveness or otherwise of the outlook will have a less important, although still material, effect on their perception of their quality of life. The degree to which this applies depends on whether the workplace is industrial, retail or commercial. Those who view the impact whilst taking part in an outdoor leisure activity may display varying sensitivity depending on the type of leisure activity. Those who view the impact whilst travelling on a public thoroughfare will also display varying sensitivity depending on the speed of travel.
- Estimated number of VSR population. This is expressed in terms of whether there are “many”, “medium” and “few” VSRs in any one category of VSR.
- Other factors which are considered (as required by EIAO GN 8/2010) include the value and quality of existing views, the availability and amenity of alternative views, the duration or frequency of view, and the degree of visibility.
- The sensitivity of VSRs is classified as follows: -
 - High:** The VSR is highly sensitive to any change in their viewing experience.
 - Medium:** The VSR is moderately sensitive to any change in their viewing experience.
 - Low:** The VSR is only slightly sensitive to any change in their viewing experience.

12.3.2.6 **Identification of sources of visual changes.** These are the various elements of the construction works and operation that would generate visual changes. Factors affecting the magnitude of changes for assessing visual impacts include:

- compatibility of the Project with the surrounding landscape;
- duration of impacts under construction and operational phases;
- scale of development;
- reversibility of change;
- viewing distance; and
- potential blockage of view.

12.3.2.7 Assessment of the magnitude of visual change experienced by the identified VSRs from proposed Project. The magnitude of visual changes is classified as follows:

- Large:** The VSRs would suffer a major change in their viewing experience.
- Intermediate:** The VSRs would suffer a moderate change in their viewing experience.
- Small:** The VSRs would suffer a small change in their viewing experience.
- Negligible:** The VSRs would suffer no discernible change in their viewing experience.

12.3.2.8 **Recommendation of potential visual mitigation measures.** These may take the form of adopting basic engineering design to prevent and/or minimise adverse visual impacts before adopting other mitigation or compensatory measures to alleviate the impacts. Potential mitigation measures shall also include the preservation of vegetation and natural landscape resources, provision of screen planting, re-vegetation of disturbed lands, compensatory planting, woodland restoration, aesthetic design of aboveground structures including provision of finishes, colour scheme, texture of materials used and any measures to mitigate the impact on the existing and planned land use and VSRs. A programme for the mitigation measures is provided. The agencies responsible for the funding, implementation, management and maintenance of the mitigation measures are identified.

12.3.2.9 **Prediction of the significance of visual impacts before and after the implementation of the mitigation measures.** By synthesizing the magnitude of the various visual impacts and the sensitivity of the VSRs, and the numbers of VSRs that are affected, it is possible to categorise the degree of significance of the impacts in a logical, well-reasoned and

consistent fashion. The following **Table 12.3** shows the rationale in assessing the potential significances of visual impacts.

Table 12.3 Relationship between Visual Receptor Sensitivity and Magnitude of Change in Defining Impact Significance

		Sensitivity of VSRs		
		Low	Medium	High
Magnitude of Change	Large	Moderate	Moderate / Substantial	Substantial
	Intermediate	Slight / Moderate	Moderate	Moderate / Substantial
	Small	Insubstantial / Slight	Slight / Moderate	Moderate
	Negligible	Insubstantial	Insubstantial	Insubstantial

- The significance of visual impacts is categorised as follows:
 - Substantial:** Adverse / beneficial impact where the proposal would cause significant deterioration or improvement in existing visual quality.
 - Moderate:** Adverse / beneficial impact where the proposal would cause a noticeable deterioration or improvement in existing visual quality.
 - Slight:** Adverse / beneficial impact where the proposal would cause a barely perceptible deterioration or improvement in existing visual quality.
 - Insubstantial:** No discernible change in the existing visual quality.

12.3.2.10 **Prediction of Acceptability of Impacts.** An overall assessment of the acceptability, or otherwise, of the impacts according to the five criteria set out in Annex 10 of the *EIAO-TM*.

12.4 Review of the Planning and Development Control Framework

12.4.1.1 The Project site falls within the Approved Sha Tin Outline Zoning Plan (OZP) No. S/ST/36.

12.4.1.2 Northern part of the Project site is characterised by high-rise residential estates, village houses and transportation corridor distributed in-between natural resources like woodland and natural watercourse. While the southern part of proposed Project site is occupied with village houses and medium to high-rise residential estates along Mei Tin Road to MTR station; woodland side with crematorium and mortuary near the Lower Shing Mun Reservoir. Tai Wai Nullah pass through the whole Project site which connects the Lower Shing Mun Reservoir at the west end and Shing Mun River to the east.

12.4.1.3 The whole Project boundary falls into the Sha Tin OZP. In accordance with the OZP, majority of the proposed works is located within the channel, which generally falls within the "River Channel" zone of the approved Sha Tin OZP. Proposed works outside of the channel fall in various other zones, such as "Green Belt", "Comprehensive Development Area" ("CDA"), "Industrial", "Residential" and "Village Type Development" zones. The zoning types and areas affected by the Project is presented in **Figure 12.2**.

12.4.1.4 The review of OZP has not only included a review of the plans, but also the 'Notes' and "Explanatory Statements" which accompany these plans. According to the notes of OZP, drainage works, road works and such other public works coordinated or implemented by the government are always permitted on land falling within the boundaries of the OZP.

12.4.1.5 The revitalisation works introduce higher quality of landscape within the Project boundary. The proposed Project would fit in with the current and future planning settings and would not be in conflict with the statutory town plan. Therefore, planning permission form the Town Planning Board is not required.

12.5 Baseline Condition

12.5.1 General

12.5.1.1 Identification of the baseline landscape resources (LRs), landscape character areas (LCAs) and visually sensitive receivers (VSRs) within the Assessment Area was achieved by a

desk-top study of topographical maps, information databases and aerial photographs, as well as undertaking site visits and broad brush tree survey at the Project site.

- 12.5.1.2 The assessment area for the landscape impact assessment shall include areas within 100m from the site boundary as stipulated in the EIA Study Brief (No. ESB-320/2019). The Visual Envelope of the visual impact assessment is defined by the villages like San Tin Wai and Kak Tin Village towards Lion Rock in the South; religious institutions such as church, monastery and cemetery on Tao Fong Shan to the East; low-rise residential estates and public mortuary to the West; Needle Hill towards the north. Within the Visual Envelope, primary zone of visual influence is further delineated mainly by the building blocks in the vicinity of the Project.

12.5.2 Broad Brush Tree Survey

- 12.5.2.1 A broad-brush tree and vegetation survey was carried out in accordance with the Appendix J of the EIA Study Brief to identify dominant tree species, maturity, rarity and any plant species of conservation interest, etc. which would be potentially affected to provide baseline information on the LRs and LCAs.

- 12.5.2.2 Total 254 nos. of existing trees are surveyed, where are located along two sides of the Tai Wai Nullah. The tree species recorded are mostly common species in Hong Kong, including but not limited to *Melaleuca cajuputi subsp. Cumingiana*, *Leucaena leucocephala*, *Celtis sinensis*, *Ficus microcarpa* etc. There are 32 species identified, their height ranges from 3m to 24m, crown spread from 1m to 22m, and Diameter at Breast Height (DBH) from 100mm to 1300mm. They are generally poor - average in form; and average in health & structural condition; and low - medium in amenity value.

Old and Valuable Trees (OVTs) & Trees of Particular Interest (TPIs)

- 12.5.2.3 No Old and Valuable Trees (OVTs) was identified within the Project boundary. A total of 3 nos. of OVTs (LCSD ST/10, LCSD ST/11 & LCSD ST/15) were identified within 100m assessment boundary, including 2 nos. of *Cinnamomum camphora* located at roadside planter along Chung Ling Road and 1 no. of *Ficus religiosa* located at roadside planter of Pik Tin Street (**Figure 12.12** to **Figure 12.14** refer). They are all located in LR6 / LCA3 which is out of site boundary and will not be affected by proposed works. Detailed information of OVTs within 100m from Project boundary are tabulated in **Table 12.4**.

Table 12.4 Detail Information of OVTs within 100m Assessment Area

OVT No.	Tree Register No.	Tree Species	DBH (mm), Height(m) & Crown Spread(m)	Location
LCSD ST/10	LCSD/ST/00012	<i>Cinnamomum camphora</i>	1,035mm, 17m & 20m	Chung Ling Road
LCSD ST/11	LCSD/ST/00013	<i>Cinnamomum camphora</i>	1,350mm, 17m & 20m	Chung Ling Road
LCSD ST/15	LCSD/ST/00015	<i>Ficus religiosa</i>	1,110mm, 17m & 16m	Pik Tin Street

- 12.5.2.4 In accordance with Guidelines for Tree Risk Assessment and Management Arrangement (9th edition (Rev. 2A), 20 April 2021), a total of 5 nos. of Trees of Particular Interest (TPIs) with DBH ≥ 1000mm were identified within the Project boundary (**Figure 12.12** & **Figure 12.15** refers), all of which are *Ficus macrocarpa* (細葉榕) with poor to average forms, and average health and structural conditions. All TPIs identified within the Project boundary would be retained.

- 12.5.2.5 On the other hand, 15 nos. of *Lagerstroemia speciosa* (大花紫薇) are identified within survey boundary which are listed under Cap.96. They are identified with poor – average form and average in health and structural condition. As the surveyed Lagerstroemia species (i.e. *Lagerstroemia speciosa*) are widely planted as ornamental trees in Hong Kong for amenity purpose, they are not considered as TPIs in this report.

12.5.3 Landscape Resources (LRs)

- 12.5.3.1 There are six existing Landscape Resources (LR) identified within the 100m assessment area, please refer to **Figure 12.3** and **Figure 12.5** for their distribution and photographic records respectively.

LR1 – Watercourse of Shing Mun River Channel and Tai Wai Nullah

- 12.5.3.2 The watercourse of Tai Wai Nullah connects Shing Mun River Channel at southeast as its upper stream; and the Lower Shing Mun Reservoir at the west. The whole watercourse is artificial with concrete nullah bed exposed and no plantation is found; except for the first section at its west-side opening which is not covered by concrete bedding where groundcover is occupied. This LR is medium in rarity and low in regional importance within Tai Wai District. As there are limited vegetation in this LR, it is considered to be low in landscape quality, with a high ability to accommodate change due to its artificial structure which can easily be replaced. The sensitivity of LR1 is considered to be **low**.

LR2 – Natural Watercourse

- 12.5.3.3 There are total 3 nos. of natural watercourses identified within 100m assessment area. They are lower-streams at downhill which pass through Heung Fan Liu and join Tai Wai Nullah at its west-side opening. LR2 is commonly found in hillside habitat with common stream-side vegetation, which is identified as medium in rarity, landscape quality and regional importance. However, as they have relatively high-level of naturalness with limited disturbance to its setting, hence, low ability to accommodate changes. And therefore, it is considered to be **high** in sensitivity.

LR3 – Waterside Landscape Amenity along Tai Wai Nullah

- 12.5.3.4 Street trees are found along two-sides of Tai Wai Nullah for amenity purposes. These trees are settled in linear planting area with shrubs and groundcover on surfaces. They are mostly common species in Hong Kong, namely *Cinnamomum burmannii* (陰香), *Ficus microcarpa* (細葉榕), *Lagerstroemia speciosa* (大花紫薇), *Livistona chinensis* (蒲葵), *Melaleuca cajuputi subsp. Cumingiana* (白千層), *Peltophorum pterocarpum* (雙翼豆) and *Spathodea campanulata* (火焰樹) etc. Visually, these plantations soften the hard edge of the concrete channel; and provide sufficient shading area for bicycle riders and travelers.
- 12.5.3.5 According to the Tree Survey findings, total 251 nos. of surveyed trees are located within LR3. Among them, 5 nos. of *Ficus macrocarpa* are identified as Trees of Particular Interest (TPIs) with DBH \geq 1000mm. On the other hand, 15 nos. of *Lagerstroemia speciosa* listed under Cap.96. are found in this LR. These *Lagerstroemia speciosa* species (i.e. *Lagerstroemia speciosa*) are not considered as TPIs as they are widely planted as ornamental trees in Hong Kong for amenity purpose.
- 12.5.3.6 This LR is identified as low in rarity and regional importance; medium in landscape quality. It has high ability to accommodate changes, e.g. replaced by compensatory trees or via transplanting. Overall, it is considered to be **medium** in sensitivity.

LR4 – Other Parks/ Gardens along Tai Wai Nullah

- 12.5.3.7 Parks are found along the nullah, which includes Mei Tin Road Sitting-out Area, Mei Lam Sitting-out Area, Chik Fuk Street Sitting-out Area, Tai Wai Playground, Pok Ngar Villa (heritage site) and Tai Wai Soccer Pitch above the existing box-culvert; they are easily accessible which lie close to the nullah. Their landscape quality is medium, mostly fringed with ornamental young trees and amenity planting on planters, provided with sitting platforms for public leisure. Sitting-out area and playground are very common in local context with medium ability to accommodate change. The sensitivity of this LR is considered to be **medium**.

LR5 – Hillside Vegetation

- 12.5.3.8 Hillside vegetation is located at the western part of assessment area surrounding Heung Fan Liu, Fu Shan and the reservoir with natural watercourses (LR2) running through the area; also, at the east adjacent to the Shing Mun Tunnel Road. It is a common habitat in Hong Kong with medium rarity and regional importance. This LR is rich in vegetation and dominated by mostly native species, it is therefore identified as high in landscape quality, with low ability to accommodate changes. LR5 is considered to be **high** in sensitivity.

LR6 – Landscape Amenity within Build-up Areas

12.5.3.9 This LR consists of high-rise residential estates, including Man Lai Court, Mei Lam Estate, Mai Shing Court, Park View Garden, Granville Garden and Mei Tin Estate, have significant amount of greenery located adjacent to two-sides of Tai Wai Nullah. They are mostly amenity planting of trees, shrubs and climbers located at entrance planter, which act as a visual buffer of the areas. 3 nos. of identified OVTs are all located within this LR. This LR is of medium landscape quality, low in rarity and local importance; with reasonable tolerance to changes. Therefore, LR6 is considered to be **medium** in sensitivity.

12.5.3.10 The sensitivity of the LRs is summarised in Table 12.5 below.

Table 12.5 Sensitivity of Landscape Resources

ID	Landscape Resource	Quality & Maturity	Rarity	Ability to Accommodate Change	Local/Regional Importance	Sensitivity
LR1	Watercourse of Shing Mun River Channel and Tai Wai Nullah	Low	Medium	High	Low	Low
LR2	Natural Watercourse	Medium	Medium	Low	Medium	High
LR3	Waterside Landscape Amenity along Tai Wai Nullah	Medium	Low	High	Low	Medium
LR4	Other Parks/ Gardens along Tai Wai Nullah	Medium	Low	Medium	Low	Medium
LR5	Hillside Vegetation	High	Medium	Low	Medium	High
LR6	Landscape Amenity within Build-up Area	Medium	Low	High	Low	Medium

12.5.4 Landscape Character Areas (LCAs)

12.5.4.1 There are five landscape character areas (LCAs) identified within the assessment area, please refer to **Figure 12.4** and **Figure 12.5** for their locations and photographic records respectively.

LCA1 – Miscellaneous Urban Landscape

12.5.4.2 This LCA comprises of two sub-areas, one in the upstream section and one near the river mouth. The upstream area includes mostly residential zones (Mei Tin Estate and Heung Fan Liu New Village) and the hillside woodlands near the existing WSD facilities. The downstream area consists of a mix of industrial buildings, residential buildings, roads, footbridges, highway structures, MTR Station, and open space, etc. The extensive transportation networks at the downstream end together with the well-established natural habitats located at the upstream forms a diverse landscape character area.

12.5.4.3 According to the Tree Survey findings, total 179 nos. of surveyed trees are located within LCA1. Among them, 5 nos. of *Ficus macrocarpa* are identified as Trees of Particular Interest (TPIs) with DBH \geq 1000mm. Also, 7 nos. of *Lagerstroemia speciosa* listed under Cap.96. are found in this LCA.

12.5.4.4 This LCA is common in Hong Kong with low rarity and regional importance. It is identified as medium in landscape quality with high ability to accommodate changes. LCA1 is therefore considered to be **medium** in sensitivity.

LCA2 – Residential Urban Fringe Landscape

12.5.4.5 LCA2 is in the woodland located in the mid-section of the nullah. It is an extensive area covered by woodland vegetation. There are also two heritage sites (Pok Ngar Villa and Li Cottage) located within this LCA. Total 16 nos. of surveyed trees are located within LCA2.

12.5.4.6 In consideration to its combination of natural and cultural elements which forms a unique landscape area, it is identified with high rarity and regional importance; high in landscape

quality with low ability to accommodate changes. LCA2 is considered to be **high** in sensitivity.

LCA3 – Residential Urban Landscape

12.5.4.7 LCA3 is overwhelmingly taken over to residential land use including Granville Garden, Mei Lam Estate and Mei Shing Court. There is one educational institution, namely Buddhist Wong Wan Tin College. The medium to high-rise estates forms a relatively uniform landscape in the area. Vegetations are mainly street trees, amenity planting at parks and ornamental plantation at residential estates. Total 48 nos. of surveyed trees are located within LCA3; and 3 nos. of identified OVTs are all located within this LCA.

12.5.4.8 LCA3 is considered to be low in rarity and local importance, with medium landscape quality and high ability to accommodate changes. And therefore, LCA3 is considered to be **medium** in sensitivity.

LCA4 – “Hui” Urban Landscape

12.5.4.9 The LCA is formed by a group of densely arranged mid to low rise residential and commercial buildings in and around Tai Wai Village. This area is categorised by busy commercial activities, but there are also communal spaces like Tai Wai Playground and educational institution, Tung Wah Group of Hospitals Sin Chu Wan Primary School. Overall, this dynamic mix of businesses, schools, and residents creates a lively and energetic neighbourhood.

12.5.4.10 Total 8 nos. of surveyed trees are located within LCA4. All of them are identified as *Lagerstroemia speciosa*, and listed under Cap.96.

12.5.4.11 This LCA is mainly occupied by street trees and domestic planting in the courtyard of village houses. It is identified to be medium in landscape quality and ability to accommodate changes. This type of area is common in New Territories, which is relatively low in rarity and regional importance. And therefore, it is considered to be **medium** in sensitivity.

LCA5 – Transportation Corridor Landscape

12.5.4.12 LCA5 comprises of various highways and elevated roads running across the nullah including Tsing Sha Highway, Tai Po Road (Tai Wai portion) and Shing Mun Tunnel Road. There are very limited vegetation in this LCA, mainly shrubs planting under highway. Total 3 nos. of surveyed trees are located within LCA5. It is identified to be low in rarity, local importance, landscape quality with high ability to accommodate changes. And therefore, it is considered to be **low** in sensitivity.

12.5.4.13 The sensitivity of five LCAs is summarised in **Table 12.6** as below.

Table 12.6 Sensitivity of Landscape Character Areas

ID	Landscape Resource	Quality & Maturity	Rarity	Ability to Accommodate Change	Local/ Regional Importance	Sensitivity
LCA1	<i>Miscellaneous Urban Landscape</i>	Medium	Low	High	Low	Medium
LCA2	<i>Residential Urban Fringe Landscape</i>	High	High	Low	High	High
LCA3	<i>Residential Urban Landscape</i>	Medium	Low	High	Low	Medium
LCA4	<i>“Hui” Urban Landscape</i>	Medium	Low	Medium	Low	Medium
LCA5	<i>Transportation Corridor Landscape</i>	Low	Low	High	Low	Low

12.5.5 Baseline Condition and Primary Zone of Visual Influence

12.5.5.1 The Visual Envelope of the visual impact assessment is defined by the villages like San Tin Wai and Kak Tin Village towards Lion Rock in the South; religious institutions such as church, monastery and cemetery on Tao Fong Shan to the East; low-rise residential estates and public mortuary to the West; Needle Hill towards the north. Within the Visual Envelope,

primary zone of visual influence is further delineated mainly by the building blocks in the vicinity of the Project. Please refer to **Figure 12.6** for detail distribution of visually sensitive receivers.

Visual Resource

- 12.5.5.2 The visual resources of the site include the ridgeline formed by Needle Hill at the north side which connects to the Lower Shing Mun Reservoir at west side of the assessment area, as well as the native hillside vegetation. Also, another major visual resource is the view towards Shing Mun River Channel and Tai Wai Nullah is available all along the assessment area. The area and distribution of visual resources is also shown in **Figure 12.6**.

12.5.6 Identification of Visually Sensitive Receivers (VSRs)

- 12.5.6.1 Eighteen (18) representative VSRs adjacent to proposed Project site are identified for estimation of potential visual impacts. The selected VSRs are further grouped into five types which are government/ institutional/ community (G), industrial (I), residential (R), recreational (REC) and travelling (T). The identified VSRs are listed in **Table 12.7** and their location are shown in **Figure 12.6**.

Government/ Institutional/ Community VSRs (3 Nos.)

- 12.5.6.2 The government/ institutional/ community VSRs include the teachers and students of Tung Wah Group of Hospitals Sin Chu Wan Primary School (G1) and Buddhist Wong Wan Tin College (G2). Both VSRs are low-rise educational building with open space towards the nullah. Due to their building height, there are at least one to two building-side of window directly facing the proposed Project. The quality of existing view is good with hillside greenery of Needle Hill as backdrop and alternative view available. In view of these VSRs is having occasional frequency of view towards the nullah and posse medium to large nos. of individuals. Their sensitivity is considered as **medium**.
- 12.5.6.3 The Sha Tin Che Kung Temple (G3) refers to visitors that travel to visit the Temple to worship Che Kung. The VSR is located at one-storey temple building with several vehicular road away from the nullah. The quality of the existing view is fair with a railway and roadside verge greening at foreground that screened the respective view towards the nullah. Alternative view is available. In view of this VSR is having occasional frequency towards the nullah and posse large nos. of devotees. Its sensitivity is considered as **medium**.

Industrial VSR (1 No.)

- 12.5.6.4 The industrial VSR (I1) refers to the workers in the industrial area along Shing Wan Road, which are mostly medium-rise buildings with less than 10-stories. It can be predicted that most of the workers can perceive the nullah in various distance and angle based on their location, the quality of existing view is good with roadside vegetation at the foreground that partially screened off the nullah. Besides, hillside greenery of Needle Hill as backdrop and alternative view is available. In view of their partial degree of visibility and most of the time they are engaged in working activities, their sensitivity to change is considered as **low**.

Residential VSRs (8 Nos.)

- 12.5.6.5 The residential VSRs comprise the residents along the northern and southern Tai Wai Nullah, together with the residents in Golden Lion Garden (R1) and Sun Chui Estate (R2) which located to the South of nullah with views towards proposed Project on the other side of Shing Mun River Channel in longer distance. They enjoy a fair quality of view with several medium-rise buildings intervening in their viewpoint. Regarding their long viewing distance and glimpse of the nullah, their corresponding sensitivity is regarded as **low**.
- 12.5.6.6 R3, R5 and R6 represent residents who live in high-rise residential estates along Tai Wai Nullah. It is predicted that residential blocks facing proposed Project will be impacted in larger degree, while residents who live in high-story from building blocks at the back would be impacted partially, subject to their particular visual composition. In general, they share a fair quality of view at a short to medium viewing distance. In view of their high frequency of view and posse a large numbers of individuals, their corresponding sensitivity is considered as **medium**.

12.5.6.7 R4 and R7 represents residents who live in low-rise village house with potential view towards the proposed Project. Whilst, R8 represents future residents that live in the Planned Comprehensive Development Area above Tai Wai Station – The Pavilia Farm. They share a fair quality of view with a short to medium viewing distance next to the nullah. Although, the population in R4 and R7 are medium, in view of their frequency of views toward the nullah, their sensitivity is considered as **medium**. R8 posse a large numbers of individuals with a short viewing distance, hence its sensitivity is considered as **medium**.

Recreational VSRs (4 Nos.)

12.5.6.8 Three recreational VSRs are identified which represent users in the Tai Wai Soccer Pitch & Playground (REC1), Pok Ngar Villa (REC2) and Mei Chuen House Children's Play Area (REC3). They share a fair quality of view. In general, views from these recreational VSRs will be relatively close to the proposed Project with partial to full visibility toward the nullah. In view of this, the sensitivity of REC1, 2 and 3 are considered as **medium**.

12.5.6.9 Another recreational VSR (REC4) refers to Mei Lam Sports Centre. In view of REC4 is mainly cater for indoor sports activity with partial view toward the nullah. This VSR is less likely to be significantly impacted by the proposed works carried out at the Tai Wai Nullah, hence, it is considered with a **low** sensitivity.

Travelling VSRs (2 Nos.)

12.5.6.10 The remaining type of VSR is travelers who commute along Tai Po Road & Tsing Sha Highway (T1) and Tai Wai Nullah (T2). These viewers have a fair quality of view with relatively short duration of staying. In view of T2 has relatively close distance that commute along the proposed Project and a full visibility when driving across the nullah, its sensitivity is considered as **medium**, whilst that of T1 is considered as **low**.

Table 12.7 Representative Visually Sensitive Receivers in the Vicinity of the Site

ID	VSR Description	Nature	No. of Individuals (Few/ Medium/ Many)	Quality of Existing View (Poor/ Fair/ Good)	Availability of Alternative Views (Yes/ No)	Degree of Visibility (Glimpse/ Partial/ Full)	Frequency of View (Frequent/ Occasional/ Rare)	Sensitivity to Change (High/ Medium/ Low)
Government/ Institutional/ Community (G)								
G1	Tung Wah Group of Hospital Sin Chu Wan Primary School	Institutional/ Government/ Community	Medium	Good	Yes	Full/ Partial	Occasional	Medium
G2	Buddhist Wong Wan Tin College	Institutional/ Government/ Community	Many	Good	Yes	Full/ Partial	Occasional	Medium
G3	Che Kung Temple	Institutional/ Government/ Community	Many	Fair	Yes	Full/ Partial	Occasional	Medium
Industrial (I)								
I1	Industrial Development along Shing Wan Road	Industrial	Medium	Good	Yes	Partial	Occasional	Low
Residential (R)								
R1	Golden Lion Garden	Residential	Many	Fair	Yes	Glimpse	Frequent	Low
R2	Sun Chui Estate	Residential	Many	Fair	Yes	Glimpse	Frequent	Low
R3	Man Lai Court	Residential	Many	Fair	Yes	Partial	Frequent	Medium
R4	Tai Wai Village	Residential	Medium	Fair	Yes	Partial	Frequent	Medium
R5	Residential Development along northern Tai Wai Nullah	Residential	Many	Fair	Yes	Partial	Frequent	Medium
R6	Residential Development along southern Tai Wai Nullah	Residential	Many	Fair	Yes	Partial	Frequent	Medium
R7	Heung Fan Liu New Village	Residential	Medium	Fair	Yes	Partial	Frequent	Medium
R8	Planned Comprehensive Development Area above Tai Wai Station – The Pavilia Farm	Residential	Many	Fair	Yes	Partial	Frequent	Medium
Recreational (REC)								
REC 1	Tai Wai Soccer Pitch & Playground	Recreational	Few	Fair	Yes	Full/ Partial	Occasional	Medium

ID	VSR Description	Nature	No. of Individuals (Few/ Medium/ Many)	Quality of Existing View (Poor/ Fair/ Good)	Availability of Alternative Views (Yes/ No)	Degree of Visibility (Glimpse/ Partial/ Full)	Frequency of View (Frequent/ Occasional/ Rare)	Sensitivity to Change (High/ Medium/ Low)
REC 2	Pok Ngar Villa	Recreational	Few	Fair	Yes	Partial	Occasional	Medium
REC 3	Mei Chuen House Children's Play Area	Recreational	Few	Fair	Yes	Full/ Partial	Occasional	Medium
REC 4	Mei Lam Sports Centre	Recreational	Few	Fair	Yes	Partial	Occasional	Low
Travelling (T)								
T1	Travelers along Tai Po Road & Tsing Sha Highway	Travelling	Medium	Fair	Yes	Partial	Rare	Low
T2	Travelers along Tai Wai Nullah	Travelling	Medium	Fair	Yes	Full	Rare	Medium

12.6 Landscape Impact Assessment

12.6.1 Potential Sources of Landscape Impacts

Construction Phase

12.6.1.1 The construction works for the proposed revitalisation will mainly be carried out within the Tai Wai Nullah, while certain proposed architectural structures will be constructed at the roadside.

12.6.1.2 During the Construction Stage, potential adverse impacts would arise from:

- Potential tree removal;
- Ground-breaking and excavation;
- Final re-surfacing to channel bed;
- Construction of architectural structures, including but not limited to: viewing deck/ platform, footbridge, pavilion & benches, new sitting-out area, railing, stepped terrace and vehicular access etc;
- Construction of hard and soft landscape, including but not limited to hard paving and new thematic Planting.

Operational Phase

12.6.1.3 During the operational phase, only minor maintenance works such as regular clearance and repair of damages to the nullah bed and embankment. Potential impacts would also arise from operation of the architectural structures and recreational facilities.

12.6.2 Magnitude of Landscape Changes

Unmitigated Impacts on LRs – Construction Phase

12.6.2.1 Magnitude of landscape change to LRs are summarised in **Table 12.8** while the significance of unmitigated landscape impact on LRs are illustrated in **Table 12.12**.

12.6.2.2 No construction works will be conducted within LR2, LR4, LR5 and LR6, and therefore 3 identified OVTs in LR6 are not affected by proposed works which will be retained in-situ. No adverse landscape impacts on these LRs are expected during construction phase.

12.6.2.3 The construction works for the Project will lead to temporary adverse landscape impacts to the LR1 and LR3. Subject to actual condition, certain loss of existing vegetation is predicted to occur in these LRs. The impacts will be reversible by thematic planting during implementation of soft landscape works.

12.6.2.4 The whole LR1 will be affected by excavation works, construction of proposed structures as stated in **Section 12.6.1**, and the approximate affected area would be around 74,000m². LR1 will be partially reinstated by hard paving. Considering the temporary and reversible works in medium scale, also the low sensitivity and high ability to accommodate changes of LR1, it is considered to experience “**intermediate**” magnitude of change and “**moderate**” impact significance during construction phase.

12.6.2.5 LR3 will be partly affected by construction works that extend to the side of nullah, such as proposed deck/ platform, footbridge and vehicular access, and also a few trees would be affected. They will be reinstated, or even enhanced by later new plantings. It is estimated that its affected area is approximately 32,000 m². Among 251 nos. of surveyed trees within this LR, 52 nos. of trees would be affected by proposed works, of which 51 nos. are proposed to be removed (including 38 nos. of undesirable species *Leucaena leucocephala*). and 1 no. of tree is proposed to be transplanted on-site. The 5 nos. of TPis identified in this LR will not be affected.

12.6.2.6 Considering the temporary and reversible works in medium scale, also the medium sensitivity and high ability to accommodate changes of LR3, it is considered to experience “**intermediate**” magnitude of change and “**moderate**” impact significance during construction phase.

Unmitigated Impacts on LRs – Operational Phase

- 12.6.2.7 As there will be no built structure within LR2, LR4, LR5 and LR6, no landscape impacts arising from the Project are expected during operation.
- 12.6.2.8 As stated in **Section 12.6.1.3**, only minor maintenance works would be carried out during operational Phase. As the re-surfacing of channel bed and the architectural structures are permanent in nature, therefore both LR1 and LR3 are considered to experience “**small**” magnitude of change and “**slight**” impact significance during operational Phase.

Unmitigated Impacts on LCAs – Construction Phase

- 12.6.2.9 Potential landscape impact to LCAs during both construction and operational Phase have been assessed with identification of their sensitivity and magnitude of change due to proposed Project. Magnitude of landscape change to LCAs are summarised in **Table 12.8** while the significance of unmitigated landscape impact on LCAs are illustrated in **Table 12.12**.
- 12.6.2.10 During construction phase, all LCAs will be affected by the proposed Project. For LCA1, mainly excavation works, modification of channel bed and thematic planting will be undertaken in this area, which vegetation settled in hillside will not be disturbed. Among 179 nos. of surveyed trees within this LCA, 38 nos. of trees would be affected by proposed works and proposed to be removed. The 5 nos. of TPIs identified in this LCA will not be affected.
- 12.6.2.11 Considering the temporary and reversible works in small scale, with approximate affected area of about 58,000m²; the medium sensitivity and high ability to accommodate changes of LCA1, it is considered to experience “**intermediate**” magnitude of change and “**moderate**” impact significance during construction phase.
- 12.6.2.12 Limited periphery area of LCA2, less than 250 m². is overlapped with proposed Project area. Among 16 nos. of surveyed trees within this LCA, 14 nos. would be affected by proposed works which 13 nos. is proposed to be removed and 1 no. is proposed to be transplanted. Considering the high sensitivity and low ability to accommodate changes due to its unique combination of cultural and natural resources, it is considered to experience “**small**” magnitude of change and “**slight**” impact significance during construction phase.
- 12.6.2.13 Large portion of the proposed construction works would take place in LCA3, with approximately affected area of 32,000 m². Most of the proposed construction works, including excavation, modification of channel bed, construction of architectural structures such as viewing deck, pavilion & benches and thematic planting will be undertaken in this area. All 48 nos. of survey trees within this LCA will not be affected by proposed works. 3 identified OVTs in LCA3 are not affected by proposed works which will be retained in-situ. Considering the temporary and reversible works in small scale, also the medium sensitivity of LCA3, it is considered to experience “**intermediate**” magnitude of change and “**moderate**” impact significance during construction phase.
- 12.6.2.14 For LCA4, construction works including new maintenance ramp and hard paving on river bed would be carried out, with estimated affected area of about 9,000m². All 8 nos. of survey trees within this LCA will not be affected by proposed works. Regarding the relatively small size of affected area, and its medium sensitivity, it is considered to experience “**small**” magnitude of change and “**slight**” impact significance during construction phase.
- 12.6.2.15 The south-end part of proposed Project is overlapped to LCA5, which affected area is about 5,000m². Mainly excavation and railing will be undertaken in this area. All 3 nos. of survey trees within this LCA will not be affected by proposed works. Due to its limited landscape elements and low sensitivity, LCA5 is considered to experience “**small**” magnitude of change and “**slight**” impact significance during construction phase.

Unmitigated Impacts on LCAs – Operational Phase

- 12.6.2.16 As stated in **Section 12.6.1**, only minor maintenance works would be carried out during operational Phase. As the re-surfacing of channel bed and architectural structures are permanent in nature and therefore, five LCAs are considered to experience “**small**” magnitude of change and “**slight**” impact significance during operational phase.

Table 12.8 Magnitude of Landscape Change on LRs & LCAs

ID	Description	Area affected by the Project (m ²)	Compatibility of Project (C / O) #	Duration of Impacts (Construction/ Operation)	Reversibility of Change (Construction/ Operation)	Magnitude of Change	
						C#	O#
Landscape Resource (LRs)							
LR1	Watercourse of Shing Mun River Channel and Tai Wai Nullah	74,000	Fair/ High	Temporary/ Permanent	Reversible/ Irreversible	Intermediate	Small
LR2	Natural Watercourse	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
LR3	Waterside Landscape Amenity along Tai Wai Nullah	32,000	Fair/ High	Temporary/ Permanent	Reversible/ Irreversible	Intermediate	Small
LR4	Other Parks/ Gardens along Tai Wai Nullah	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
LR5	Hillside Vegetation	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
LR6	Landscape Amenity within Build-up Area	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
Landscape Character Areas (LCAs)							
LCA1	Miscellaneous Urban Landscape	58,000	Fair	Temporary/ Permanent	Reversible/ Irreversible	Intermediate	Small
LCA2	Residential Urban Fringe Landscape	<250	Fair/ High	Temporary/ Permanent	Reversible/ Irreversible	Small	Small
LCA3	Residential Urban Landscape	32,000	Fair	Temporary/ Permanent	Reversible/ Irreversible	Intermediate	Small
LCA4	"Hui" Urban Landscape	9,000	Fair	Temporary/ Permanent	Reversible/ Irreversible	Small	Small
LCA5	Transportation Corridor Landscape	5,000	Negligible/ Fair	Temporary/ Permanent	Reversible/ Irreversible	Small	Small

Note:

#: "C" = Construction; "O" = Operation

12.7 Visual Impact Assessment

12.7.1 Potential Source of Visual Impacts

Construction Phase

- 12.7.1.1 The proposed channel modification, construction of DWFI system, construction of bankside public open space will be constructed inside the existing Tai Wai Nullah, while certain proposed architectural structures will be constructed at the roadside which may impose visual impact to adjacent VSRs.
- 12.7.1.2 During the Construction Stage, potential adverse visual impacts would arise from:
- Potential tree removal;
 - Ground-breaking and excavation;
 - Final re-surfacing to channel bed;
 - Construction of architectural structures, including but not limited to: viewing deck/ platform, footbridge, pavilion & benches, new sitting-out area, railing, stepped terrace and vehicular access etc;
 - Construction of hard and soft landscape, including but not limited to hard paving and new thematic Planting.
 - Construction of temporary structures including screen hoarding, temporary site office, storage areas or temporary works.
- 12.7.1.3 Additional source of night-time lighting which may affect adjacent VSRs close to proposed Project. As the revitalisation works cover the whole nullah, construction of all above-ground structures and soft landscape works will be the main visual impact to VSRs.

Operational Phase

- 12.7.1.4 During the operational phase, only minor maintenance works such as regular clearance and repair of damages to the nullah bed and embankment. Potential visual impacts would also arise from operation of the architectural structures and recreational facilities.

12.7.2 Recommended Vantage Points for Photomontage

- 12.7.2.1 Key vantage point is selected based on the representative VSRs to further analyses the visual impact of the Project. Photomontage is prepared to demonstrate potential visual impact raised from the proposed Project. The photomontage illustrates the proposed revitalisation of Tai Wai Nullah under the following scenarios in accordance with EIAO Guidance No. 8/2010:
- Existing baseline condition;
 - The unmitigated visual impacts at operation day 1 of the proposed Project;
 - The partially mitigated visual impacts after implementation of the proposed mitigation measures at operational day 1; and
 - The completed works with mitigation after 10 years
- 12.7.2.2 There are total 5 nos. of vantage points, including VP1 – Mei Chuen House Children's Play Area; VP2 – Tsuen Nam Road Overpass; VP3 – Mei King House Podium; VP4 – Mei Shing Court Car Park; and VP5 – Sha Tin Che Kung Temple. Please refer to **Figures 12.06 to 12.11** for Locations of VPs, their representation of VSR and Photomontages of VPs 1 to 5.

12.7.3 Magnitude of Visual Impacts

- 12.7.3.1 Assessment on potential magnitude and significance of unmitigated visual impacts during construction and operational Phases are shown in **Table 12.9** and assessment on potential magnitude of change and significance of mitigated visual impacts are detailed in **Table 12.13**.

G1 - Tung Wah Group of Hospitals Sin Chu Wan Primary School , G2 – Buddhist Wong Wan Tin College & G3 The Sha Tin Che Kung Temple

- 12.7.3.2 Viewers from G1 and G2 are teachers and students, with occasional frequency of views. As they are mostly engaged in educational activities within the multi-storey buildings, there

will be no significant obstruction of view during construction and operational Phases as those works are proposed at a level lower than where the VSRs are located at. The magnitude of change to G1 and G2 are considered to be “small” and the significance of unmitigated impact is “slight” during both construction and operational Phases. Photomontages of G1 and G2 are illustrated in VP2 and VP4 respectively. Whilst, G3 refers to devotees and visitors that come to worship Che Kung. In view of the users are mainly having activities within the Temple, their views toward the nullah are occasional with no significant obstruction of their view by the construction activities. Therefore, the magnitude of change to G3 is considered to be “small” and the significance of unmitigated impact is “slight” during both construction and operational Phases. Photomontage of G3 is illustrated in VP5.

I1 - Industrial Development along Shing Wan Road

- 12.7.3.3 Viewers from I1 are mainly workers from medium-rise industrial buildings along Shing Wan Road during working hour. In view of they are engaged in working activities, the VSR has a low sensitivity towards the proposed works at Nullah. There will be no significant obstruction of view nor loss of visual resources toward in their viewpoint, the magnitude of change to I1 is considered to be “small” and the significance of unmitigated impact is “slight” during both construction and operational Phases, photomontage of I1 is illustrated in VP2.

R1 - Golden Lion Garden & R2 - Sun Chui Estate

- 12.7.3.4 Viewers from R1 and R2 are residents in Golden Lion Garden and Sun Chui Estate with up to 400m and 200m viewing distance respectively. Due to their long viewing distance among all VSRs, and relatively small-scale of proposed above-ground structures, the magnitude of change to R1 and R2 are considered to be “negligible” and the significance of unmitigated impact is “insubstantial” during both construction and operational Phases. Details of mitigation impacts on R1 & R2 is illustrated in VP5.

R3 - Man Lai Court, R5 - Residential Development along northern Tai Wai Nullah & R6 - Residential Development along southern Tai Wai Nullah

- 12.7.3.5 Viewers from these VSRs are residents from high-rise housing estates alongside to Tai Wai Nullah to be visually impacted by proposed works. There will be no large alteration on their openness of view toward the nullah as their sightline are generally overlooking the nullah with negligible blockage of their current view. As the visual composition in the view will only be slightly impacted by the proposed development. The magnitude of change to R3, R5 and R6 are considered to be “small”, the significance of unmitigated impact is “slight” during both construction and operational Phases since the construction works taken place are not visually prominent in their viewpoint e.g. re-surfacing of channel bed and architectural structures. Photomontage of R3, R5 and R6 are illustrated in VP2, VP4 and VP3 respectively.

R4 - Tai Wai Village & R7 - Heung Fan Liu New Village

- 12.7.3.6 Viewers from R4 and R7 refers to residents who live in low-rise village house near the Tai Wai Nullah. Given the locations of the low-rise village houses, their views toward the nullah are partially blocked by vegetation or existing building at their foreground, not much direct sightline towards the nullah is found among these VSRs. Hence, no obvious obstruction of view is expected to these VSRs, their magnitude of change are therefore considered to be “small” and the significance of unmitigated impact is “slight” during both construction and operational Phases. Photomontage of R4, R7 are illustrated in VP2 and VP3 respectively.

R8 - Planned Comprehensive Development Area above Tai Wai Station – The Pavilia Farm

- 12.7.3.7 R8 represents the future residents of The Pavilia Farm in the planned comprehensive development above Tai Wai Station, they have a short viewing distance of about 25m. Residential building blocks in the planned development will be high-rise buildings. Given that they are currently enjoying a wide panorama view of skyline with lush greenery as backdrop, the proposed work at Tai Wai Nullah and the corresponding works during construction or operational Phases would not create significant blockage or degradation in amenity of their views, the magnitude of change to R8 is considered to be “small” and the

significance of unmitigated impact is “slight” during both construction and operational Phases. Photomontage of R8 is illustrated in VP2 respectively.

REC1 - Tai Wai Soccer Pitch & Playground, REC2 - Pok Ngar Villa, REC3 - Mei Chuen House Children’s Play Area & REC4 – Mei Lam Sports Centre

- 12.7.3.8 Viewers from REC1 are users of public facilities, in which there are limited windows perceiving the outdoor area. There will not be visual blockage to viewers, especially with rare frequency of users viewing from these building. On the other hand, viewers from REC2 are visitors to the Pok Ngar Villa. With walls surrounding the park. it has not much visual connection with the nullah view. Whilst, viewers from REC3 are users of playground, which is 3 sides of the park are surrounded by building blocks which can hardly perceive the nullah area.
- 12.7.3.9 In the light of the above and the activities that the VSRs are having, the proposed work at nullah will not be visually prominent in their views. Hence, the magnitude of change to REC1 – 3 are considered to be “small” and the significance of unmitigated impact is “slight” during both construction and operational Phases.
- 12.7.3.10 For viewers from REC4 are users of the sports centre who come to enjoy indoor activities with only partial view, they have a low sensitivity towards the proposed works at Nullah, in the light of the negligible potential blockage of view by the development, the magnitude of change to REC4 is considered to be “small” throughout the construction and operational Phases. The significance of unmitigated impact is “slight” during both construction and operational Phases. Photomontage of REC1, 3 are illustrated in VP2 and VP1 respectively. Photomontage of REC2 and 4 are illustrated in VP4.

T1 - Travelers along Tai Po Road & Tsing Sha Highway & T2 - Tai Wai Nullah

- 12.7.3.11 Travelers from T1 are mostly drivers and passengers on Tai Po Road who has a short duration of staying with passing views towards the proposed Project area. There will not be potential blockage of view nor loss of visual resources, as the highway is elevated and proposed above-ground structures are small-scale. On the other hand, travelers from T2 intend to enjoy the full degree of visibility of views and facilities within the nullah. There will not be significant visual blockage, while new sitting platforms and viewing decks will be constructed which provides better angle of appreciation for visitors. Considering the above, the magnitude of change to T1 is “small” while that to T2 is “intermediate”. Given the “low” and “medium” sensitivity for T1 and T2, the significance of unmitigated impact is “slight” for T1 and “moderate” for T2 during both construction and operational Phases. Photomontage of T1 and 2 are illustrated in VP2 and 1 respectively.

Table 12.9 Magnitude of Visual Change

ID	VSR Description	Viewing Distance (m)	Compatibility of the Project (High/ Medium/ Low)	Duration of Impacts (C/O) #	Scale of Works	Reversibility of Change (C/O) #	Potential Blockage of View by Development (Full/ Partial/ Negligible)	Magnitude of Change (C/O) #	Significance of unmitigated impact (C/O)#
Government/ Institutional/ Community (G)									
G1	Tung Wah Group of Hospital Sin Chu Wan Primary School	20 - 30	High	Temporary / Permanent	Intermediate	Yes / No	Negligible	Small / Small	Slight/ Slight
G2	Buddhist Wong Wan Tin College	20 - 30	High	Temporary / Permanent	Intermediate	Yes / No	Negligible	Small/ Small	Slight/ Slight
G3	The Sha Tin Che Kung Temple	100	High	Temporary / Permanent	Intermediate	Yes/ No	Negligible	Small/ Small	Slight/ Slight
Industrial (I)									
I1	Industrial Development along Shing Wan Road	20 - 30	High	Temporary / Permanent	Intermediate	Yes/ No	Negligible	Small/ Small	Slight/ Slight
Residential (R)									
R1	Golden Lion Garden	400	High	Temporary / Permanent	Intermediate	Yes/ No	Negligible	Negligible/ Negligible	Insubstantial/ Insubstantial
R2	Sun Chui Estate	200	High	Temporary / Permanent	Intermediate	Yes/ No	Negligible	Negligible/ Negligible	Insubstantial/ Insubstantial
R3	Man Lai Court	20 - 30	High	Temporary / Permanent	Intermediate	Yes/ No	Negligible	Small/ Small	Slight/ Slight
R4	Tai Wai Village	50	High	Temporary/ Permanent	Intermediate	Yes/ No	Negligible	Small/ Small	Slight/ Slight
R5	Residential Development along northern Tai Wai Nullah	15 - 30	High	Temporary/ Permanent	Intermediate	Yes/ No	Negligible	Small/ Small	Slight/ Slight
R6	Residential Development along southern Tai Wai Nullah	50 - 100	High	Temporary/ Permanent	Intermediate	Yes/ No	Negligible	Small/ Small	Slight/ Slight
R7	Heung Fan Liu New Village	50 - 100	High	Temporary/ Permanent	Intermediate	Yes/ No	Negligible	Small/ Small	Slight/ Slight

ID	VSR Description	Viewing Distance (m)	Compatibility of the Project (High/ Medium/ Low)	Duration of Impacts (C/O) #	Scale of Works	Reversibility of Change (C/O) #	Potential Blockage of View by Development (Full/ Partial/ Negligible)	Magnitude of Change (C/O) #	Significance of unmitigated impact (C/O)#
R8	Planned Comprehensive Development Area above to Tai Wai Station – The Pavilia Farm	30 - 50	High	Temporary/ Permanent	Intermediate	Yes/ No	Negligible	Small/ Small	Slight/ Slight
Recreational (REC)									
REC1	Tai Wai Soccer Pitch & Playground	Adjacent	High	Temporary/ Permanent	Intermediate	Yes/ No	Negligible	Small/ Small	Slight/ Slight
REC2	Pok Ngar Villa	10 - 20	High	Temporary/ Permanent	Intermediate	Yes/ No	Negligible	Small/ Small	Slight/ Slight
REC3	Mei Chuen House Children's Play Area	20 - 40	High	Temporary/ Permanent	Intermediate	Yes/ No	Negligible	Small/ Small	Slight/ Slight
REC4	Mei Lam Sports Centre	10 - 20	High	Temporary/ Permanent	Intermediate	Yes/ No	Negligible	Small/ Small	Slight/ Slight
Travelling (T)									
T1	Travelers along Tai Po Road & Tsing Sha Highway	15-30	High	Temporary/ Permanent	Intermediate	Yes/ No	Negligible	Small/ Small	Slight/ Slight
T2	Travelers along Tai Wai Nullah	Adjacent	High	Temporary/ Permanent	Intermediate	Yes/ No	Partial	Intermediate/ Intermediate	Moderate/ moderate

Note:

#: "C" = Construction; "O" = Operation

12.8 Landscape and Visual Mitigation Measures

12.8.1.1 In the light of the potential landscape and visual impacts arising from proposed Project in previous sections, numerous of mitigation measures are proposed to alleviate the effects during construction and operational Phases. They are summarised in the following **Table 12.10** and **Table 12.11**. The landscape and visual mitigation plan are provided in **Figure 12.12** and **Figure 12.13**.

Table 12.10 Proposed Mitigation Measures for Construction Phase

ID	Landscape and Visual Mitigation Measures	Funding Agency	Implementation Agency
CM1	<p><u>Tree Preservation during Construction</u> All existing trees to be retained shall be carefully protected during construction. Tree protection works shall be in accordance with DEVB TC(W) No. 4/2020 - Tree Preservation and Tree Management Practice Note No. 1 – Tree Preservation during Construction.</p> <p>The 5 nos. of Trees of Particular Interest (TPIs) identified within the site boundary will be preserved in-situ. For the 3 nos. of identified OVTs within 100m assessment area outside of the Project boundary, although they are not affected by proposed works, tree maintenance departments/ their agents are required to follow the respective requirements as stipulated in Para.16 - 32 of DEVB TC(W) No. 5/2020 to preserve the OVTs in the Register.</p>	DSD / LCSD	DSD / LCSD / Contractor
CM2	<p><u>Erection of Decorative Screen Hoarding</u> Decorative Hoarding, which is compatible with the surrounding settings, shall be erected during construction to minimise the potential landscape and visual impacts due to the construction works and activities.</p>	DSD	DSD / Contractor
CM3	<p><u>Control of Night-time Lighting Glare</u> Any lighting provision of the construction works at night shall be carefully controlled to prevent light overspill to the nearby VSRs and into the sky.</p>	DSD	DSD / Contractor
CM4	<p><u>Management of Construction Activities and Facilities</u> The facilities and activities at works sites and areas, which include site office, temporary storage areas, temporary works etc., shall be carefully managed and controlled on the height, deposition and arrangement to minimise any potential adverse landscape and visual impacts.</p>	DSD	DSD / Contractor
CM5	<p><u>Reinstatement of Temporarily Disturbed Landscape Areas</u> All hard and soft landscape areas disturbed temporarily during construction due to temporary excavations, temporary works sites and works areas shall be reinstated to equal or better quality, to the satisfaction of the relevant Government Departments.</p>	DSD	DSD / Contractor
CM6	<p><u>Reinstatement of Temporarily Disturbed Watercourses</u> Temporarily disturbed watercourses shall be reinstated to the satisfaction of relevant Government Departments. Good site practices as described in ETWB TCW No. 5/2005 “Protection of natural streams/rivers from adverse impacts arising from construction works” shall also be adopted to avoid any pollution entering the watercourses nearby where applicable.</p>	DSD	DSD / Contractor

Table 12.11 Proposed Design / Mitigation Measures for Operational Phase

ID	Landscape and Visual Mitigation Measures	Funding Agency	Implementation Agency
OM1	<p><u>Greening Enhancement along Channel Bed and Embankment</u> The existing concrete riverbed and embankment will be resurfaced by a layer of vegetation, which will enhance the aesthetic value of the nullah. The riverbed will be planted with various types of riparian and wetland plants while the river embankment will be covered by various types of climbers or trailing plants along the parapet planters.</p>	DSD	DSD / Contractor Long-term Maintenance Party*: DSD
OM2	<p><u>Provision of Recreational Opportunity along Nullah</u> The provision and improvement of recreational facilities including but not limited to sitting-out areas, thematic planting, play elements, viewing decks, gathering points, proposed 3km walkways, improvement/ modification of planters, water play zone etc along the nullah aim to enhance the ecological, landscape and visual value of the nullah, provide a greener environment, promote water friendliness and improve the community environment.</p>	DSD	DSD / Contractor Long-term Maintenance Party*: DSD / LCSD
OM3	<p><u>Compensatory Tree Planting</u> Any trees to be felled under the Project shall be compensated in accordance with DEVB TC(W) No. 4/2020 - Tree Preservation. A Tree Preservation and Removal Proposal (TPRP) shall be prepared and submitted under the DEVB TC(W) No. 4/2020 by Contractor. The compensatory plantings shall be realistic, practicable and sustainable with a holistic consideration to balance the quantity and quality of tree planting and follow the “right tree for the right place” principles. The proposed planting species shall be made reference to the Greening Master Plan issued by CEDD and the Street Tree Selection Guide issued by DEVB.</p> <p>According to latest tree treatment proposal, 51 nos. of trees would be removed due to proposed works, including 38 nos. of undesirable species (i.e. <i>Leucaena leucocephala</i>). As stipulated in DEVB TC(W) No. 4/2020, “...the number of compensatory trees onsite and offsite shall not be lower than that of number of trees removed including dead trees, but excluding trees of undesirable species...”, therefore, compensation of the undesirable <i>Leucaena leucocephala</i> would not be required and only 13 nos. of trees would need to be compensated. Nonetheless, to compensate the loss of existing trees and to further enhance greening and the amenity value to vicinity of site, approximately 28 nos. of heavy standard compensatory trees are proposed to be planted at available planting area on-site, subject to detailed design.</p>	DSD	DSD / Contractor Long-term Maintenance Party*: DSD / LCSD
OM4	<p><u>Sensitive and Aesthetically Pleasing Design</u> Sensitive and aesthetically pleasing design as regard to the form, material and finishes shall be incorporated to the proposed above-ground structures e.g. pavilions, seating areas, viewing decks, railings along the nullah etc so as to minimise any potential adverse landscape and visual impact.</p>	DSD	DSD / Contractor Long-term Maintenance Party*: DSD / LCSD
OM5	<p><u>Tree Transplanting</u> According to latest tree treatment proposal, 1 no. of tree that is unavoidably affected by proposed works is</p>	DSD	DSD / Contractor

ID	Landscape and Visual Mitigation Measures	Funding Agency	Implementation Agency
	<p>suggested to be transplanted where practical. A TPRP will be submitted to relevant government departments for approval in accordance with DEVB TC(W) No. 6/2015 - Maintenance of Vegetation and Hard Landscape Features and DEVB TC(W) No. 4/2020 - Tree Preservation, and 4/2020 and Guidelines on Tree Transplanting by DEVB and final locations of transplanted trees should be agreed prior to commencement of the work.</p> <p>A cost-effective transplanting strategy should be established at the Design Phase of the Project. Transplanted trees are recommended to be relocated to final locations without the use of Holding Nursery under single handling where possible subject to the sequence of construction of the works. This will minimize the cost and ensure the better survival of the trees after transplanting. However, if single transplanting handling is not possible, the transplanted trees shall be translocated to a holding nursery before the commencement of the engineering works; and will be replanted back to the receptor sites once the engineering works are completed.</p>		<p>Long-term Maintenance Agent*: DSD / LCSD</p>

Note:

*In case of interface issues between DSD (Project Proponent) and LCSD facilities, the arrangement of long-term maintenance/management agencies are subject to agreement of with corresponding departments in accordance with DEVB TCW No. 6/2015 - Maintenance of Vegetation and Hard Landscape Features.

Table 12.12 Significance of Landscape Impact on LRs & LCAs

ID	Description	Sensitivity	Magnitude of Change BEFORE Mitigation		Impact Significance Threshold BEFORE Mitigation		Recommended Mitigation Measures	Residual Impact Significance Threshold UPON Mitigation		
			C#	O#	C#	O#		C & O#	C#	O#
							Day 1			Year 10
Landscape Resource (LRs)										
LR1	Watercourse of Shing Mun River Channel and Tai Wai Nullah	Low	Intermediate	Small	Moderate	Slight	CM2, CM3, CM4, CM6, OM1, OM2 & OM4	Slight	Slight	Insubstantial
LR2	Natural Watercourse	High	Negligible	Negligible	Insubstantial	Insubstantial	N/A	Insubstantial	Insubstantial	Insubstantial
LR3	Waterside Landscape Amenity along Tai Wai Nullah	Medium	Intermediate	Small	Moderate	Slight	CM1, CM2, CM3, CM4, CM5, OM2, OM3, OM4 & OM5	Slight	Slight	Insubstantial
LR4	Other Parks/ Gardens along Tai Wai Nullah	Medium	Negligible	Negligible	Insubstantial	Insubstantial	N/A	Insubstantial	Insubstantial	Insubstantial
LR5	Hillside Vegetation	High	Negligible	Negligible	Insubstantial	Insubstantial	N/A	Insubstantial	Insubstantial	Insubstantial
LR6	Landscape Amenity within Build-up Area	Medium	Negligible	Negligible	Insubstantial	Insubstantial	N/A	Insubstantial	Insubstantial	Insubstantial
Landscape Character Areas (LCAs)										
LCA1	Miscellaneous Urban Landscape	Medium	Intermediate	Small	Moderate	Slight	CM1, CM2, CM3, CM4, CM5, CM6, OM1, OM2, OM3, OM4 & OM5	Slight	Slight	Insubstantial
LCA2	Residential Urban Fringe Landscape	High	Small	Small	Slight	Slight	CM1, CM2, CM3, CM4, CM5, CM6, OM1, OM2, OM3 & OM4	Slight	Insubstantial	Insubstantial
LCA3	Residential Urban Landscape	Medium	Intermediate	Small	Moderate	Slight	CM1, CM2, CM3, CM4, CM5, CM6, OM1, OM2, OM3 & OM4	Slight	Slight	Insubstantial
LCA4	“Hui” Urban Landscape	Medium	Small	Small	Slight	Slight	CM1, CM2, CM3, CM4, CM5, CM6, OM1, OM2, OM3 & OM4	Slight	Insubstantial	Insubstantial
LCA5	Transportation Corridor Landscape	Low	Small	Small	Slight	Slight	CM1, CM2, CM3, CM4, CM5, CM6, OM1, OM2, OM3 & OM4	Slight	Insubstantial	Insubstantial

Note:

#: “C” = Construction; “O” = Operation

Table 12.13 Significance Thresholds of Visual Impacts

ID	Description	Represented VP	Sensitivity	Magnitude of Change BEFORE Mitigation		Impact Significance Threshold BEFORE Mitigation		Recommended Mitigation Measures	Residual Impact Significance Threshold UPON Mitigation			
				C#	O#	C#	O#		C & O #	C#	O#	
											Day 1	Year 10
Institutional (G)												
G1	Tung Wah Group of Hospital Sin Chu Wan Primary School	VP2	Medium	Small	Small	Slight	Slight	CM1, CM6, OM1, OM4	Slight	Insubstantial	Insubstantial	
G2	Buddhist Wong Wan Tin College	VP4	Medium	Small	Small	Slight	Slight	CM1, CM2, OM1, OM2 & OM4	Slight	Insubstantial	Insubstantial	
G3	The Sha Tin Che Kung Temple	VP5	Medium	Small	Small	Slight	Slight	CM1, CM2, CM3, CM4 & OM4	Slight	Insubstantial	Insubstantial	
Industrial (I)												
I1	Industrial Development along Shing Wan Road	VP2	Low	Small	Small	Slight	Slight	CM1, CM6, OM1, OM4	Slight	Insubstantial	Insubstantial	
Residential (R)												
R1	Golden Lion Garden	VP5	Low	Negligible	Negligible	Insubstantial	Insubstantial	Insubstantial	Insubstantial	Insubstantial	Insubstantial	
R2	Sun Chui Estate	VP5	Low	Negligible	Negligible	Insubstantial	Insubstantial		Insubstantial	Insubstantial	Insubstantial	
R3	Man Lai Court	VP2	Medium	Small	Small	Slight	Slight	CM1, CM6, OM1, OM4	Slight	Insubstantial	Insubstantial	
R4	Tai Wai Village	VP2	Medium	Small	Small	Slight	Slight		Slight	Insubstantial	Insubstantial	
R5	Residential Development along northern Tai Wai Nullah	VP4	Medium	Small	Small	Slight	Slight	CM1, CM2, OM1, OM2 & OM4	Slight	Insubstantial	Insubstantial	
R6	Residential Development along southern Tai Wai Nullah	VP3	Medium	Small	Small	Slight	Slight	CM1, CM6, OM1	Slight	Insubstantial	Insubstantial	

ID	Description	Represented VP	Sensitivity	Magnitude of Change BEFORE Mitigation		Impact Significance Threshold BEFORE Mitigation		Recommended Mitigation Measures	Residual Impact Significance Threshold UPON Mitigation			
				C#	O#	C#	O#		C & O #	C#	O#	
											Day 1	Year 10
R7	Heung Fan Liu New Village	VP3	Medium	Small	Small	Slight	Slight		Slight	Insubstantial	Insubstantial	
R8	Planned Comprehensive Development Area above Tai Wai Station – The Pavilia Farm	VP2	Medium	Small	Small	Slight	Slight	CM1, CM6, OM1, OM4	Slight	Insubstantial	Insubstantial	
Recreational (REC)												
REC1	Tai Wai Soccer Pitch & Playground	VP2	Medium	Small	Small	Slight	Slight	CM1, CM6, OM1, OM4, & OM5	Slight	Insubstantial	Insubstantial	
REC2	Pok Ngar Villa	VP4	Medium	Small	Small	Slight	Slight	CM1, CM2, OM1, OM2 & OM4	Slight	Insubstantial	Insubstantial	
REC3	Mei Chuen House Children's Play Area	VP1	Medium	Small	Small	Slight	Slight	CM1, CM5, CM6, OM1, OM2 & OM4	Slight	Insubstantial	Insubstantial	
REC4	Mei Lam Sports Centre	VP4	Low	Small	Small	Slight	Slight	CM1, CM2, OM1, OM2 & OM4	Slight	Insubstantial	Insubstantial	
Travelling (T)												
T1	Travelers along Tai Po Road & Tsing Sha Highway	VP2	Low	Small	Small	Slight	Slight	CM1, CM6, OM1 & OM4	Slight	Insubstantial	Insubstantial	
T2	Travelers along Tai Wai Nullah	VP1	Medium	Intermediate	Intermediate	Moderate	Moderate	CM1, CM5, CM6, OM1, OM2, OM4 & OM5	Moderate	Slight	Slight	

Note:

#: "C" = Construction; "O" = Operation

12.9 Residual Impacts

12.9.1 Significance of Residual Landscape Impact

- 12.9.1.1 Assuming proper implementation of mitigation measures for construction and operational Phases as stated in previous Table 12.10, Table 12.11 and Table 12.12, the residual impact for LRs and LCAs are discussed as below:
- 12.9.1.2 During construction phase, CM2 - Erection of Decorative Screen Hoarding, CM3 - Control of Night-time Lighting Glare and CM4 - Management of Construction Activities and Facilities will reduce the landscape impact generated by construction works for LR1, LR3 and LCA1 - 5. CM1 - Tree Preservation during Construction and CM5 - Reinstatement of Temporarily Disturbed Landscape Areas will help to protect trees and landscape area for LR3 and LCA1 - 5. Lastly, CM6 will help to reinstate the disturbed watercourse area for LR1 and LCA1 - 5.
- 12.9.1.3 Overall, after well-implemented mitigation measures, residual landscape impact of LR1, LR3, LCA1, LCA3 will be reduced from “**moderate**” to “**slight**” while LCA2, LCA4 and LCA5 will remain as “**slight**”.
- 12.9.1.4 During operational Phase, OM2 - Provision of Recreational Opportunity along Nullah and OM4 - Sensitive and Aesthetically Pleasing Design would help to enhance the overall aesthetics for LR1, LR3 and LCA1 - LCA5. While OM1 - Greening Enhancement along Channel Bed and Embankment is applicable to nullah area including LR1 and LCA1 - LCA5. For landscape impacts generated from unavoidable tree removal in LR3 and LCA1 - LCA5, it can be mitigated by OM3 - Compensatory Tree Planting. Overall, residual landscape impacts of LCA2, LCA4 and LCA5 will be further reduced to “**insubstantial**” at Day 1 and Year 10 of operation, while LR1, LR3, LCA1, LCA3 will be “**slight**” at Day 1 and further reduced to “**insubstantial**” upon Year 10 of operation.

12.9.2 Residual Visual Impact

- 12.9.2.1 Assuming proper implementation of mitigation measures for construction and operational Phases as stated in previous Table 12.10, Table 12.11 and Table 12.13, the residual impact for identified VSRs are discussed as below:
- 12.9.2.2 During construction phase, Mitigation measures including CM1 - Tree Preservation during Construction, CM2 - Erection of Decorative Screen Hoarding, CM3 - Control of Night-time Lighting Glare, CM4 - Management of Construction Activities and Facilities, CM5 - Reinstatement of Temporarily Disturbed Landscape Areas, and CM6 – Reinstatement of Temporarily Disturbed Watercourses will reduce the visual impacts generated by construction works for G1 – G3, I1, R3 - R8, REC1 – REC4 and T1 – T2. For instance, measures like night-time lighting glare and preserved trees are anticipated to partially screen-off the construction works and minimize the nuisance induced from construction of temporary structures. Hence, the residual impact significance is regarded as “**slight**” during construction phase, except for T2 which may still have “**moderate**” residual impact on commuters who used to have full visibility of the nullah at a relatively close distance. Whilst for R1 and R2 will have “**insubstantial**” impact significance throughout the construction to operational phases as they are having a relatively longer viewing distance among other VSRs.
- 12.9.2.3 During operational phase with implementation of mitigation measures, OM1 - Greening Enhancement along Channel Bed and Embankment and OM4 - Sensitive and Aesthetically Pleasing Design, there will be “**insubstantial**” residual visual impacts for most of the VSRs including G1 – G3, I1, R3 - R8, REC1 – REC4 and T1, as there would be visual upgradation on the riverbed and embankment with plantation various of riparian, wetland plants and climbers. For T2, there will be “**slight**” residual visual impacts upon completion of mitigation measures (OM1, OM2, OM4 & OM5) at Day1 and Year 10 of operational phase. OM2 - Provision of new landscaping works and recreational facilities along the nullah proposed in this Project can have beneficial impact, serving as another gathering ground for the VSRs throughout the operational Phase. OM5 - Trees Transplanting is also considered in order to preserve existing trees as far as practicable and maintain the amenity value within the neighbourhood.

12.10 Cumulative Impacts

- 12.10.1.1 In addition to those concurrent government projects listed in **Section 2.8** of this EIA Report, a comprehensive development area adjoining the Tai Wai Station including private residential development within the assessment area has already been considered and assessed in this landscape and visual impact assessment, which may impose cumulative landscape and visual impact.
- 12.10.1.2 The development has already been considered and assessed in **Section 12.6**, which included in visually sensitive receiver as R8 - Planned Comprehensive Development Area next to Tai Wai Station.
- 12.10.1.3 In consideration of the above concurrent development will not cause significant landscape and visual impact during construction and operational Phase, major adverse cumulative impacts are not anticipated.

12.11 Environmental Monitoring and Audit

- 12.11.1.1 The landscape and visual mitigation measures as aforementioned in **Section 12.8** shall be incorporated into the detail landscape and engineering design of the Project to mitigate the landscape and visual impacts as much as possible. A specialist landscape sub-contractor should be employed by the Contractor for the construction of the landscape works and subsequent maintenance during establishment period. A detailed tree survey and topographic survey showing the site conditions should be prepared prior to commencement of works. Detailed tree survey should be prepared by an Arborist accredited by the Hong Kong Institute of Landscape Architects or equivalent employed by the Contractor. For proper implementation of the measures, a Registered Landscape Architect (RLA) will be employed to check the detailed tree survey and to prepare the Tree Preservation and Removal Proposal (TPRP) as required in the DEVB TC(W) No. 4/2020 - Tree Preservation.
- 12.11.1.2 A baseline review should be undertaken at the commencement of the construction contracts to update the status of LRs, LCAs and VSRs and submitted to EPD and PlanD for record.
- 12.11.1.3 The implementation of the recommended mitigation measures should be regularly audited throughout the construction phase. Details of the environmental monitoring and audit (EM&A) requirements are provided in the separate EM&A Manual. As the operation landscape and visual mitigation measures would be provided during the construction phase, no specific EM&A programme is required during operational Phase.

12.12 Conclusion

- 12.12.1.1 During construction phase, the proposed channel modification and construction of DWFI system and mid-stream water pumps for ecological enhance associated water supplement will be constructed inside the existing Tai Wai Nullah, while some proposed architectural structures will be constructed at the roadside for enhancement of public open space which may impose visual impact to adjacent VSRs. Based on the broad-brush tree survey, amongst the 254 nos. of surveyed trees, 202 nos. are proposed to be retained, including all existing mature trees growing along the nullah banks. According to the latest tree treatment proposal, 1 no. of tree of common species (i.e. *Sterculia lanceolata*) will be transplanted on-site, and 13 nos. of common species of trees (i.e. *Ficus elastica*, *Ficus subpisocarpa* and *Sterculia lanceolata*) and 38 nos. of undesirable species (i.e. *Leucaena leucocephala*) are proposed to be removed. As stipulated in DEVB TC(W) No. 4/2020, "...the number of compensatory trees onsite and offsite shall not be lower than that of number of trees removed including dead trees, but excluding trees of undesirable species...", therefore, compensation of the undesirable *Leucaena leucocephala* would not be required and only 13 nos. of trees would need to be compensated. Nonetheless, to compensate the loss of existing trees and to further enhance greening and the amenity value to vicinity of site, approximately 28 nos. of heavy standard compensatory trees are proposed to be planted at available planting area on-site. With proper implementation of mitigation measures, all affected LRs and LCAs would have "moderate" to "insignificant" adverse landscape impacts. Whilst all affected VSRs would have "slight" or "insubstantial"

adverse visual impacts except for T2 which would have “moderate” adverse impacts during construction phase. During operational phase with implementation of mitigation measures, there will be “insubstantial” residual visual impacts for most of the VSRs except for T2, which will have “slight” residual impact significance upon completion of mitigation measures (OM1, OM2, OM4 & OM5) at Day1 and at Year 10 of operational phase. The provision of new landscaping works and recreational facilities along the nullah proposed in this Project can have beneficial impact to the VSRs throughout the operational phase.

- 12.12.1.2 Tai Wai Nullah will be revitalised with architectural and landscape features aimed at promoting water friendliness and providing an enhanced green and ecological environment. The proposed architectural and landscape features and modified channel bed would be the key sources of visual and landscape changes during operation. With proper implementation of landscape and visual measures, namely greening enhancement along channel bed and embankment, provision of recreational opportunity along nullah, sensitive and aesthetically pleasing design, re-provision of affected open space, the landscape and visual impacts are considered in compliance with Annexes 10 and 18 of the EIAO-TM and the EIA Study Brief No. ESB-320/2019.

13 ENVIRONMENTAL MONITORING & AUDIT REQUIREMENTS

13.1 Introduction

13.1.1.1 This section elaborates the requirements of environmental monitoring and audit (EM&A) for the construction and operational phases of the Project, based on the assessment results of the various environmental issues.

13.1.1.2 The purpose of the EM&A programme is to ascertain and verify the assumptions implicit to, and accuracy of, EIA study predictions. The EM&A programme includes the scope of the EM&A requirements for the Project to ensure compliance with the EIA study recommendations, to assess the effectiveness of the recommended mitigation measures and to identify any further need for additional mitigation measures or remedial action.

13.1.1.3 The following sections summarise the recommended EM&A requirements for this Project. Details of the requirements are provided in a stand-alone EM&A Manual.

13.2 Air Quality Impact

13.2.1.1 Since the construction works of the Project would be divided into sections which are in small scale, the air quality impacts would be localised and minor, and would be well controlled through the implementation of standard good site practices and dust suppression measures stipulated in the *Air Pollution Control (Construction Dust) Regulation* as well as the proposed air pollution control measures to minimise the exhaust emissions from NRMMS and odour nuisance. No adverse air quality impact due to the construction of the Project would therefore be anticipated. Nonetheless, dust monitoring is recommended near mid-stream TWN (sections 2 to 4 of TWN) during construction phase to ascertain that there would be no adverse cumulative dust impacts at the nearby sensitive receivers due to this Project and the concurrent construction with the interfacing Revised Trunk Road T4, which site area overlaps with this Project. Regular weekly site environmental audit is also recommended to ensure the implementation of recommended mitigation measures during the construction phase. Details of the audit programme are contained in a stand-alone EM&A Manual. No EM&A programme is required during the operational phase.

13.3 Noise Impact

13.3.1.1 Noise monitoring is recommended as part of the environmental monitoring and audit (EM&A) programme for the construction phase of the Project to check compliance with the daytime construction noise criteria. Weekly site audit is also recommended to ensure the proper implementation of the recommended mitigation measures for daytime construction activities as part of the EM&A programme. Details of the EM&A requirements are provided in the EM&A Manual.

13.3.1.2 No adverse noise impact is anticipated during the operation of the proposed underground water pumps at mid-stream of TWN based on the plant inventory provided by the Project Engineer at the time of the assessment and that of the proposed UV disinfection system provided that it is properly designed to meet the maximum allowable sound power level. Commissioning test should be conducted prior to operation of the Project to ensure that the fixed plant noise impact would comply with the relevant noise standards. No EM&A programme is required during the operational phase.

13.4 Water Quality Impact

13.4.1.1 With proper implementation of the recommended pollution control measures, water pollution from the Project would be avoided and minimised and no adverse water quality impacts would be expected during construction and operational phases. Water quality monitoring is therefore not considered necessary. Nonetheless, weekly site audit should be undertaken during the construction phase to ensure the recommended pollution control measures are properly implemented.

13.4.1.2 While the Project is expected to improve the overall water quality of TWN and EM&A for water quality is not considered necessary for the operational phase under this EIA study, a

post-revitalisation water quality monitoring programme to review compliance with the Water Quality Goals as stipulated in DSD PN No. 3/2021 will be established and implemented by the DSD.

13.5 Waste Management Implications

- 13.5.1.1 Waste management would be the contractor's responsibility to ensure that all wastes produced during the construction of the Project are handled, stored and disposed of in accordance with the recommended good waste management practices and relevant legislation and waste management guidelines. The recommended mitigation measures should form the basis of the site Waste Management Plan (WMP) to be developed by the Contractors as part of the Environmental Management Plan in accordance with ETWB TC(W) No. 19/2005 *Environmental Management on Construction Sites* and submitted to the Architect/Engineer for approval in the construction phase. The monitoring and auditing requirement stated in ETWB TCW No.19/2005 should be followed with regard to the management of C&D materials.
- 13.5.1.2 Monthly site audit should be conducted by the Environmental Team (ET) during the construction phase to check if wastes are being managed in accordance with approved procedures. The audit should cover site inspection on all aspects of on-site waste management practices including waste generation, storage, recycling, transport and disposal. Apart from site inspections, waste management related documents including licenses, permits, disposal and recycling records should be reviewed and audited for compliance with the legislation of the recommended good site practice and other waste management mitigation measures under the site audit.
- 13.5.1.3 It is expected that limited quantities of waste would be generated from the operation of the Project and adverse environmental impacts would not be anticipated with the implementation of good waste management practices following the existing practices of regular maintenance works. Hence, no EM&A requirement is considered necessary during the operational phase.

13.6 Land Contamination

- 13.6.1.1 Since no land contamination impact is anticipated, no EM&A programme is required during the construction or operational phase.

13.7 Sewerage and Sewage Treatment Implications

- 13.7.1.1 Since no adverse impact on sewerage and sewage treatment is anticipated, no EM&A programme is required during the construction or operational phase.

13.8 Ecological Impact

- 13.8.1.1 A pre-construction ardeid survey should be conducted no earlier than 3 months before the commencement of construction works for each section of TWN, for areas within 100m from the Project site to confirm the location and status of the night roost. Ecological monitoring of ardeid is recommended to monitor the ardeid usage of the active pre-roosting and roosting sites (as confirmed by the pre-construction ardeid survey), and of the proposed temporary floating pontoons. A plan detailing the monitoring methodology should be submitted to and approved by AFCD prior to the monitoring. Monthly counts of species composition and abundance should be undertaken to monitor the effectiveness of proposed mitigation measures and detect any unpredicted indirect ecological impacts arising from the proposed Project. The ecological monitoring / surveys should be undertaken by experience ecologist(s) with relevant working experience. The detail monitoring data should be reported in the monthly EM&A report. In case of any unforeseen ecological impacts identified, remedial actions should then be recommended, where appropriate, in consultation with relevant authorities.
- 13.8.1.2 Monthly site audit should also be carried out throughout the construction phase to ensure recommended avoidance / pollution control measures are properly implemented. In case of

non-compliance, contractor should be informed to strengthen the proposed measures accordingly. Details of EM&A requirements are discussed in the separate EM&A Manual. No EM&A programme is required during the operational phase.

13.9 Fisheries Impact

- 13.9.1.1 Since no unacceptable adverse fisheries impacts are anticipated during both construction and operational phases, no specific EM&A programme for fisheries impact is required.

13.10 Cultural Heritage Impact

- 13.10.1.1 Pre and post condition survey of Gatehouse of Pok Ngar Villa (new item pending for grading assessment), Li Cottage (Grade 1), Nos. 1-3 First Street, Tai Wai (Grade 3) and Entrance Gate, Chik Chuen Wai (Grade 2) shall be carried out. The survey reports shall be submitted to AMO for record.
- 13.10.1.2 A buffer zone of 5 m from Gatehouse of Pok Ngar Villa (new item pending for grading assessment) should be set up, in which no construction machineries and construction storage should trespass the buffer zone. Fencing should also be set up to clearly demarcate the buffer zone to avoid potential damage due to site negligence.
- 13.10.1.3 Monitoring of vibration, settlement and tilting incorporated with a set of AAA system shall be employed for Gatehouse of Pok Ngar Villa (new item pending for grading assessment), Li Cottage (Grade 1), Nos. 1-3 First Street, Tai Wai (Grade 3) and Entrance Gate, Chik Chuen Wai (Grade 2) during the construction phase. Details of the EM&A requirements for construction phase are discussed in the standalone EM&A Manual. The actual limiting criteria should be further agreed with the AMO. A monitoring proposal, including type of monitoring, distribution of monitoring points and proposed actions to be taken when reaching respective monitoring limits, should be submitted to AMO for comments before commencement of the works. Record of monitoring should be submitted regularly to AMO during the construction. AMO should be alerted in case any irregularities are observed.
- 13.10.1.4 No EM&A would be required for archaeology during the construction phase.

13.11 Landscape and Visual Impacts

- 13.11.1.1 The detailed landscape and engineering design of the Project would be undertaken so as to ensure compliance with the landscape and visual mitigation measures described in **Section 12.8**.
- 13.11.1.2 A baseline review should be undertaken by the Contractor at the commencement of the construction contracts to update the status of landscape resources, character areas and VSRs and submitted to EPD and PlanD for record. Implementation of the recommended mitigation measures should be regularly audited during the construction phase. Details of the EM&A requirements for construction phase water are discussed in the standalone EM&A Manual. As the landscape and visual mitigation measures for operational impacts would be provided and established during the construction phase, no EM&A programme is required during the operational phase.

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14. IMPLEMENTATION SCHEDULE OF THE PROPOSED MITIGATION MEASURES

14.1.1.1 Implementation schedules of the proposed environmental mitigation measures are provided in **Table 14.1** to **Table 14.10**. Following the existing routine maintenance practices undertaken by DSD, implementation schedule of the best management practices (BMPs) on pollution control during operational phase is provided in **Table 14.11**.

Table 14.1 Implementation Schedule of the Measures for Air Quality

EIA Ref.	EM&A Manual Ref.	Environmental Protection Measures	Objectives of the Measures	Location / Duration of Measures/ Timing of Completion of Measures	Implementation Agent	Implementation Stages**			Relevant Legislation and Guidelines	Tools/ Mechanism for Implementation
						Des	C	O		
3.7.1.1	2.2	Implement the following dust suppression measures as stipulated under the Air Pollution Control (Construction Dust) Regulation (Cap. 311R), good site practices and good housekeeping of the site: <ul style="list-style-type: none"> • Use of regular watering, to reduce dust emissions from exposed site surfaces and unpaved roads particularly during dry weather; • Use of frequent watering in particularly dusty construction areas close to ASRs; • Use of frequent watering or water sprinklers for major haul roads, material stockpiling areas and other dusty activities within the construction site; • Side enclosure and covering of any aggregate or dusty material storage piles to reduce emissions. Where this is not practicable owing to frequent usage, watering should be applied to aggregate fines; • For the work sites close to the ASR with a separation distance less than 5m, provide hoardings of not less than 5m high from ground level along the site boundary; for the work sites close to the ASRs with a separation distance between 5m and 10 m, provide hoardings of not less than 3.5 m high from ground level along the site boundary; for other work sites, provide hoardings of not less than 2.4 m high from ground level along the site boundary except for site entrance or exit; • Open temporary stockpiles should be avoided or covered. Prevent placing dusty material storage plies near ASRs; 	To minimise construction dust nuisance	All construction sites / construction phase / upon completion of all construction activities	Contractor		✓		- Air Pollution Control Ordinance (APCO) (Cap. 311) - Air Pollution Control (Construction Dust) Regulation (Cap. 311R)	- Pollution control regulations - EM&A

** Des – Design, C – Construction, and O – Operation

EIA Ref.	EM&A Manual Ref.	Environmental Protection Measures	Objectives of the Measures	Location / Duration of Measures/ Timing of Completion of Measures	Implementation Agent	Implementation Stages**			Relevant Legislation and Guidelines	Tools/ Mechanism for Implementation
						Des	C	O		
		<ul style="list-style-type: none"> Tarpaulin covering of all dusty vehicle loads transported to, from and between site locations; Establishment and use of vehicle wheel and body washing facilities at the exit point of the site; Imposition of speed control for vehicles on unpaved site roads. 8 km/hr is the recommended limit; Routing of vehicles and positioning of construction plants should be at the maximum possible distance from ASRs; Avoid position of material stockpiling areas, major haul roads and dusty works within the construction site close to concerned ASRs; Avoid unnecessary exposed earth; and During or after the de-bagging process, the use of cement or dry pulverised fuel ash should be conducted in a totally enclosed system or facility and effective air pollution control measures should be placed at any exits or exhaust to avoid potential air quality influence. 								
3.7.1.2	2.2	<p>Incorporate the below guidelines on construction control from EPD's Recommended Pollution Control Clauses for Construction Contracts in the contract documents:</p> <ul style="list-style-type: none"> The Contractor shall observe and comply with the APCO and its subsidiary regulations, particularly the Air Pollution Control (Construction Dust) Regulation. The Contractor shall undertake at all times to prevent dust nuisance as a result of the construction activities. The Contractor shall ensure that there will be adequate water supply / storage for dust suppression. The Contractor shall devise and arrange methods of working and carrying out the works in such a manner so as to minimise dust impacts on the surrounding environment, and shall provide experienced personnel with suitable training to ensure that these methods are implemented. 	To minimise construction dust nuisance	All construction sites / construction phase / upon completion of all construction activities	Contractor		✓		<ul style="list-style-type: none"> APCO Air Pollution Control (Construction Dust) Regulation EPD's Recommended Pollution Control Clauses for Construction Contracts 	<ul style="list-style-type: none"> Pollution control regulations EM&A

** Des – Design, C – Construction, and O – Operation

EIA Ref.	EM&A Manual Ref.	Environmental Protection Measures	Objectives of the Measures	Location / Duration of Measures/ Timing of Completion of Measures	Implementation Agent	Implementation Stages**			Relevant Legislation and Guidelines	Tools/ Mechanism for Implementation
						Des	C	O		
		<ul style="list-style-type: none"> Before the commencement of any work, the Contractor may be required to submit the methods of working, plant, equipment and air pollution control system to be used on the site for the Engineer inspection and approval. 								
3.7.1.3	2.2	<p>Follow the requirements as stipulated in Air Pollution Control (Non-road Mobile Machinery) (Emission) Regulation and implement the below measures:</p> <ul style="list-style-type: none"> Connect construction plant and equipment to mains electricity supply and avoid use of diesel generators and diesel-powered equipment; Deploy electrified NRMMS as far as practicable; and Use of exempted NRMMS not allowed. 	To minimise exhaust emission from non-road mobile machinery	All construction sites / construction phase / upon completion of all construction activities	Contractor		✓		- Air Pollution Control (Non-road Mobile Machinery) (Emission) Regulation	- Pollution control regulations - EM&A
3.7.1.4	2.2	<ul style="list-style-type: none"> The odorous materials from desilting works and excavation at nullah bed should be well covered on site with tarpaulin and placed as far away from the ASRs as possible. These odorous materials should be removed off-site for disposal as soon as possible within 24 hours. During transportation, these odorous materials on the trucks should be properly covered by tarpaulin. 	To minimise odour nuisance from desilting / excavated materials	All construction sites / construction phase / upon completion of all construction activities	Contractor		✓		- EIAO-TM	- EM&A

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Table 14.2 Implementation Schedule of the Measures for Noise

EIA Ref.	EM&A Manual Ref.	Environmental Protection Measures	Objectives of the Measures	Location / Duration of Measures/ Timing of Completion of Measures	Implementation Agent	Implementation Stages**			Relevant Legislation and Guidelines	Tools/ Mechanism for Implementation
						Des	C	O		
For Construction Phase										
4.8.1.2	3.2	<p><u>Good Site Practices</u> The site practices listed below should be followed during construction works:</p> <ul style="list-style-type: none"> • Only well-maintained PME to be operated on site and should be serviced regularly during construction • Silencers or mufflers on construction equipment should be utilised (if appropriate) and should be properly maintained during the construction; • Mobile plant, if any, should be sited as far away from NSRs as possible • Machines and plant (such as trucks) that may be in intermittent use should be shut down between work periods or should be throttled down to a minimum • Plant known to emit noise strongly in one direction should, wherever possible, be orientated to direct noise away from the nearby NSRs • Material stockpiles and other structures should be effectively utilised, wherever practicable, in screening noise from on-site construction activities 	To minimise construction noise nuisance arising from the Project	All construction sites / construction phase / upon completion of all construction activities	Contractor		✓		- EIAO-TM	- EM&A
4.8.1.3 – 4.8.1.5	3.2	<p><u>Use of Quality PME / Quieter Construction Method</u></p> <ul style="list-style-type: none"> • Use Quality PME (QPME) for Hand-held Percussive Breaker, Excavator/loader, wheeled/tracked, Roller, vibratory, Crane, mobile/barge mounted (diesel), and Crane, mobile/barge mounted (diesel) and quieter construction methods such as silent piling by press-in method using Giken Piler and Power-pack is adopted as an alternative of traditional sheet piling, use of hydraulic crusher is adopted for demolition of footbridge, and use of road ripper is adopted for concrete breaking. 	To mitigate the adverse construction noise impact arising from the Project at the affected NSRs	All active construction sites / construction phase / upon completion of all construction activities	Contractor		✓		- EIAO-TM	- EM&A

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EIA Ref.	EM&A Manual Ref.	Environmental Protection Measures	Objectives of the Measures	Location / Duration of Measures/ Timing of Completion of Measures	Implementation Agent	Implementation Stages**			Relevant Legislation and Guidelines	Tools/ Mechanism for Implementation
						Des	C	O		
		<ul style="list-style-type: none"> The Contractors may adopt alternative quiet PME / construction method as long as it can be demonstrated that they would not result in construction noise impacts worse than those predicted in this EIA Report. 								
4.8.1.6 – 4.8.1.7	3.2	<p><u>Use of Movable Noise Barriers / noise insulation fabric / noise enclosure</u></p> <ul style="list-style-type: none"> A typical design which has been used locally is a wooden framed barrier with a cantilevered upper portion of superficial density no less than 14 kg/m² on a skid footing with 25mm thick internal sound absorptive lining. Acoustic mat with surface mass of not less than 7kg/m² would be used for plant items such as piler. A longer cantilevered top cover would be required to achieve screening benefits at upper floors of NSRs. The direct line-of-sight between the PME and the NSRs should be totally screened by a substantial barrier such that the PME will not be visible when viewed from any window, door or other opening in any façade of the NSR. The Contractor shall be responsible for the design and actual position of the movable noise barriers with due consideration given to the position and size of the PME, and the requirement of intercepting the line-of-sight from the NSRs to the PME, as well as ensuring that the barriers should have no opening and gap. Use movable noise barriers for PMEs as listed in Appendix 4.6 of EIA Report. 	To mitigate the adverse construction noise impact arising from the Project at the affected NSRs	All active construction sites / construction phase / upon completion of all construction activities	Contractor		✓		- EIAO-TM	- EM&A
4.8.1.10 & 4.8.1.16	3.2	<p><u>Construction Restrictions during Examination Period</u></p> <ul style="list-style-type: none"> construction of dry weather flow intercepting channel and pipe laying along the nullah (Work Section 3, Group C-2) should not be undertaken within 30m from TWGHs 	To mitigate the adverse construction noise impact	All active construction sites / construction phase / upon completion of all	Contractor		✓		- EIAO-TM	- EM&A

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EIA Ref.	EM&A Manual Ref.	Environmental Protection Measures	Objectives of the Measures	Location / Duration of Measures/ Timing of Completion of Measures	Implementation Agent	Implementation Stages**			Relevant Legislation and Guidelines	Tools/ Mechanism for Implementation
						Des	C	O		
		<p>Tsoi Wing Sing Primary School (NAP11) during examination period; and</p> <ul style="list-style-type: none"> • construction of staircases and ramps (Work Section 1, Group B-2) and (connection work to the existing sewerage system (Work Section 1, Group C-1) should not be undertaken concurrently within 30m from TWGHs Sin Chu Wan Primary School (NAP16) during examination period. • Concurrent construction of this Project with Revised Trunk Road T4 should avoid examination period of Buddhist Wong Wan Tin College (NAP12) between December 2025 and February 2026. • Concurrent construction of this Project with Joint-user Complex at Tsuen Nam Road, Tai Wai should avoid examination period of TWGHs Sin Chu Wan Primary School (NAP16) from January 2024 to April 2024 and July 2024 to October 2024. 	arising from the Project at the affected NSRs	construction activities						
For Operational Phase <i>(to be provided and established during the construction phase)</i>										
4.8.2.1	3.2	<p>The fixed plants of the proposed UV disinfection system should be properly designed to meet the maximum permissible SWL in Appendix 4.5. The following best practices should be implemented for the proposed underground water pumps and disinfection system as far as practicable to further minimise any potential impacts:</p> <ul style="list-style-type: none"> • Quieter plant should be chosen as far as practicable; • Include noise levels specification when ordering new plant items; • Locate fixed plant / louvres away from any NSRs as far as practicable; • Locate fixed plant in walled plant rooms or in specially designed enclosures; • Install direct noise mitigation measures including silencers, acoustic louvres and acoustic enclosure where necessary. 	Avoid adverse fixed plant noise impact	Design phase	Project Proponent / Contractor	✓		✓	<ul style="list-style-type: none"> - EIAO-TM - NCO 	<ul style="list-style-type: none"> - Pollution control regulations - EM&A

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Table 14.3 Implementation Schedule of the Measures for Water Quality

EIA Ref.	EM&A Manual Ref.	Environmental Protection Measures	Objectives of the Measures	Location / Duration of Measures/ Timing of Completion of Measures	Implementation Agent	Implementation Stages**			Relevant Legislation and Guidelines	Tools/ Mechanism for Implementation
						Des	C	O		
For Construction Phase										
5.8.1.1	4.2	All effluent discharged from the construction site should comply with the standards stipulated in the Technical Memorandum on Standards for Effluents Discharged into Drainage and Sewerage Systems, Inland and Coastal Waters (TM-DSS). There is a need to apply to EPD for a discharge licence for discharge of effluent from the construction site under the WPCO. The discharge quality must meet the requirements specified in the discharge licence. All the runoff and wastewater generated from the works areas should be treated so that it satisfies all the standards listed in the TM-DSS. If monitoring of the treated effluent quality from the works areas is required during the construction phase of the Project, the monitoring should be carried out in accordance with the relevant WPCO licence.	To avoid water quality impacts from polluted site discharges.	All construction sites / construction phase / upon completion of all construction activities	Contractor		✓		- Water Pollution Control Ordinance (WPCO) - TM-DSS	- Pollution control regulations - EM&A
5.8.1.1 – 5.8.1.14	4.2	<u>Wastewater from General Construction Activities and Construction Site Run-off</u> Implement Best Management Practices (BMPs) of mitigation measures in controlling water pollution to achieve control of potential pollution of nearby water bodies during the construction phase of the Project. The guidelines for handling and disposal of the following types of construction site discharges as detailed in the ProPECC PN 1/94 "Construction Site Drainage" should be followed, where applicable: <ul style="list-style-type: none"> • Construction Site Run-off • Boring and Drilling Water • Wheel Washing Water • Rubbish and Litter • Acid Cleaning, Etching and Pickling Wastewater 	To prevent water pollution from uncontrolled wastewater discharge / construction site runoff so as to avoid / minimise water quality impacts	All construction sites / construction phase / upon completion of all construction activities	Contractor		✓		- EIAO-TM - The Practice Note for Professional Persons on Construction Site Drainage (ProPECC PN 1/94)	- Pollution control regulations - EM&A

** Des – Design, C – Construction, and O – Operation

EIA Ref.	EM&A Manual Ref.	Environmental Protection Measures	Objectives of the Measures	Location / Duration of Measures/ Timing of Completion of Measures	Implementation Agent	Implementation Stages**			Relevant Legislation and Guidelines	Tools/ Mechanism for Implementation
						Des	C	O		
5.8.1.15	4.2	<p><u>Construction Works in Close Proximity of Inland Waters</u> Adopt the precautionary measures / practices outlined in ETWB TC (Works) No. 5/2005 "Protection of natural streams/rivers from adverse impacts arising from construction works" where applicable, such as the followings:</p> <ul style="list-style-type: none"> The use of less or smaller construction plants may be specified in areas close to the watercourses Temporary storage of materials (e.g. equipment, chemicals and fuel) and temporary stockpile of construction materials should be located well away from any watercourses when carrying out of the construction works. Stockpiling of construction materials and dusty materials should be covered and located away from any watercourses. Construction debris and spoil should be covered up and / or disposed of as soon as possible. Proper shoring may need to be erected. 	To prevent / minimise water pollution from construction works in close proximity to inland water	All construction sites / construction phase / upon completion of all construction activities	Contractor		✓		- ETWB TC (Works) No. 5/2005	- EM&A
5.5.1.1	4.2	The Contractor should communicate and coordinate with DSD and CEDD to avoid overlapping of the proposed desilting works at downstream tidal zone with their routine maintenance desilting works as far as practicable.	To minimise the potential water quality impact	Desilting works at downstream tidal zone / construction phase	Contractor		✓		- EIAO-TM	- EM&A
5.8.1.16 – 5.8.1.18	4.2	<p><u>Construction Works at Tai Wai Nullah</u> Construction works within the nullah should be scheduled in dry season when the flow is low. Precautionary / pollution control measures listed below for site demarcation and flow diversion with physical barriers / temporary drainage should be implemented prior to the construction works within channel to ensure that all the construction works would be undertaken in dry conditions and physically separated from downstream.</p> <ul style="list-style-type: none"> Physical barriers with impermeable liners will be deployed to confine the works area to maintain a dry 	To prevent / minimise water pollution from construction works at TWN	All construction sites / construction phase / upon completion of all construction activities	Contractor		✓		- WPCO - EIAO-TM - ETWB TC (Works) No. 5/2005	- Pollution control regulations - EM&A

** Des – Design, C – Construction, and O – Operation

EIA Ref.	EM&A Manual Ref.	Environmental Protection Measures	Objectives of the Measures	Location / Duration of Measures/ Timing of Completion of Measures	Implementation Agent	Implementation Stages**			Relevant Legislation and Guidelines	Tools/ Mechanism for Implementation
						Des	C	O		
		condition within and to prevent pollutants running into the downstream waters <ul style="list-style-type: none"> Depending on the site conditions, physical barriers or temporary drainage would be established to intercept and divert the upstream flow Dewatering of the construction works area shall be conducted prior to the construction works. Silt removal facilities should be adopted to treat the wastewater from dewatering operations prior to discharge. Details of the containment structures, flow diversion pathway and water treatment method should be provided by the Contractor to the Engineer for approval before commencement of construction works for the Project. After completion of the construction works, the works area shall be cleaned up before receiving any water flow or connecting to any existing watercourse. All excavated materials generated from construction works in watercourses and wet areas should be collected and handled in compliance with the WDO. No direct disposal of the construction wastes or excavated materials into the stormwater drainage system and inland water should be allowed. The precautionary measures in Appendix D of ETWB TC No. 5/2005 shall be applied and pollution control measures for construction works in close proximity to inland water and mitigation measures for general construction activities should also be implemented. 								
5.8.1.19 – 5.8.1.20	4.2	<u>Sewage from Construction Workforce</u> <ul style="list-style-type: none"> No discharge of sewage to the stormwater drains and inland water will be allowed. Adequate and sufficient portable chemical toilets should be provided in the works areas to handle sewage from construction workforce. A licensed collector should be employed to clean and maintain the 	To avoid water quality impact from sewage effluent from construction workforce	All construction sites / construction phase / upon completion of all construction activities	Contractor		✓		– WPCO – EIAO-TM – ProPECC PN 1/94	– Pollution control regulations – EM&A

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EIA Ref.	EM&A Manual Ref.	Environmental Protection Measures	Objectives of the Measures	Location / Duration of Measures/ Timing of Completion of Measures	Implementation Agent	Implementation Stages**			Relevant Legislation and Guidelines	Tools/ Mechanism for Implementation
						Des	C	O		
		chemical toilets on a regular basis. • Notices should be posted at conspicuous locations to remind the workers not to discharge any sewage or wastewater into the surrounding environment								
5.8.1.21 – 5.8.1.23	4.2	<u>Accidental Spillage of Chemicals</u> • Contractor must register as a chemical waste producer if chemical wastes would be produced from the construction activities. The Waste Disposal Ordinance (Cap 354) and its subsidiary regulations in particular the Waste Disposal (Chemical Waste) (General) Regulation, should be observed and complied with for control of chemical wastes. • The Contractor is also recommended to develop management procedures for chemicals used and prepare an emergency spillage handling procedure to deal with chemical spillage in case of accident occurs. • Any service shop and maintenance facilities should be located on hard standings within a bunded area, and sumps and oil interceptors should be provided. Maintenance of vehicles and equipment involving activities with potential for leakage and spillage should only be undertaken within the areas appropriately equipped to control these discharges. • Disposal of chemical wastes should be carried out in compliance with the WDO and requirements in its subsidiary Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes.	To avoid water quality impact from accidental spillage of chemicals	All construction sites / construction phase / upon completion of all construction activities	Contractor		✓		– WPCO – EIAO-TM – WDO	– Pollution control regulations – EM&A
For Operational Phase (to be provided and established during the construction phase)										
5.8.2.1 – 5.8.2.5	4.2	<u>Surface Run-off / Runoff from Riparian Public Open Space</u> Follow the guidelines in ProPECC PN 5/93 “Drainage Plans subject to Comments by Environmental Protection Department” in design of site drainage: <i>Design Measures</i> • Exposed surface shall be avoided within the Site to	Avoid or minimise water quality impact from surface run-off	Design phase	Project Proponent / Contractor	✓		✓	– EIAO-TM – WPCO – TM-DSS – ProPECC PN 5/93	– Pollution control and other regulations

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EIA Ref.	EM&A Manual Ref.	Environmental Protection Measures	Objectives of the Measures	Location / Duration of Measures/ Timing of Completion of Measures	Implementation Agent	Implementation Stages**			Relevant Legislation and Guidelines	Tools/ Mechanism for Implementation
						Des	C	O		
		minimise soil erosion. The Site shall be either hard paved or covered by landscaping area and plantation where appropriate. <ul style="list-style-type: none"> The drainage system within the Site should be designed to cater for the runoff from 50 year-return-period rainstorm. <i>Devices / Facilities to Control Pollution</i> <ul style="list-style-type: none"> Screening facilities such as standard gully grating and trash grille, with spacing which is capable of screening large substances such as fallen leaves and rubbish should be provided at the inlet of drainage system. Road gullies with standard design and silt traps and oil interceptors should be incorporated during the detailed design to remove particles present in stormwater runoff. 								

** Des – Design, C – Construction, and O – Operation

Table 14.4 Implementation Schedule of the Measures for Waste Management

EIA Ref.	EM&A Manual Ref.	Environmental Protection Measures	Objectives of the Measures	Location / Duration of Measures/ Timing of Completion of Measures	Implementation Agent	Implementation Stages**			Relevant Legislation and Guidelines	Tools/ Mechanism for Implementation
						Des	C	O		
6.5.1.3	5.2	Implement the following good site practices on waste management: <ul style="list-style-type: none"> • Nomination of approved personnel, such as a site manager, to be responsible for implementation of good site practices, arrangements for waste collection and effective disposal to an appropriate facility; • Training of site personnel in site cleanliness, concepts of waste reduction, reuse and recycling, proper waste management and chemical waste handling procedures; • Provision of sufficient waste reception / disposal points, and regular collection of waste; • Adoption of appropriate measures to minimise windblown litter and dust during transportation of waste by either covering trucks or by transporting wastes in enclosed containers; • Provision of regular cleaning and maintenance programme for drainage systems, sumps and oil interceptors; • Adoption of a recording system for the amount of wastes generated, recycled and disposed (including the disposal sites); and • Preparation of Waste Management Plan (WMP), as part of the Environmental Management Plan (EMP) for submission to the Architect/Engineer for approval. 	To ensure proper waste management	All construction sites / Construction Phase / upon completion of all construction activities	Contractor		✓		- Waste Disposal Ordinance (WDO) - ETWB TC(W) No. 19/2005 - Waste Disposal (Chemical Waste) (General) Regulation - Project Administration Handbook (PAH) for Civil Engineering Works, Section 4.1.3 of Chapter 4	- Pollution control regulations
6.5.1.4	5.2	<u>Waste Reduction Measures</u> <ul style="list-style-type: none"> • Segregate and store different types of construction related waste in different containers, skips or stockpiles to enhance reuse or recycling of materials and their proper disposal; • Provide separate labelled bins to segregate recyclable waste such as aluminium cans from other general refuse generated by the work force, and to encourage collection by individual collectors; 	Good site practices to achieve avoidance / minimisation of waste generation	All construction sites / Construction Phase / upon completion of all construction activities	Contractor		✓		- WDO	- Pollution control regulations - EM&A

** Des – Design, C – Construction, and O – Operation

EIA Ref.	EM&A Manual Ref.	Environmental Protection Measures	Objectives of the Measures	Location / Duration of Measures/ Timing of Completion of Measures	Implementation Agent	Implementation Stages**			Relevant Legislation and Guidelines	Tools/ Mechanism for Implementation
						Des	C	O		
		<ul style="list-style-type: none"> Recycle any unused chemicals or those with remaining functional capacity; Maximise the use of reusable steel formwork to reduce the amount of C&D materials; Adopt proper storage and site practices to minimise the potential for damage to, or contamination of construction materials; Plan the delivery and stock of construction materials carefully to minimise the amount of waste generated; and Minimise over ordering and wastage through careful planning during purchasing of construction materials. 								
6.5.1.6 – 6.5.1.7	5.2	<u>Reducing and Reuse of C&D Materials</u> <ul style="list-style-type: none"> Careful design, planning together with good site management to reduce over-ordering and generation of C&D materials. Formwork should be designed to minimise the use of standard wooden panels, so that high reuse levels can be achieved. Alternatives such as steel formwork or plastic facing should be considered to increase the potential for reuse. Excavated inert materials with suitable characteristics / size should be reused on-site as fill material as far as practicable. Surplus inert C&D materials would be transported and delivered to public filling area for beneficial reuse as fill material by other projects. Prior to disposal of non-inert C&D materials, wood, steel and other metals should also be separated for reuse and / or recycle where practicable. 	Good site practices on reducing and reuse of C&D materials	All construction sites / Construction Phase / upon completion of all construction activities	Contractor		✓		<ul style="list-style-type: none"> WDO ETWB TC(W) No. 19/2005 Project Administration Handbook (PAH) for Civil Engineering Works, Section 4.1.3 of Chapter 4 	<ul style="list-style-type: none"> Pollution control regulations EM&A
6.5.1.8	5.2	<u>Storage of C&D Materials</u> Suitable areas should be designated within the works site boundaries for temporary stockpiling of C&D material. The temporary storage of C&D materials on-site should be	To ensure proper waste management to control	All construction sites / Construction Phase / upon completion of all construction activities	Contractor		✓		<ul style="list-style-type: none"> WDO ETWB TC(W) No. 19/2005 	<ul style="list-style-type: none"> Pollution control regulations EM&A

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EIA Ref.	EM&A Manual Ref.	Environmental Protection Measures	Objectives of the Measures	Location / Duration of Measures/ Timing of Completion of Measures	Implementation Agent	Implementation Stages**			Relevant Legislation and Guidelines	Tools/ Mechanism for Implementation
						Des	C	O		
		limited to no more than 1,000m ³ . Within stockpile areas, the following measures should be taken to control potential environmental impacts or nuisance: <ul style="list-style-type: none"> cover material during heavy rainfall; locate stockpiles to minimise potential visual impacts; minimise land intake of stockpile areas as far as possible. 	associated environmental nuisance						- PAH for Civil Engineering Works, Section 4.1.3 of Chapter 4	
6.5.1.9	5.2	<u>Delivering of C&D Materials</u> <ul style="list-style-type: none"> A trip-ticket system and a recording system for the amount of waste generated, recycled and disposed, including the disposal sites, should also be set up to monitor the disposal of C&D materials and to control fly-tipping. Warning signs should be put up to remind the designated disposal sites. CCTV should also be installed at the vehicular entrance and exit of the site as additional measures to prevent fly-tipping. When delivering inert C&D materials at a public fill reception facility, the material shall not contain material considered to be unsuitable by the Filling Supervisor. 	To ensure proper waste management to control associated environmental nuisance	All construction sites and Transportation Route of Waste / Construction Phase / upon completion of all construction activities	Contractor		✓		- WDO - DEVB TC(W) No.06/2010 - Land (Miscellaneous Provisions) Ordinance (Cap. 28)	- Pollution control regulations - EM&A
6.5.1.10	5.2	<u>Chemical Waste</u> <ul style="list-style-type: none"> If chemical waste is produced at the construction site, the contractor would be required to register with the EPD as a Chemical Waste Producer. Good quality containers compatible with the chemical wastes should be used, and incompatible chemicals should be stored separately. Appropriate labels should be securely attached on each chemical waste container indicating the corresponding chemical characteristics of the chemical waste. The contractor shall use a licensed collector to transport and dispose of the chemical wastes at the CWTC or other licensed facility. 	To ensure proper waste management	All construction sites / Construction Phase / upon completion of all construction activities	Contractor		✓		- WDO - Waste Disposal (Chemical Waste) (General) Regulation - Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes	- Pollution control regulations - EM&A

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EIA Ref.	EM&A Manual Ref.	Environmental Protection Measures	Objectives of the Measures	Location / Duration of Measures/ Timing of Completion of Measures	Implementation Agent	Implementation Stages**			Relevant Legislation and Guidelines	Tools/ Mechanism for Implementation
						Des	C	O		
6.5.1.11	5.2	<u>General Refuse</u> <ul style="list-style-type: none"> General refuse should be stored in enclosed bins or compaction units separate from C&D materials and chemical wastes. A reputable waste collector should be employed by the contractor to remove general refuse from the site on a regular basis for disposal of at designated landfill. Clearly labelled recycling bins should be provided on site. The contractor should carry out an education programme for workers in avoiding, reducing, reusing and recycling of materials generation. Posters and leaflets advising on the use of the bins should also be provided in the site as reminders. The recyclable waste materials should then be collected by reliable waste recycling agents on a regular basis. 	To ensure proper waste management to control associated environmental nuisance	All construction sites / Construction Phase / upon completion of all construction activities	Contractor		✓		<ul style="list-style-type: none"> WDO Public Health and Municipal Services Ordinance (Cap.132) 	<ul style="list-style-type: none"> Pollution control regulations EM&A
6.5.1.12 – 6.5.1.13	5.2	<u>Desilted Materials</u> <ul style="list-style-type: none"> The desilted materials should be contained in watertight container on-site and be transported off-site by trucks for disposal of at strategic landfill. The excavated silts shall be wetted during excavation / material handling and shall be properly covered when placed on trucks. Loading of the materials to the truck shall be controlled to avoid splashing and overflowing of the slurry to the surrounding water. Requirements of the Air Pollution Control (Construction Dust) Regulation and Water Pollution Control Ordinance (WPCO), where relevant, shall be adhered to during excavation, transportation and disposal of the desilted materials. 	To ensure proper waste management to control associated environmental nuisance	Section 1 of the Construction site / Construction Phase / upon completion of all construction activities	Contractor		✓		<ul style="list-style-type: none"> Air Pollution Control (Construction Dust) Regulation WDO Public Health and Municipal Services Ordinance (Cap.132) WPCO 	<ul style="list-style-type: none"> Pollution control regulations EM&A

** Des – Design, C – Construction, and O – Operation

Table 14.5 Implementation Schedule of the Measures for Land Contamination Issue

EIA Ref.	EM&A Manual Ref.	Environmental Protection Measures	Objectives of the Measures	Location / Duration of Measures/ Timing of Completion of Measures	Implementation Agent	Implementation Stages**			Relevant Legislation and Guidelines	Tools/ Mechanism for Implementation
						Des	C	O		
7.6	6.1.1.2	Since land contamination issue would not be anticipated, no mitigation measure is considered necessary for the Project.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Table 14.6 Implementation Schedule of the Measures for Sewerage and Sewage Treatment Issue

EIA Ref.	EM&A Manual Ref.	Environmental Protection Measures	Objectives of the Measures	Location / Duration of Measures/ Timing of Completion of Measures	Implementation Agent	Implementation Stages**			Relevant Legislation and Guidelines	Tools/ Mechanism for Implementation
						Des	C	O		
8.5.1.1	7.2.1.1	Since no adverse impacts on sewerage and sewage treatment would be anticipated, no mitigation measure is considered necessary for the Project.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

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Table 14.7 Implementation Schedule of the Measures for Ecological Aspect

EIA Ref.	EM&A Manual Ref.	Environmental Protection Measures	Objectives of the Measures	Location / Duration of Measures/ Timing of Completion of Measures	Implementation Agent	Implementation Stages**			Relevant Legislation and Guidelines	Tools/ Mechanism for Implementation
						Des	C	O		
For Construction Phase										
9.8.2.1	8.2	<u>Avoidance of Ardeid Roosting Site</u> Avoid encroachment of the night roosting sites for ardeids	To avoid direct impacts on ardeid night roosting sites	Design and Construction Phase	Project Proponent / Contractor	✓	✓		N/A	- EM&A
9.8.2.2	8.2	<u>Protection of Mature Vegetation along Nullah</u> Retain existing mature trees along TWN on pedestrian road within the Project site.	To protect mature vegetation along the nullah	Design and Construction Phase	Project Proponent / Contractor	✓	✓		N/A	- EM&A
9.8.2.3	8.2	<u>Restriction of Construction Hours</u> No construction works within the nullah in Section 1 (channel bed modification and desilting at downstream tidal zone) should be undertaken from 16:30 to 07:30 during dry season (October to March) and from 17:00 to 07:00 during wet season (April to September). A pre-construction ardeid survey should be conducted no earlier than 3 months before the commencement of construction works for each sections of TWN, for areas within 100m from the Project site to confirm the location and status of the night roost. The surveys should be conducted covering the ardeid pre-roosting and night roosting sites to record the location of ardeid roosting trees, the ardeid species and abundance utilizing the pre-roosting and night roosting sites. A plan detailing the survey methodology should be submitted to and approved by AFCD prior to the pre-construction ardeid survey. The findings should also be submitted and approved by AFCD. No noisy construction works with power mechanical equipment (PME) in areas within 100m away from any night roost confirmed by the survey should be undertaken from 16:30 to 07:30 during dry season (October to March) and from 17:00 to 07:00 during wet season (April to September) for all work sections 1 – 6 of TWN.	To avoid construction works with PME interfacing with ardeids pre-roosting/roosting hours.	Construction Phase	Project Proponent / Contractor	✓	✓		N/A	- EM&A

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EIA Ref.	EM&A Manual Ref.	Environmental Protection Measures	Objectives of the Measures	Location / Duration of Measures/ Timing of Completion of Measures	Implementation Agent	Implementation Stages**			Relevant Legislation and Guidelines	Tools/ Mechanism for Implementation
						Des	C	O		
9.8.3.1	8.2	<u>Careful Phasing of Construction Activities</u> The construction works will be divided into six sections. Construction will start from the downstream and will not be undertaken at the entire section at the same time to reduce the construction impacts on nearby sensitive receivers comparing construction in the entire section. All works within the nullah would be undertaken during dry season while works outside the nullah (such as walkway improvement) would be scheduled to avoid overlapping with works within the nullah to avoid heavy construction activities concentrating in a certain area over any period.	To minimise construction disturbances to surrounding habitats and associated wildlife	All construction sites / Construction Phase / upon completion of all construction activities	Contractor	✓	✓		N/A	- EM&A
9.8.3.2	8.2	<u>Careful Phasing of Construction Activities within Stilling Basin</u> Regarding to reconstruction of wetland habitat in the stilling basin at Section 6, construction will be divided into parts depending on the site constraints (i.e. reconstruct half of the basin at a time) to minimise disturbance and mortality of existing freshwater community within the basin.	To minimise disturbance and mortality of existing freshwater community within stilling basin.	Construction site at Section 6 / Construction Phase / upon completion of all construction activities	Contractor	✓	✓		N/A	- EM&A
9.8.3.3 – 9.8.3.5	8.2	Good site practices on air quality and noise control to further minimise construction disturbances to surrounding habitats and associated wildlife.	To minimise construction disturbances to surrounding habitats and associated wildlife	Construction Phase	Contractor		✓		- EIAO-TM	- EM&A
9.8.3.7	8.2	<u>Minimising Impacts on Water Quality during Construction Phase</u> Precautionary / pollution control measures and good site practices for construction works in close proximity and within as detailed in Table 14.3 .	To prevent pollution of waterbodies and to minimise indirect water quality impacts on ecology	All construction sites / Construction Phase / upon completion of all construction activities	Contractor	✓	✓		- EIAO-TM - ProPECC PN 1/94 - ETWB TC (Works) No. 5/2005 - WPCO - TM-DSS	- Pollution control regulations - EM&A

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EIA Ref.	EM&A Manual Ref.	Environmental Protection Measures	Objectives of the Measures	Location / Duration of Measures/ Timing of Completion of Measures	Implementation Agent	Implementation Stages**			Relevant Legislation and Guidelines	Tools/ Mechanism for Implementation
						Des	C	O		
9.8.4.1	8.2	<p><u>Compensation of Temporary Loss of Pre-roosting Site</u> Under the revitalisation design, ardeids pre-roosting habitat at downstream Section 1 would be reinstated into a mix of stepped terrace and slope at water edge to enhance foraging / pre-roosting habitats for waterbirds (e.g. ardeids). To compensate for the temporary loss of pre-roosting site for ardeids during reconstruction of the concrete platforms at Section 1 in dry seasons, floating pontoons of similar areas could be provided at downstream of the works area as far as practicable, along southern bank out of Project site, as an alternative assembly point for ardeids. These floating pontoons should be installed by October before the start of every dry season within the construction programme and disassemble in April upon end of dry season. Installation of the floating pontoons in early dry season can help in maximising usage of ardeids, by allowing them to get familiar with these floating platforms earlier and thereby increase the percentage of usage. The proposed extend and location of the floating pontoon should be submitted and approved by AFCD together with the pre-construction survey methodology. Ardeid's usage of the temporary floating pontoon should be monitored in the monthly ecological monitoring.</p>	To compensate for the temporary loss of pre-roosting site for ardeids	Construction site at Section 1 / Installed before and disassemble after Dry seasons (November to March) during Construction Phase / upon completion of all construction activities	Contractor	✓	✓		- EIAO-TM	- EM&A
For Both Construction and Operational Phases										
9.8.3.8	8.2	Lighting installed along TWN under the revitalisation plan shall be minimised or incorporate wildlife-friendly lighting to avoid light spill. Intensity of light should be controlled to the lowest level possible and long wavelength lights such as amber lamps, which is visible to human but invisible to most animals, are recommended. The lights should be installed with a shield and at level as close to the ground as possible to prevent extensive light casting up into the sky. Lights with motion sensors can also be considered to further minimise disturbance to surrounding habitats as	To minimise disturbance to surrounding habitats and associated wildlife	Design, Construction & Operation Phase	Contractor for construction phase / Project Proponent for operational phase	✓	✓	✓	- Charter of External Lighting issued by EEB - Guidelines on Industry Best Practices for External Lighting Installations	- EM&A (for construction phase)

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EIA Ref.	EM&A Manual Ref.	Environmental Protection Measures	Objectives of the Measures	Location / Duration of Measures/ Timing of Completion of Measures	Implementation Agent	Implementation Stages**			Relevant Legislation and Guidelines	Tools/ Mechanism for Implementation
						Des	C	O		
		lights that are not in use would be automatically turn off.							issued by EEB	
For Operational Phase (to be provided and established during the construction phase)										
9.8.3.6	8.2	<u>Minimising Impacts on Hydrodynamics Properties</u> Design of ecological-friendly riverbed lining should be considered with reference to DSD PN No. 3/2021 "Guidelines on Design for Revitalisation of River Channel". For instance, the original bed substrates within the nullah in the stilling basin at Section 6 could be stockpiled and preserved off-site temporarily during construction phase for reuse in wetland vegetation planting in the nullah as far as practicable.	To minimise impact on hydrological properties of watercourse habitat	Design / Construction Phase	Contractor	✓	✓		- DSD PN No. 3/2021	- EM&A
9.8.3.9	8.2	Design of site drainage and Best Management Practices (BMPs) for storm water discharge should follow the relevant guidelines and practices as given in the ProPECC PN 5/93 to minimise surface runoff from the Project.	To prevent / minimise the indirect water quality impacts from surface run-off on ecology	Design phase	Project Proponent / Contractor	✓	✓	✓	- ProPECC PN 5/93	- EM&A

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Table 14.8 Implementation Schedule of the Measures for Fisheries

EIA Ref.	EM&A Manual Ref.	Environmental Protection Measures	Objectives of the Measures	Location / Duration of Measures/ Timing of Completion of Measures	Implementation Agent	Implementation Stages**			Relevant Legislation and Guidelines	Tools/ Mechanism for Implementation
						Des	C	O		
10.6.2	9.2	Since no adverse impacts on fisheries would be anticipated, no specific fisheries mitigation measure is considered necessary for the Project. Nonetheless, water pollution control measures (Table 14.3 refers) should be strictly followed as these measures also serve to further protect fisheries resources.	N/A (Measures are under water quality section)	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Table 14.9 Implementation Schedule of the Measures for Cultural Heritage

EIA Ref.	EM&A Manual Ref.	Environmental Protection Measures	Objectives of the Measures	Location / Duration of Measures/ Timing of Completion of Measures	Implementation Agent	Implementation Stages**			Relevant Legislation and Guidelines	Tools/ Mechanism for Implementation
						Des	C	O		
11.7.1.1	10.1.1.2	Pre and post condition survey of Gatehouse of Pok Ngar Villa (new item pending for grading assessment), Li Cottage (Grade 1), Nos. 1-3 First Street, Tai Wai (Grade 3) and Entrance Gate, Chik Chuen Wai (Grade 2) should be conducted to inspect the buildings' structural integrity and record the buildings' conditions by professional qualified building surveyor or engineer before and after the construction works, respectively. The survey results shall be submitted to AMO for record. Protective measures shall be provided to the built heritage subject to the results of the pre-condition survey. Post-condition survey should be conducted after the construction works to identify any damages that have occurred or caused by the construction. If damages to these built heritage resources are identified, AMO shall be informed immediately.	To avoid and minimise potential indirect impacts of ground-borne vibration to built heritage	During construction phase in Work Sections 2 & 3 of TWN / upon completion of all construction activities in Work Sections 2 & 3	Contractor		✓		- EIAO-TM	- EM&A

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EIA Ref.	EM&A Manual Ref.	Environmental Protection Measures	Objectives of the Measures	Location / Duration of Measures/ Timing of Completion of Measures	Implementation Agent	Implementation Stages**			Relevant Legislation and Guidelines	Tools/ Mechanism for Implementation
						Des	C	O		
11.7.1.2	10.1.1.2	A buffer zone of 5 m from Gatehouse of Pok Ngar Villa (new item pending for grading assessment) should be set up, in which no construction machineries and construction storage should trespass the buffer zone. Fencing should also be set up to clearly demarcate the buffer zone to avoid potential damage due to site negligence.	To avoid potential direct damage to built heritage	During construction phase in Work Section 3 of TWN / upon completion of all construction activities in Work Section 3	Contractor		✓		- EIAO-TM	- EM&A
11.1.7.3	10.1.1.2	Monitoring of vibration, settlement and tilting incorporated with a set of Alert, Alarm and Action (AAA) system shall be employed for Gatehouse of Pok Ngar Villa (new item pending for grading assessment), Li Cottage (Grade 1), Nos. 1-3 First Street, Tai Wai (Grade 3) and Entrance Gate, Chik Chuen Wai (Grade 2) during the construction phase. If the alert level is exceeded, the monitoring frequency should be increased. If the alarm level is exceeded, the design of the construction may need to be amended. If the action level is exceeded, all works should be stopped. The actual limiting criteria should be further agreed with the AMO. A monitoring proposal, including type of monitoring, checkpoint locations, distribution of monitoring points, installation details, frequency of monitoring and proposed actions to be taken when reaching respective monitoring limits, should be submitted to AMO for comments before commencement of the works. Prior agreement and consent should be sought from the owner(s), stakeholder(s) and relevant Government department(s) for the installation of monitoring points before commencement of the works. Record of monitoring should be submitted regularly to AMO during the construction. AMO should be alerted in case any irregularities are observed.	To avoid and minimise potential indirect impacts of ground-borne vibration to built heritage	During construction phase in Work Sections 2& 3 of TWN / upon completion of all construction activities in Work Sections 2 & 3	Contractor		✓		- EIAO-TM	- EM&A

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Table 14.10 Implementation Schedule of the Measures for Landscape and Visual Aspect

EIA Ref.	EM&A Manual Ref.	Environmental Protection Measures	Objectives of the Measures	Location / Duration of Measures/ Timing of Completion of Measures	Implementation Agent	Implementation Stages**			Relevant Legislation and Guidelines	Tools/ Mechanism for Implementation
						Des	C	O		
For Construction Phase										
Table 12.10	11.2.	<p><u>CM1 – Tree Preservation during Construction</u> All existing trees to be retained shall be carefully protected during construction. Tree protection works shall be in accordance with DEVB TC(W) No. 4/2020 – Tree Preservation and Tree Management Practice Note No. 1 – Tree Preservation during Construction.</p> <p>For the 3 nos. of identified OVTs within 100m assessment boundary, though they are not affected by proposed works, tree maintenance departments/ their agents are required to follow the respective requirements as stipulated in Para.16 - 32 of DEVB TC(W) No. 5/2020 to preserve the OVTs in the Register.</p>	To protect the existing trees to be retained	All active construction sites / construction phase / upon completion of all construction activities	DSD / LCSD / Contractor	✓	✓		- DEVB TCW No. 4/2020 and the latest Guidelines on Tree Preservation during Development issued by GLTM Section of DEVB	- EM&A
Table 12.10	11.2.	<p><u>CM2 – Erection of Decorative Screen Hoarding</u> Decorative Hoarding, which is compatible with the surrounding settings, shall be erected during construction to minimise the potential landscape and visual impacts due to the construction works and activities.</p>	Proper site management / setting to minimise potential landscape and visual impacts	All active construction sites / construction phase / upon completion of all construction activities	DSD / Contractor		✓		- EIAO-TM	- EM&A
Table 12.10	11.2.	<p><u>CM3 – Control of Night-time Lighting Glare</u> Any lighting provision of the construction works at night shall be carefully control to prevent light overspill to the nearby VSRs and into the sky.</p>	To minimise potential impact to nearby VSRs by proper site settings	All active construction sites / construction phase / upon completion of all construction activities	DSD / Contractor		✓		- Charter of External Lighting issued by EEB - Guidelines on Industry Best Practices for External Lighting Installations issued by EEB	- EM&A
Table 12.10	11.2.	<p><u>CM4 – Management of Construction Activities and Facilities</u> The facilities and activities at works sites and areas, which</p>	Proper site management / setting to minimise	All active construction sites / construction phase / upon	DSD / Contractor		✓		- EIAO-TM	- EM&A

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EIA Ref.	EM&A Manual Ref.	Environmental Protection Measures	Objectives of the Measures	Location / Duration of Measures/ Timing of Completion of Measures	Implementation Agent	Implementation Stages**			Relevant Legislation and Guidelines	Tools/ Mechanism for Implementation
						Des	C	O		
		include site office, temporary storage areas, temporary works etc., shall be carefully managed and controlled on the height, deposition and arrangement to minimise any potential adverse landscape and visual impacts.	potential landscape and visual impacts	completion of all construction activities						
Table 12.10	11.2.	<u>CM5 – Reinstatement of Temporarily Disturbed Landscape Areas</u> All hard and soft landscape areas disturbed temporarily during construction due to temporary excavations, temporary works sites and works areas shall be reinstated to equal or better quality, to the satisfaction of the relevant Government Departments.	To reinstate disturbed hard and soft landscape areas	All active construction sites / construction phase / upon completion of all construction activities	DSD / Contractor		✓		- EIAO-TM	- EM&A
Table 12.10	11.2.	<u>CM6 – Reinstatement of Temporarily Disturbed Watercourses</u> Temporarily disturbed watercourses shall be reinstated to the satisfaction of relevant Government Departments. Good site practices as described in ETWB TCW No. 5/2005 “Protection of natural streams/rivers from adverse impacts arising from construction works” shall also be adopted to avoid any pollution entering the watercourses nearby where applicable.	To reinstate disturbed watercourse	All active construction sites / construction phase / upon completion of all construction activities	DSD / Contractor		✓		- ETWB TCW No. 5/2005	- EM&A
For Operational Phase (to be provided and established during the construction phase)										
Table 12.11	11.2.	<u>OM1 – Greening Enhancement along Channel Bed and Embankment</u> The existing concrete riverbed and embankment will be resurfaced by a layer of vegetation, which will enhance the aesthetic value of the nullah. The riverbed will be planted with various types of riparian and wetland plants while the river embankment will be covered by various types of climbers or trailing plants along the parapet planters.	To enhance aesthetic value of TWN	Design, Construction and Operational Phases	DSD / Contractor Long-term Maintenance Party: DSD	✓	✓	✓	- EIAO-TM	- EM&A (for construction phase)

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EIA Ref.	EM&A Manual Ref.	Environmental Protection Measures	Objectives of the Measures	Location / Duration of Measures/ Timing of Completion of Measures	Implementation Agent	Implementation Stages**			Relevant Legislation and Guidelines	Tools/ Mechanism for Implementation
						Des	C	O		
Table 12.11	11.2.	<p>OM2 – Provision of Recreational Opportunity along Nullah The provision and improvement of recreational facilities including but not limited to sitting-out areas, thematic planting, play elements, viewing decks, gathering points, proposed 3km walkways, improvement/ modification of planters, water play features etc. along the nullah aim to enhance the ecological, landscape and visual value of the nullah, provide a greener environment, promote water friendliness and improve the community environment.</p>	To enhance landscape and visual value of TWN	Design, Construction and Operational Phases	DSD / Contractor Long-term Maintenance Party⁽¹⁾: DSD / LCSD	✓	✓	✓	- EIAO-TM	- EM&A (for construction phase)
Table 12.11	11.2.	<p>OM3 – Compensatory Tree Planting Any trees to be felled under the Project shall be compensated in accordance with DEVB TC(W) No. 4/2020 - Tree Preservation. A Tree Preservation and Removal Proposal (TPRP) shall be prepared and submitted under the DEVB TC(W) No. 4/2020 by Contractor. As stipulated in DEVB TC(W) No. 4/2020, "...the number of compensatory trees onsite and offsite shall not be lower than that of number of trees removed including dead trees, but excluding trees of undesirable species...". The compensatory plantings shall be realistic, practicable and sustainable with a holistic consideration to balance the quantity and quality of tree planting, and follow the "right tree for the right place" principles. The proposed planting species shall be made reference to the Greening Master Plan issued by CEDD and the Street Tree Selection Guide issued by DEVB.</p> <p>To compensate the loss of existing trees, heavy standard compensatory trees are proposed in available planting area to enhance the amenity value to vicinity of site, subject to detailed design.</p>	To compensate trees to be felled under the Project	Design, Construction and Operational Phases	DSD / Contractor Long-term Maintenance Party⁽¹⁾: DSD / LCSD	✓	✓	✓	- DEVB TC(W) No. 4/2020	- EM&A (for construction phase)

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EIA Ref.	EM&A Manual Ref.	Environmental Protection Measures	Objectives of the Measures	Location / Duration of Measures/ Timing of Completion of Measures	Implementation Agent	Implementation Stages**			Relevant Legislation and Guidelines	Tools/ Mechanism for Implementation
						Des	C	O		
Table 12.11	11.2.	<u>OM4 – Sensitive and Aesthetically Pleasing Design</u> Sensitive and aesthetically pleasing design as regard to the form, material and finishes shall be incorporated to the proposed above-ground structures e.g. pavilions, seating areas, viewing decks, railings along the nullah etc so as to minimise any potential adverse landscape and visual impact.	To enhance aesthetic value of the proposed aboveground structures	Design and Operational Phases	DSD / Contractor Long-term Maintenance Party^[1]: DSD / LCSD	✓			- EIAO-TM	- EM&A (for construction phase)
Table 12.11	11.2.	<u>OM5 – Tree Transplanting</u> According to latest tree treatment proposal, 1 no. of tree that is unavoidably affected by proposed works is suggested to be transplanted where practical. A TPRP will be submitted to relevant government departments for approval in accordance with DEVB TC(W) No. 6/2015 - Maintenance of Vegetation and Hard Landscape Features and DEVB TC(W) No. 4/2020 - Tree Preservation, and Guidelines on Tree Transplanting by DEVB and final locations of transplanted trees should be agreed prior to commencement of the work. A cost-effective transplanting strategy should be established at the Design Phase of the Project. Transplanted trees are recommended to be relocated to final locations without the use of Holding Nursery under single handling where possible subject to the sequence of construction of the works. This will minimize the cost and ensure the better survival of the trees after transplanting. However, if single transplanting handling is not possible, the transplanted trees shall be translocated to a holding nursery before the commencement of the engineering works; and will be replanted back to the receptor sites once the engineering works are completed.	To transplant trees which are affected by proposed works	Design, Construction and Operational Phases	DSD / Contractor Long-term Maintenance Agent^[1]: DSD / LCSD	✓	✓	✓	- DEVB TC(W) Nos. 6/2015 and 4/2020 - Guidelines on Tree Transplanting by DEVB	- EM&A (for construction phase)

Note:
[1] In case of interface issues between DSD (Project Proponent) and LCSD facilities, the arrangement of long-term maintenance/management agencies are subject to agreement of with corresponding departments in accordance with DEVB TCW No. 6/2015 - Maintenance of Vegetation and Hard Landscape Features.

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Table 14.11 Implementation Schedule of the Best Management Practices on Pollution Control during Operational Phase

EIA Ref.	EM&A Manual Ref.	Environmental Protection Measures	Objectives of the Measures	Location / Duration of Measures/ Timing of Completion of Measures	Implementation Agent	Implementation Stages**			Relevant Legislation and Guidelines	Tools/ Mechanism for Implementation
						Des	C	O		
Air Quality										
3.7.2	N/A	The temporary stockpile materials from maintenance desilting will be located as far away from the ASRs as possible. These materials will be properly covered with tarpaulin and should be removed off-site within 24 hours to avoid any odour nuisance arising.	To avoid odour from desilting materials from maintenance works	Maintenance period / Throughout operational phase	Project Proponent			✓	-EIAO-TM	- Maintenance practices of future management government departments
Noise										
4.8.2.1	N/A	Develop and implement a regularly scheduled plant maintenance programme so that plant items are properly operated and serviced. The programme should be implemented by properly trained personnel.	To further minimise any fixed plant noise nuisance	Maintenance period / Throughout operational phase	Project Proponent			✓	-EIAO-TM	- Maintenance practices of future management government departments
Water Quality										
5.8.2.1 – 5.8.2.9	N/A	<p><u>Surface Run-off / Irrigation Run-off / Runoff from Riparian Public Open Space</u></p> <ul style="list-style-type: none"> BMPs for storm water discharge and management, as well as good administrative and management measures for riparian public open spaces as detailed below are recommended for the Project to mitigate potential adverse water quality impacts. DSD PN No. 3/2021 “Guidelines on Design for Revitalisation of River Channel” guidelines on the essential environmental considerations and maintenance and management requirements for a revitalised river channel should also be followed. Good management measures such as regular cleaning and sweeping of road surface / open areas is suggested. The road surface / open area cleaning should also be carried out prior to occurrence of rainstorm. Sufficient garbage collection unit / system should be established / maintained and litters in 	To prevent / minimise water pollution from surface / irrigation run-off	Maintenance period / Throughout operational phase	Project Proponent			✓	<ul style="list-style-type: none"> WPCO TM-DSS ProPECC PN 5/93 Pesticide Ordinance (Cap. 133) Code of Practice for the Safe and Proper Use of Pesticides in Public Areas 	<ul style="list-style-type: none"> Pollution control and other regulations Maintenance practices of future management government departments

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EIA Ref.	EM&A Manual Ref.	Environmental Protection Measures	Objectives of the Measures	Location / Duration of Measures/ Timing of Completion of Measures	Implementation Agent	Implementation Stages**			Relevant Legislation and Guidelines	Tools/ Mechanism for Implementation
						Des	C	O		
		<p>amenity areas or river should be regularly removed.</p> <ul style="list-style-type: none"> • Good management practices should be adopted to properly manage the water application rate and time during irrigation to minimise chance of run-off. Use of fertilisers and pesticides, if required, should be properly controlled, e.g. applications prior to forecasted heavy rain event should also be avoided to minimise the potential for run-off of residual fertiliser. In addition, use of more specific, systemic and biodegradable pesticide in low dosage is more preferred. Priority would be given to remove infected/sick plantings over the use of pesticides. The use and handling of fertilisers and pesticides should follow the Pesticide Ordinance and Code of Practice for the Safe and Proper Use of Pesticides in Public Areas by AFCD, Food and Health Bureau (FEHD) and Leisure and Cultural Services Department (LCSD). • Manholes, as well as storm water gullies, ditches provided among the development areas should be regularly inspected and cleaned (e.g. monthly). Additional inspection and cleansing should be carried out before forecast heavy rainfall. • Channel that allows activities close to the water should deploy a patrol team to identify unsafe behaviours and to safeguard the public's safety. The leisure facilities should also be provided with instructions and safety warnings in conspicuous places. • The following management and maintenance requirements on water quality control recommended in DSD PN No. 3/2021: <ul style="list-style-type: none"> ○ Regular sample and test water quality; ○ Facilities that allow primary contact recreation (e.g. water play zone) should develop its standard operating procedure in case of not meeting the 								

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EIA Ref.	EM&A Manual Ref.	Environmental Protection Measures	Objectives of the Measures	Location / Duration of Measures/ Timing of Completion of Measures	Implementation Agent	Implementation Stages**			Relevant Legislation and Guidelines	Tools/ Mechanism for Implementation
						Des	C	O		
		<p>Water Quality Goals (Mitigation measures during operation phase for water play zone);</p> <ul style="list-style-type: none"> ○ Regularly maintain the treatment unit to meet its design treatment effectiveness; ○ Develop emergency response plan on how primary/secondary contact recreation activities; and shall be suspended when water quality fails to achieve the water quality goals i.e. mitigation measures during operation phase for water play zone. 								
5.8.2.10 – 5.8.2.11	N/A	<p>Routine Maintenance Works The maintenance practices would be similar to the existing maintenance works undertaken by the DSD. The following considerations would be included in planning for the maintenance works:</p> <ul style="list-style-type: none"> • Maintenance desilting of the nullah should be carried out on an annual basis during dry season (November to March) when the water flow is low, with the exception of during emergency situations where the accumulated silt would adversely affect the hydraulic capacity of the nullah or where flooding risk is imminent, or when complaints on environmental nuisance associated with the accumulated silt are received. Desilting should be carried out by hand-held or light machinery at low tide. • Phasing of the works should be considered to better control and reduce any impacts caused. Where possible, works should be carried out along half width of the drainage channel in short sections. A free passage along the drainage channel is necessary to avoid forming stagnant water in any phase of the works. • Containment structures (such as sandbags barrier) should be provided for the desilting works area to 	To avoid or minimise water quality impact from routine maintenance works	Maintenance period / Throughout operational phase	Project Proponent			✓	<ul style="list-style-type: none"> - EIAO-TM - WPCO - WDO 	<ul style="list-style-type: none"> - Pollution control regulations - Maintenance practices of future management government departments

** Des – Design, C – Construction, and O – Operation

EIA Ref.	EM&A Manual Ref.	Environmental Protection Measures	Objectives of the Measures	Location / Duration of Measures/ Timing of Completion of Measures	Implementation Agent	Implementation Stages**			Relevant Legislation and Guidelines	Tools/ Mechanism for Implementation
						Des	C	O		
		facilitate a dry or at least confined working area within the drainage channel. <ul style="list-style-type: none"> The locations for the disposal of the removed materials should be identified and agreement sought with the relevant departments before commencement of the maintenance works. Temporary stockpile of waste materials should be located away from the channel and properly covered. These waste materials should be disposed of in a timely and appropriate manner. Effective temporary flow diversion scheme should be implemented and the generated wastes should be collected and disposed off-site properly to avoid adversely affecting the water quality of the drainage system. 								
Waste Management										
6.5.2.1	N/A	<ul style="list-style-type: none"> The silt materials, debris and screenings from the DWFI system / nullah during routine maintenance, as well as from maintenance desilting, should be properly stored in enclosed bins or compaction units and transported to the designated landfill for disposal as soon as possible. 	To ensure proper waste management to control associated environmental nuisance	Maintenance period / Throughout operational phase	Project Proponent			✓	- Air Pollution Control (Construction Dust) Regulation - WDO - Public Health and Municipal Services Ordinance (Cap.132) - WPCO	- Pollution control regulations - Maintenance practices of future management government departments
6.5.2.2	N/A	<ul style="list-style-type: none"> All chemical waste generated from the maintenance works should be properly stored, labelled and removed by licensed waste collectors in accordance with Waste Disposal (Chemical Waste) (General) Regulation. 	To ensure proper waste management	Maintenance period / Throughout operational phase	Project Proponent			✓	- WDO - Public Health and Municipal Services	- Pollution control regulations - Maintenance practices of future

** Des – Design, C – Construction, and O – Operation

EIA Ref.	EM&A Manual Ref.	Environmental Protection Measures	Objectives of the Measures	Location / Duration of Measures/ Timing of Completion of Measures	Implementation Agent	Implementation Stages**			Relevant Legislation and Guidelines	Tools/ Mechanism for Implementation
						Des	C	O		
									Ordinance (Cap.132) - Waste Disposal (Chemical Waste) (General) Regulation - Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes	management government departments
6.5.2.3	N/A	<u>General Refuse from Visitors</u> <ul style="list-style-type: none"> Sufficient number of trash bins and recycling bins have already been provided and would be retained for the collection of general refuse generated by visitors along TWN. Same as the existing practice, the general refuse would be removed by reputable waste collector on a daily basis. 	To ensure proper waste management to control associated environmental nuisance	Along TWN / Throughout operational phase	Project Proponent			✓	- WDO - Public Health and Municipal Services Ordinance (Cap.132)	- Pollution control regulations
Ecology										

** Des – Design, C – Construction, and O – Operation

EIA Ref.	EM&A Manual Ref.	Environmental Protection Measures	Objectives of the Measures	Location / Duration of Measures/ Timing of Completion of Measures	Implementation Agent	Implementation Stages**			Relevant Legislation and Guidelines	Tools/ Mechanism for Implementation
						Des	C	O		
9.8.3.8	N/A	Best Management Practices (BMPs) for storm water discharge should follow the relevant guidelines and practices as given in the ProPECC PN 5/93 to minimise surface runoff from the Project, whilst good site practices in planning maintenance works should be followed to minimise the potential impacts on water quality to the nearby waterbodies from surface run-off / maintenance works and the associated ecological impacts.	Minimise the potential impacts on water quality to the nearby waterbodies from surface run-off / maintenance works and the associated ecological impacts	Maintenance period / Throughout operational phase	Project Proponent			✓	- ProPECC PN 5/93	- Pollution control regulations - Maintenance practices of future management government departments
Fisheries										
10.6.3	N/A	Since no adverse fisheries impacts would be anticipated under normal operation of the TWN, no specific fisheries mitigation measure during operational phase is considered necessary for the Project. Nonetheless, water pollution control measures should be strictly followed as these measures also serve to further protect fisheries resources.	N/A (Measures are under water quality section)	N/A	N/A	N/A	N/A	N/A	N/A	N/A

** Des – Design, C – Construction, and O – Operation

15 CONCLUSIONS

15.1 Introduction

15.1.1.1 The Project covers the following designated project (DP) item under Schedule 2, Part I under the Environmental Impact Assessment Ordinance (EIAO) (Cap.499) -

Item I.1(b)(ii) – A drainage channel or river training and diversion works which discharges or discharge into an area which is less than 300m from the nearest boundary of an existing or planned site of cultural heritage.

15.1.1.2 This EIA report has provided an assessment of the potential environmental impacts associated with the construction and operation of the Project based on the preliminary engineering design information available at this stage. The assessment has been conducted, in accordance with the EIA Study Brief No. ESB-320/2019 issued under the EIAO for the Project and the EIAO-TM, covering the following environmental issues.

- Air Quality Impact
- Noise Impact
- Water Quality Impact
- Waste Management Implication
- Land Contamination
- Sewerage and Sewage Treatment Implications
- Ecological Impact (Terrestrial and Marine)
- Fisheries Impact
- Cultural Heritage Impact
- Landscape and Visual Impacts

15.1.1.3 The findings of this EIA Study have determined the likely nature and extent of environmental impacts predicted arise from the construction and operation of the Project. During the EIA process, specific environmental control and mitigation measures have been identified and incorporated into the planning and design of the Project in order to comply with the relevant environmental legislation and standards during both the construction and operation phases. An environmental monitoring and audit (EM&A) programme has also been developed. The Implementation Schedules listing the recommended mitigation measures are presented in **Section 14**. A summary of key assessment assumptions and limitation of methodologies are presented in **Appendix 15.1**.

15.1.1.4 A summary of the environmental outcomes/benefits that have accrued from the environmental considerations and analysis during the EIA study and the implementation of environmental control measures of the Project are presented in the sections below.

15.2 Summary of Key Environmental Outcomes

15.2.1 Estimated Populations and Environmentally Sensitive Areas Protected from Various Environmental Impacts

15.2.1.1 With the implementation of the Project, besides improving the existing drainage facilities, over 70,000 m² of concrete-lined channel space would be transformed into green spaces to promote greening of the local environment and the ecological value of existing TWN would be enhanced with the incorporation of the ecological enhancement features. Furthermore, the introduction of the DWFI system and treatment wetlands to intercept/polish the existing polluted discharges at the drainage outlets along TWN, as well as modification of channel bed downstream of TWN's broad-crested weir at its confluence with Shing Mun River near Man Lai Court to reduce excessive accumulation of silts brought by tidal influence, would improve long-standing water quality and odour issues associated with the polluted discharges to the nullah and with excessive siltation at downstream TWN which have been of public concerns as expressed by Sha Tin District Council (STDC) and local stakeholders. In order to facilitate the public to better enjoy the view of the revitalised waterscape and ecological enhancement features (e.g. treatment wetland) as well as to promote water-friendliness, certain locations of the nullah bank of TWN will be transformed into a green open space that can be accessed by the public with provision of riparian

walkway and amenity areas for public enjoyment. There will be multiple large entrance points with stepped seats and decked platforms on nullah bed that can provide communal spaces for recreation and leisure activities to promote water friendliness (e.g. riparian walkway, sightseeing of greening and ecological enhancement features, water play features equipped with UV disinfection system) at midstream of TWN. Cantilevered viewing decks / sheltered walkway are also proposed by the bankside in the upstream section.

15.2.1.2 During construction, mitigation measures as recommended in the EIA will be implemented to protect the identified sensitive receivers in the vicinity of the Project, including residential dwellings in Heung Fan Liu, Mei Tin Estate, Granville Garden, Park View Garden at upstream TWN, Mei Shing Court, Mei Lam Estate, educational institutes, Man Lai Court and other residential dwellings in Tai Wai near mid-stream and downstream TWN from air quality and noise impacts.

15.2.1.3 With the implementation of DWFI system and treatment wetlands to intercept/polish the existing polluted discharges at the drainage outlets along TWN, as well as modification of channel bed downstream of TWN's broad-crested weir at its confluence with Shing Mun River near Man Lai Court to reduce excessive accumulation of silts brought by tidal influence, the odour nuisance of TWN currently experienced by these air sensitive receivers and general public visiting TWN would be improved as a result of the operation of the Project.

15.2.2 Environmental Designs Recommended, Environmentally Friendly Option Considered and Incorporated in the Preferred Option

Water Quality Improvement and Water Friendliness

15.2.2.1 Due to ageing drainage systems and possible expedient connection made in the past, polluted discharges from the existing drainage outlets along TWN are observed at present. Complaints and concerns from the public, including Sha Tin District Council (STDC) and local stakeholders, on the long-standing water quality and odour nuisance of TWN, particular at the confluence of TWN and Shing Mun River area near Man Lai Court, were received. With the implementation of the proposed DWFI system and treatment wetlands, the existing polluted dry weather flow from the drainage outlets along TWN will either be intercepted by the DWFI system and discharged to the existing sewerage system, via gravity mains (i.e. no DWFI pumping station required), to Shatin Sewage Treatment Works for treatment, or be discharged into the treatment wetlands installed at drainage outlets for in-situ polishing. Furthermore, with the modification of channel bed downstream of TWN's low flow channel near its confluence with Shing Mun River near Man Lai Court, the excessive accumulation of silts brought by tidal influence caused by the uneven surface and flat gradient in front of the broad-crested weir would be greatly reduced. With the abovementioned designs, the water quality and hygiene within the nullah would be improved and odour nuisance to the resident nearby would be alleviated.

15.2.2.2 After the revitalisation works, similar to the existing condition, the nullah bank of the engineering channel of TWN would be dry most of the time during non-rainy days, except for the low flow channel in the middle. While the water body of TWN, i.e. low flow channel, is not suitable to be opened up for public access / physical contact due to safety reasons, the improvement of water quality and riverside environment of the nullah due to the Project would enhance user experience and hence promoting water friendliness culture. In order to allow public to better enjoy the view of revitalised waterscape and ecological enhancement features (e.g. treatment wetland), construction / modification of footbridges / walkways and public open spaces is proposed along the nullah. The riparian areas (nullah bed of the engineering channel of TWN outside of the low flow channel) of midstream TWN near Pok Ngar Villa would also be opened for public access and be transformed into a public open space with accesses with stepped seats, riparian walkways and other community amenities [including water play features (fully separated from the water body of TWN)] to promote water-friendliness. Associated visitor's facilities, including toilet and management office, would also be provided for the proposed riparian public open space. The riparian walkway and amenity areas will be properly designed to restrict public access / physical contact to the water body of TWN in order to ensure the public safety (e.g. elevated walkway design, fencing, provision of warnings / signage etc.). Channel

management system, rain detection and safety system and flood warning will also be adopted and to be managed by DSD and access to the riparian walkway and amenity areas [provided with water play features] will be closed under extreme weather conditions.

- 15.2.2.3 Freshwater discharge from the existing drainage outlet of the nullah near Pok Ngar Villa, which receives mainly clean river flow from upstream natural hillside catchment, north to Peak One, will be partially intercepted and conveyed to the proposed UV disinfection system for treatment prior to be used in the water play features (e.g. water spouts and fountains). Based on the preliminary design, no additional stormwater collection facilities would be required for the conveyance of freshwater supply for the proposed water play features. DSD Practice Note (PN) No. 3/2021 “Guidelines on Design for Revitalisation of River Channel” lays out the Water Quality Goals (WQGs) for primary contact recreation (type 3 designated use) at revitalised river channel. A more stringent treatment standard will be adopted for the water supply for the proposed water play features that in addition to fulfilling the relevant WQGs for type 3 designated use, *E. coli* bacteria should be non-detectable (in cfu/100 mL, calculated as the geometric mean of all samples collected in one calendar year) in the treated water. There would also be provision of proper signage and deployment of specific management personnel to ensure safe and appropriate usage of the water play features. The water play features will be closed when the disinfection system is not under normal operation, under maintenance or when the treatment standard as specified in the post-revitalisation water quality monitoring programme established and implemented by DSD is not complied with. The detailed designs of the UV disinfection system and water play features would be conducted in the next stage of the Project in consultation with relevant Government authorities and reference would be made to other existing water play features in Hong Kong (e.g. splash pads, water cascade facilities, water jets and spray grounds etc.).
- 15.2.2.4 The riparian walkway and amenity areas would be properly designed to restrict public access / physical contact to the water body, i.e. the low flow channel, and to ensure public safety (e.g. elevated walkway design, fencing, provision of warnings / signage, deployment of specific management personnel etc.). In particular, it should be noted that neither the water from the revitalised nullah with improved water quality or the water play features utilising treated freshwater shall be used for human or animal consumption, bathing or showering, food preparation / washing. Channel management system, as well as rain detection, safety and flood warning system (e.g. water level sensor at the low flow channel) will be adopted and managed by the DSD and access to the riparian walkway and amenity areas [provided with water play features] will be closed in case of foreseeable flooding at the nullah bed or under extreme weather conditions.

Greening Enhancement

- 15.2.2.5 The existing concrete nullah of TWN will be resurfaced with layer of vegetation, which will enhance both the aesthetic and ecological values of TWN. Greening of the nullah bed and along its banksides, such as provision of emergent wetland planting (e.g. reed and other aquatic herbs), mangroves, climbing plants, tree and / or grasscrete etc, will be provided. The existing mature trees growing by the banksides along the nullah will be retained, and additional tree planting will be provided along the nullah. The existing planters will also be modified to beautify the footpath along TWN.

Ecological Enhancement

- 15.2.2.6 The existing TWN is of low ecological value in view of its concrete-lined channel bed and bank, as well as its limited baseflow, especially in dry season (i.e. from November to March). With the proposed modification of the existing stilling basin (part of channel bed modification works) and the installation of the underground water pumps installed by the bankside near mid-stream of TWN for associated water retention and supplement, ecological features will be viable to improve and create aquatic and terrestrial habitats, enhancing its ecological values.

15.2.3 Key Environmental Problems Avoided and Compensation Area Included

Avoidance of Natural Habitats

- 15.2.3.1 All identified natural watercourses are located in the upper catchment of TWN and outside of the Project site. All natural watercourses and other natural habitats been avoided under the revitalisation design.

Avoidance and Minimisation of Impacts to Roosting Ardeids

- 15.2.3.2 Ardeid night roost was recorded along Shing Mun River nearby the Project, including the mature trees alongside Man Lai Court and Sha Tin Government Secondary School (**Section 9** refers). The ardeid night roosts in vicinity of the Project have been avoided under the revitalisation design. Under the revitalisation design, existing concrete channel bank and existing vehicular access at downstream section of TWN would also be modified into a mix of stepped terrace and slope at water edge to enhance foraging / pre-roost habitats for waterbirds (e.g. ardeids).
- 15.2.3.3 No construction works within the nullah in Section 1 (channel bed modification and desilting at downstream tidal zone) should be undertaken from 16:30 to 07:30 during dry season (October to March) and from 17:00 to 07:00 during wet season (April to September) in order to minimise the potential disturbance to pre-roosting / night-roosting ardeids. A pre-construction ardeid survey should be conducted for areas within 100m from the Project site to confirm the location and status of the night roost. No construction works with PME should be undertaken within 100m from any night roost should be undertaken from 16:30 to 07:30 during dry season (October to March) and from 17:00 to 07:00 during wet season (April to September) to avoid disturbance for all work sections 1 – 6 of TWN.

Protection of Mature Vegetation along TWN

- 15.2.3.4 There are existing mature trees along TWN on pedestrian road within the Project site. Although these tree species are not of conservation importance, the tree specimens are mature with good foliage and tree crown that can potentially provide habitat for fauna species, e.g. ardeid night roost. These mature trees will therefore be retained under the revitalisation design.

Avoidance of Constructions Works within Nullah during Wet Season

- 15.2.3.5 The construction work within the nullah, including (including construction of energy dissipation structures), construction of DWFI system along the nullah, underground water pipes along the nullah, construction of riparian walkway and amenity areas, and desilting works at downstream tidal zone, will only be undertaken during dry season when water is limited to low flow channel. In addition, site demarcation and flow diversion as detailed in **Section 5.8** will be implemented to avoid release of sediments/other pollutants into receiving waters.

Minimisation of Construction Disturbances

- 15.2.3.6 The Project site will be divided into six sections to be constructed in sequence starting from downstream TWN and the construction works within each section will be undertaken by parts to reduce the construction impacts on nearby sensitive receivers as compared to constructing simultaneously in adjoining sections and areas. Construction works outside the nullah such as walkway improvement will be scheduled to avoid overlapping with works within the nullah to avoid heavy construction activities concentrating in a certain area over any period.
- 15.2.3.7 As the Project would not cause any loss of habitat of conservation importance, no compensation area is recommended.

15.2.4 Environmental Benefits of Environmental Protection Measures Recommended

- 15.2.4.1 Environmental benefits of environmental protection measures recommended in this EIA Report are summarised below. No environmental disbenefits would be envisaged from the proposed revitalisation works.

Air Quality Impact

- 15.2.4.2 The potential air quality impacts arising from the construction of the Project would be related to fugitive dust emissions from construction works and gaseous emissions from the use of PME, and odour nuisance from desilted / excavated materials generated during the desilting at downstream tidal zone / excavation works in the nullah. In view that the construction works of the Project would be conducted in section which is small in scale, the air quality impacts would be localised and minor, and would be well controlled through the implementation of good site practices and dust suppression measures stipulated in the Air Pollution Control (Construction Dust) Regulation as well as the proposed good site practices to minimise the exhaust emissions from NRMMS and odour nuisance from handling of desilting/excavated materials. No adverse air quality impact due to the construction of the Project would therefore be anticipated. Nonetheless, dust monitoring is recommended during construction phase to ascertain that there would be no adverse cumulative dust impacts at the nearby sensitive receivers. Regular weekly site audit is also recommended to be carried out during construction phase in order to confirm that the mitigation measures are properly implemented and are working effectively.
- 15.2.4.3 With the introduction of the DWFI system and treatment wetlands to intercept/polish the existing polluted discharges at the drainage outlets along TWN, as well as modification of channel bed downstream of TWN's broad-crested weir at its confluence with Shing Mun River near Man Lai Court to minimise excessive accumulation of silts brought by tidal influence, the odour nuisance of TWN would be alleviated as a result of the operation of the Project. Any odour emission generated from exposed desilted materials during the routine maintenance works would be temporary and confined to the areas of maintenance works that it would be well-controlled through good site practices. No adverse air quality impact due to the operation of the Project would be anticipated.

Noise Impact

- 15.2.4.4 Noise impact would arise from the use of powered mechanical equipment during construction phase. With the proper implementation of the recommended mitigation measures such as use of quality powered mechanical equipment (PME) / quieter construction method and movable noise barriers, implementation of good site practice and proper scheduling construction activities during examination period of TWGHs Tsoi Wing Sing Primary School, Buddhist Wong Wan Tin College and TWGHs Sin Chu Wan Primary School, the mitigated cumulative noise levels at all NSRs would comply with the noise criteria set out in the EIAO-TM. No adverse noise impact is anticipated during the construction phase of the Project.
- 15.2.4.5 During operational phase, fixed plant noise from the operation of the proposed underground water pumps at mid-stream of TWN for ecological enhancement associated water supplement and the proposed UV disinfection system for riparian amenity area would be the major source of noise impacts based on the current design. The noise impact associated with the operation of the Project has been assessed based on the design information provided by the Project Engineer at the time of the assessment. The assessment result indicated that the predicted fixed plant noise levels at all representative NSRs would comply with the noise criteria. No adverse noise impact would be anticipated during operational phase of the Project. Commissioning test should be conducted prior to operation of the Project to ensure that the fixed plant noise impact would comply with the relevant noise standards.

Water Quality Impact

- 15.2.4.6 The key issues of the land-based construction works include construction works at and in close proximity to TWN / inland water, wastewater generated from general construction activities, construction site runoff, sewage from construction workforce and accidental spillage of chemicals. The potential water quality impacts could be avoided and minimised by implementing the recommended pollution control measures. No adverse water quality impact during construction phase would be anticipated. Regular site audit should be undertaken routinely to inspect the construction activities and works area to ensure the recommended measures are properly implemented.

- 15.2.4.7 The potential sources of water quality impacts during the operational phase would be related to non-point source surface / irrigation runoff, routine maintenance works (maintenance desilting and minor maintenance to DWFI system), potential changes in hydrodynamics properties and hydrology, and potential changes in hydrodynamics properties and hydrology, and water quality impact from riparian public open space (including operation of UV disinfection system and water play features in amenity area). Adequate drainage system with silt traps and oil interceptors should be incorporated into the proposed works to collect the surface / irrigation runoff or runoff from riparian public open space. With proper design of drainage system and implementation of the recommended pollution control measures, no adverse water quality impact from non-point source surface / irrigation run-off or runoff from riparian public open space would be expected. No adverse water quality impacts would be expected to occur at any identified WSRs due to the small-scale and infrequent routine maintenance works to remove excessive silts, debris and any obstructions for safeguarding the hydraulic capacity of the nullah, which practices and frequencies would be similar to the ones undertaken by DSD along TWN under existing arrangement.
- 15.2.4.8 Despite the reduced environmental baseflow at the nullah due to the interception of the flow with heavily polluted discharges by the DWFI system, with the provision of treatment wetland for in-situ polishing of non-intercepted flow with less polluted discharges, the polished flow could serve as a part of the environmental flow to sustain the ecological function of the flora and fauna and habitat processes present within the revitalised TWN. Furthermore, owing to the water retention and replenish designs and ecological enhancement features (e.g. wetland habitats created) within the nullah, average flow rate would remain similar to baseline condition and no unacceptable impacts on hydrodynamics properties and hydrology would be anticipated. Furthermore, with the modification of channel bed and realignment of low flow channel at downstream TWN near its confluence with Shing Mun River near Man Lai Court, the sedimentation before the low flow channel caused by tidal influence and uneven surface and flat gradient in front of the broad-crested weir at would be greatly improved. No adverse water quality impact during the operational phase would therefore be anticipated. Regular weekly site audit during the construction phase is proposed to inspect the construction activities and works area to ensure the recommended pollution control measures are properly implemented.
- 15.2.4.9 While the Project is expected to improve the overall water quality of TWN and environmental monitoring for water quality is not considered necessary for the operational phase under this EIA study, a post-revitalisation water quality monitoring programme to review compliance with the Water Quality Goals as stipulated in DSD PN No. 3/2021 will be established and implemented by the DSD.

Waste Management Implications

- 15.2.4.10 During construction phase, waste types generated from the Project are likely to include C&D materials from construction activities, chemical wastes from maintenance and servicing of construction plants and vehicles, desilted materials from desilting works at downstream tidal zone, and general refuse from workforce. In view of the nature and limited scale of the Project, the quantity of waste arisings would not be substantial. However, improper handling, collection, transportation and re-use / disposal of the wastes would likely give rise to hygiene problems and adverse environmental impacts, e.g. odour nuisance to local residents, and contamination of the nearby watercourses. Provided that these wastes are handled, transported and disposed of according to the recommended good site practices and measures, no adverse environmental impacts (including potential hazard, air and odour emissions, noise and wastewater discharges) would be anticipated during the construction phase.
- 15.2.4.11 The main waste types generated from the operation of the Project would be silt, debris, screening and limit amount of chemical waste from the routine maintenance of the DWFI system and nullah as well as desilted materials from maintenance desilting works. The maintenance practices would be similar to the existing maintenance works undertaken by the DSD. With implementation of the good waste management practices, adverse environmental impacts (including potential hazard, air and odour emissions, noise and wastewater discharges) and public transport impact would not be anticipated during operational phase. General refuse would also be generated from the visitors of the

revamped public open space along TWN. Provided that sufficient number of trash bins and recycling bins have already been provided and would be retained for the collection of general refuse generated by visitors along TWN, no unacceptable environmental impact and public transport impact would be anticipated.

Land Contamination

- 15.2.4.12 Based on the findings of the site appraisal, no adverse land contamination impact arising from Project is anticipated. No further site investigation works at the Project site is required. Thus, no Contamination Assessment Plan / Contamination Assessment Report / Remediation Assessment Plan are required.

Sewerage and Sewage Treatment Implications

- 15.2.4.13 A DWFI system is proposed to improve the water quality in the TWN with intercepted dry weather flow estimated to be at 2,850 m³/day. An additional toilet facility for the visitors in Tai Wai Nullah located near Pok Ngar Villa with negligible additional sewage flow has also been proposed. The sewage impact assessment indicated that existing sewerage system has sufficient capacity to take up the additional dry weather flow intercepted by the DWFI system and proposed toilet facility. Thus, no mitigation measures are required. No adverse sewerage impact arising from the Project is anticipated.

Ecological Impact (Terrestrial and Marine)

- 15.2.4.14 A total of nine habitat types were recorded within the 500 m assessment area from recent surveys, including woodland, mixed woodland, plantation, grassland, reservoir, village/orchard, developed area/wasteland, natural and modified watercourses. Dominant habitat types recorded within the Project site included developed area and modified watercourse, which are of low ecological values except for limited sections of the TWN found to support some wetland vegetation and/or support pre-roost congregation of ardeids and other wetland birds. These habitats were considered of low to moderate ecological value. Species of conservation importance recorded within the assessment area included eight flora, twelve avifauna, eight mammals, four herpetofauna, five butterflies, two odonates and two freshwater species. Among these species, only eight avifauna, two mammal, four butterfly species of conservation importance were recorded within the Project site.
- 15.2.4.15 Marine habitats within the assessment area included subtidal hard substrata, soft bottom, and intertidal habitats, which are all of low ecological value. As the Project site is located far from marine habitats (>5.55 km), no direct impacts to marine habitats are anticipated, and indirect impacts are considered negligible.
- 15.2.4.16 Modified watercourses within the assessment area [especially alongside downstream TWN from Man Lai Court Block 1 and 2 (Section 1) to Hong Kong Heritage Museum] supported large number of wetland birds dominated by ardeids, with over 100 individuals congregating on the concrete access ramps as a pre-roost in the dry season.
- 15.2.4.17 Whereas ardeid night roost is located within developed areas within the assessment area, mature trees on the northern bank of Shing Mun River Channel (from Block 3 of Man Lai Court to Sha Tin Government Secondary School). Significantly lower abundance of ardeids were recorded during wet season. No breeding or nursery behaviour of any wetland avifauna species was identified within the assessment area.
- 15.2.4.18 No direct impacts to natural habitats within the assessment area are anticipated for the Project. Direct impacts arising from the proposed works would be limited to the temporary loss (about 11.1ha) of modified watercourse and developed area. Given the relatively low to moderate ecological value of affected habitats, the small area affected, and the temporary nature of the impact, direct impacts are expected to be *Minor* except for minor-moderate scale impacts to two small stretches of the TWN supporting some wetland vegetation and ardeid pre-roosting site. All affected areas will be reinstated and enhanced in terms of ecological value as part of the Project. Avoidance measures (e.g. restriction of construction hours, protection of mature trees along the nullah and avoidance of encroachment of ardeids night roosting sites) would be implemented to preserve the day roosting and night roosting habitats for bats and ardeids respectively. Floating platforms would be installed downstream of the Project site (in the Shing Mun River Channel) to compensate for temporary loss of the pre-roosting site.

- 15.2.4.19 Indirect impacts during the construction phase would comprise of human disturbance, construction noise, dust and site run-off. With proper implementation of the recommended mitigation measures and good site practices, no significant adverse ecological impact is anticipated. With ecological enhancement measures incorporated into revitalisation design of TWN and with restriction of public access in Section 1, nature of disturbance during operational phase would be minimal compared to existing baseline condition. Net positive ecological outcome would be result from the created and enhanced wetland habitats. No unacceptable adverse residual impacts would therefore be expected during both construction and operational phase.
- 15.2.4.20 Ecological monitoring of ardeid usage of the active pre-roosting and roosting sites confirmed by the pre-construction ardeid survey, and of the proposed temporary floating pontoons has also been recommended. Remedial actions can then be recommended, where appropriate, based on the impact monitoring results. Monthly site audit should also be carried out throughout the construction phase to ensure recommended avoidance / pollution control measures are fully implemented.
- 15.2.4.21 Ecological enhancement designs have been incorporated into the revitalisation plan to promote ecological value of the Project, as well as enhancement measures and good site practices to further minimise any potential environmental impacts. The proposed revitalisation plan for TWN should seek to find a balance between design for local communities' requirements (e.g. aesthetics, recreation/leisure and access) and ecological enhancement. Ecological enhancement could be achieved by incorporating habitat creation within and along the TWN to improve the overall ecological value of the Project site. The design should not result in disturbance impacts on surrounding habitats and fauna utilising the nullah. Upon completion of revitalisation for TWN, ecological value of the Project site is anticipated to be improved by ecological enhancement measures incorporated into the design. A post-enhancement ecological monitoring programme would be developed and implemented by the DSD to review effectiveness of these enhancement measures (e.g. creation of wetland habitats, vegetation planting and specific enhancement measures for identified species). The programme shall aim to record the overall ecological condition of the Project site, including but not limited to the followings: quality of the created habitats and enhancement elements, usage by targeted fauna species and vegetation conditions. Maintenance and management requirements for TWN would be adjusted accordingly based on the monitoring results.

Fisheries Impact

- 15.2.4.22 The Project would only involve construction works within the Project area (existing TWN and developed area alongside). No loss of fishing grounds and mariculture areas are anticipated within the assessment area. With the implementation of the recommended water pollution control measures, the Project would not cause any unacceptable indirect impacts to fishing grounds and mariculture areas on fisheries within the assessment area during both construction and operational phases.

Cultural Heritage Impact

- 15.2.4.23 Direct impacts from damages through contacting with construction machineries and site negligence might be anticipated for Gatehouse of Pok Ngar Villa (new item pending for grading assessment) within the Project site during construction phase. Indirect impacts of ground-borne vibration would also be anticipated for Gatehouse of Pok Ngar Villa (New Item Pending for Grading Assessment), Li Cottage (Grade 1), Nos. 1-3 First Street, Tai Wai (Grade 3) and Entrance Gate, Chik Chuen Wai (Grade 2) during construction phase. Appropriate mitigation measures including pre- and post-condition surveys, buffer zone and monitoring of vibration, settlement and tilting incorporated with AAA system for the concerned buildings have been recommended for the built heritages impacted by the Project.
- 15.2.4.24 A Declared Monument, Old House, Wong Uk Village, is located within 300m of the discharge area from the revitalised TWN, and located at about 1.8km from the nearest site boundary. As the proposed works are mostly situated within the TWN and there is substantial separation distance between the Old House and the proposed works, no direct and indirect impacts on the Old House would be anticipated during the construction and operation phases of the Project.

- 15.2.4.25 As no archaeological potential exists within the site boundary, and no sites of archaeological interest (SAI) is identified within 300m from the site boundary, no impact to archaeology would be anticipated during the construction and operational phases of the Project.

Landscape and Visual Impacts

- 15.2.4.26 During construction phase, the proposed channel modification and construction of DWFI system and mid-stream water pumps for ecological enhance associated water supplement will be constructed inside the existing Tai Wai Nullah, while some proposed architectural structures will be constructed at the roadside for enhancement of public open space which may impose visual impact to adjacent VSRs. Based on the broad-brush tree survey, amongst the 254 nos. of surveyed trees, 202 nos. are proposed to be retained, including all existing mature trees growing along the nullah. According to the latest tree treatment proposal, 1 no. of tree of common species (i.e. *Sterculia lanceolata*) will be transplanted on-site, and 13 nos. of common species of trees (i.e. *Ficus elastica*, *Ficus subpisocarpa* and *Sterculia lanceolata*) and 38 nos. of undesirable species (i.e. *Leucaena leucocephala*) are proposed to be removed. As stipulated in DEVB TC(W) No. 4/2020, "...the number of compensatory trees onsite and offsite shall not be lower than that of number of trees removed including dead trees, but excluding trees of undesirable species...", therefore, compensation of the undesirable *Leucaena leucocephala* would not be required and only 13 nos. of trees would need to be compensated. Nonetheless, to compensate the loss of existing trees and to further enhance greening and the amenity value to vicinity of site, approximately 28 nos. of heavy standard compensatory trees are proposed to be planted at available planting area on-site. With proper implementation of mitigation measures, all affected LRs and LCAs would have "moderate" to "insignificant" adverse landscape impacts whilst all affected VSRs would have "slight" or "insubstantial" adverse visual impacts except for T2 which would have "moderate" adverse impacts during construction phase. During operational phase with implementation of mitigation measures, there will be "insubstantial" residual visual impacts for most of the VSRs except for T2, which will have "slight" residual impact significance upon completion of mitigation measures (OM1, OM2, OM4 & OM5) at Day1 and at Year 10 of operational phase. The provision of new landscaping works and recreational facilitate along the nullah proposed in this Project can have beneficial impact to the VSRs throughout the operational phase.
- 15.2.4.27 Tai Wai Nullah will be revitalised with architectural and landscape features aimed at promoting water friendliness and providing an enhanced green and ecological environment. The proposed architectural and landscape features and modified channel bed would be the key sources of visual and landscape changes during operation. With proper implementation of landscape and visual measures, namely greening enhancement along channel bed and embankment, provision of recreational opportunity along nullah, sensitive and aesthetically pleasing design, re-provision of affected open space, the landscape and visual impacts are considered as acceptable in accordance to Annexes 10 and 18 of the EIAO-TM.

15.3 Summary of Key Environmental Impacts

- 15.3.1.1 A summary of environmental impacts for the environmental issues in this EIA is presented in **Appendix 15.2**.

15.4 Summary of Alternative Options and Mitigation Measures

- 15.4.1.1 A summary of alternative development options and environmental benefits and disbenefits of different mitigation options is presented in **Section 2.4**.

15.5 Overall Conclusion

- 15.5.1.1 The findings of this EIA have provided information on the nature and extent of environmental impacts arising from the construction and operation of the Project. The EIA has, where appropriate, identified mitigation measures to ensure compliance with the relevant environmental legislation and standards. The EIA report has meet the requirements of the EIAO-TM and EIA Study Brief No. ESB-320/2019 for the Project.

- 15.5.1.2 Overall, the EIA Report has predicted that the Project would be environmentally acceptable with the implementation of the proposed mitigation measures for the construction and operational phases. An environmental monitoring and audit programme has been recommended to ensure the effectiveness of recommended mitigation measures.