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7. ECOLOGICAL IMPACT ASSESSMENT

7.1 Introduction

7.1.1 This Section presents the findings of an assessment of potential ecological impacts associated with the Project. It summarises baseline information gathered from the literature review and baseline ecological surveys on the terrestrial ecological resources in the Assessment Area and describes the ecological importance of this area.

7.2 Legislative Requirements & Evaluation Criteria

7.2.1 The local ordinances and regulations, international conventions and local / international guidelines relevant to protection of species and habitats of ecological importance include the following:

- *Forests and Countryside Ordinance (Cap. 96)* and its subsidiary legislation, the *Forestry Regulations (Cap. 96A)*
- *Wild Animals Protection Ordinance (WAPO) (Cap. 170)*
- *Country Parks Ordinance (Cap. 208)* and its subsidiary legislation
- *Environmental Impact Assessment Ordinance (EIAO) (Cap. 499)* and relevant *annexes 8, 9, 11, 16, 17, 20 and 21 of the associated Technical Memorandum (EIAO-TM)*
- Protection of Endangered Species of Animals and Plants Ordinance (Cap. 586*)* and its subsidiary legislation
- *EIAO Guidance Note No. 6/2010 – Some Observations on Ecological Assessment from the Environmental Impact Assessment Ordinance Perspective*
- *EIAO Guidance Note No. 7/2010 – Ecological Baseline Survey for Ecological Assessment*
- *EIAO Guidance Note No. 10/2010 – Methodologies for Terrestrial and Freshwater Ecological Baseline Surveys*
- *Hong Kong Planning Standards and Guidelines*
- *Planning, Environment & Lands Branch Technical Circular (PELBTC) No. 1/97/Works Branch Technical Circular (WBTC) No. 4/97 – Guidelines for Implementing the Policy on Off-site Ecological Mitigation Measures*
- *Drainage Services Department Practice Note No.1/2005 – Guidelines on Environmental Considerations for River Channel Design*
- *Environment, Transport and Works Bureau Technical Circular (Works) (ETWB TCW) No. 5/2005 – Protection of Natural Streams/Rivers from Adverse Impact Arising from Construction Works*

- New Nature Conservation Policy
- Hong Kong Biodiversity Strategy and Action Plan (2016-2021)
- List of Wild Animals under State Protection
- List of Wild Plants under State Protection
- Convention on International Trade in Endangered Species of Wild Fauna and Flora ("CITES").
- United Nations Convention on Biological Diversity.

7.3 Areas/ Species of Conservation Importance from Reviewed Literature

7.3.1 The baseline conditions of terrestrial ecological resources of the habitats in the Assessment Area are reviewed by desktop literature review and dedicated field surveys. The methodology and findings of this review is presented in detail in **Appendix 7.1**.

7.3.2 The distribution of recognised sites of conservation importance located within the Assessment Area and its proximity are as shown in **Figure 7.1**, the following section provides a brief account of those areas.

Lantau North Country Park

7.3.3 Lantau North Country Park covers Sunset Peak, Yi Tung Shan, Lin Fa Shan, Northern slopes of Lantau Peak and Nei Lak Shan. The well-established secondary woodlands, shrublands, grasslands and freshwater habitats within the park are recognised for their high conservation and landscape value. Some rare native plant species are recorded commonly within the country park, such as the *Asarum hongkongense*. An area of Lantau North Country Park (approximately 28 ha) is located in the Western side of the 500m Assessment Area.

Lantau South Country Park

7.3.4 Lantau South Country Park covers a variety of habitats. The secondary forests and shrub lands covering Lantau Peak and northern Sunset Peak in particular, has a high diversity of native flora species such as *Dendropanax dentigerus*, *Magnolia championii* and rare species such as *Gmelina chinensis*. The secondary forests within the country park is also noted as an area where the Red Muntjac is active, and the Chi Ma Wan peninsula within the park is one of the known nesting sites of the White-bellied Sea Eagle (So & Yuen 2021), a species of bird with an IUCN status of "Vulnerable". An area of Lantau South Country Park (approximately 21 ha) is located in Southern side of the 500m Assessment Area, edged by South Lantau Road.

Fung Shui Woods

7.3.5 *Fung Shui* Woods are established by traditional villagers as a barrier between the village and surrounding natural forest, which serves as a symbolic meaning of

protection. As these woods are well preserved by villagers, they are often unaffected by habitat destruction and tree felling, resulting in unique and high ecological value. Two *Fung Shui* Woods were recorded in Mui Wo at the north of Tseng Tau San Tsuen and the south of Luk Tei Tong Tsuen, respectively, according to a territory-wide *Fung Shui* wood survey initiated by AFCD in 2002.

Amphibian Hotspot in Mui Wo

7.3.6 Mui Wo is noted as an amphibian hotspot within the Proposed Action Plan for the Conservation of Amphibians in Hong Kong (AFCD 2009). Species of conservation concern such as Romer's Tree Frog and Chinese Bullfrog were recorded in Mui Wo by Lau (1998).

7.3.7 A literature review has been conducted to characterise the existing ecological conditions of the Assessment Area and to identify habitats and species of conservation concern in the area as presented in **Appendix 7.1**. Baseline information of the terrestrial ecological resources is available in the following key sources:

- Environmental assessments reports done in Mui Wo from various sources by aec (2018), Arup & aec (2018) and CEDD (2009)
- EIA reports submitted by M&EL (2005) and MLAL & CLL (2016).
- Surveys on specific taxa at Mui Wo done by local experts, institutes and organizations – Lau & Dudgeon (1999); Carey *et al.* (2001) and the University of Hong Kong (2001), referenced by M&EL (2005).
- List of fauna recorded by AFCD within the survey area provided on request.

Habitat and Vegetation

7.3.8 A total of 13 habitat types were recognised in the study by M&EL (2005), namely, secondary woodland, plantation, shrubland, semi-natural watercourse, active dry agriculture, active wet agriculture, inactive dry agriculture, inactive wet agriculture, pond, orchard, developed land, bare ground and wasteland. A summarised description of the habitats is listed within **Appendix 7.1**. It is noted that the construction of Luk Tei Tong Bypass Channel, and the associated pumping stations, floodwalls, and bunds following M&EL (2005) have altered the ecology of the affected streams and surrounding areas, causing some information from this literature review to become obsolete.

7.3.9 Eleven (11) flora species of conservation importance namely, Ailanthus fordii, Aquilaria sinensis, Aralia chinensis, Artocarpus hypargyreus, Azolla imbricata, Camellia sp., Canthium dicoccum, Diospyros vaccinioides, Pavetta hongkongensis, Rhododendron simsii and Rhododendron sp. were recorded within the Assessment Area and its vicinity from previous surveys/ approved EIA studies. Details of the flora species of conservation importance are presented in **Appendix 7.1**.

Terrestrial Mammals

7.3.10 Ten (10) mammal species of conservation importance namely, Short-nosed Fruit Bat, Chinese Horseshoe Bat, Intermediate Horseshoe Bat, Least Horseshoe Bat, Himalayan Leaf-nosed Bat, Pomona Leaf-nosed Bat, Chinese Myotis, Rickett's Big-footed Myotis, Lesser Bent-winged Bat and Red Muntjac were recorded within the Assessment Area and its vicinity from previous surveys/ approved EIA studies. Details of the mammal species of conservation importance are presented in **Appendix 7.1**.

Birds

7.3.11 Forty-two (42) bird species of conservation importance namely, Falcated Duck, Eurasian Teal, Chinese Francolin, Yellow Bittern, Cinnamon Bittern, Black Bittern, Black-crowned Night Heron, Striated Heron, Chinese Pond Heron, Eastern Cattle Egret, Grey Heron, Great Egret, Little Egret, Pacific Reef Heron, Western Osprey, Crested Serpent Eagle, Black Kite, Eastern Buzzard, Slaty-legged Crake, Slaty-breasted Rail, Western Water Rail, Brown Crake, Watercock, Little Ringed Plover, Greater Painted-snipe, Pintail/Swinhoe's Snipe, Far Eastern Curlew, Greater Coucal, Lesser Coucal, Collared Scops Owl, Pacific Swift, White-throated Kingfisher, Common Kestrel, Chinese Penduline Tit, Zitting Cisticola, Red-billed Starling, Daurian Starling, White-shouldered Starling, Common Starling, Plumbeous Water Redstart, Chinese Grosbeak and Yellow-breasted Bunting were recorded within the Assessment Area and its vicinity from previous surveys/ approved EIA studies. Details of the avifauna species of conservation importance are presented in **Appendix 7.1**

Herpetofauna

7.3.12 Fifteen (15) herpetofauna species of conservation importance, including 5 amphibian species and 10 reptiles species namely, Short-legged Toad, Chinese Bullfrog, Lesser Spiny Frog, Three-striped Grass Frog, Romer's Tree Frog, Four-clawed Gecko, Tokay Gecko, Common Wolf Snake, Taiwan Kukri Snake, Common Rat Snake, Chinese Cobra, Chinese Water Snake, Plumbeous Water Snake, Buff-striped Keelback and Burmese Python were recorded within the Assessment Area and its vicinity from previous surveys/ approved EIA studies. Details of the herpetoauna species of conservation importance are presented in **Appendix 7.1**

Butterfly and Odonate

7.3.13 Ten (10) butterfly species of conservation importance namely, Orange Awlet, Common Awl, Grey Scrub Hopper, Banded Demon, Grass Demon, Metallic Cerulean, Falcate Oak Blue, Yellow Rajah, White Dragontail and Small Cabbage White were recorded within the Assessment Area and its vicinity from previous surveys/ approved EIA studies. Details of the butterfly species of conservation importance are presented in **Appendix 7.1**

7.3.14 Ten (10) odonate species of conservation importance namely, Chinese Yellowface, Blue Sprite, Blue-spotted Dusk-hawker, Dingy Dusk-hawker, Tiger Hawker, Dog-legged Clubtail, Angle-winged Cruiser, Ruby Darter, Sapphire Flutterer and Emerald Cascader were recorded within the Assessment Area and its vicinity from previous surveys/

approved EIA studies. Details of the odonate species of conservation importance are presented in **Appendix 7.1**

Freshwater Community

7.3.15 Ten (10) freshwater community species of conservation importance, including 7 freshwater fish species and 3 aquatic invertebrate species namely, Japanese Eel, Giant Mottled Eel, Largesnout Goby, Blue Neon Goby, Scaly Neon Goby, Small Snakehead, Dark-margined Flagtail, Emerald Cascader (Larva), *Cryptopotamon anaculothon* and *Somanniathelphusa zanklon* were recorded within the Assessment Area and its vicinity from previous surveys/ approved EIA studies. Details of the freshwater species of conservation importance are presented in **Appendix 7.1**.

7.4 Identification and Evaluation of Information Gap

7.4.1 In general, the ecological profiles of the four main streams (Pak Ngan Heung River, Tai Tei Tong River, Luk Tei Tong River, and Wang Tong River), the wetlands and woodlands (Butterfly Hill) that enclosed in the Assessment Area have been well studied in the past.

7.4.2 However, some species of conservation importance had only been recorded in older studies especially the waterbirds such as Cinnamon Bittern, Black Bittern, Striated Heron, Slaty-breasted Rail Western Water Rail, Brown Crake, Watercock and Greater Painted Snipe. The reason for the lack of records of these bird species in recent studies is unknown. However, attention has been given to these avifauna species in the current surveys in order to reflect their current status in Mui Wo and to provide an accurate and updated ecological baseline condition.

7.4.3 Other limitation of this literature review is that previous assessments to the habitats of the Assessment Area may be outdated. Moreover, additional settlements, development and human activities within the Assessment Area might also have increased significantly since the previous study by M&EL (2005) (over 18 years). Besides, there are artificial watercourses established after the study.

7.4.4 An ardeid night roost at Tai Wai Yuen near the estuary of Wang Tong River was discovered within the Assessment Area since the commencement of the Project (Year 2021). Usage of this night roost and its ecological value had been examined in the baseline survey.

7.4.5 In conclusion, information gaps were identified in the knowledge of the latest habitat conditions and biodiversity at the marsh, agricultural lands and watercourses within the Assessment Area as well as the newly identified Tai Wai Yuen night roost, all of which shall be addressed in the following sections.

7.5 Ecological Field Survey Methodology

7.5.1 A survey programme of the Study is summarised below in **Table 7.1**.

Table 7.1 – Survey Programme

Habitat	2021			2022								
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Habitat and Vegetation Surveys						✓			✓			
Terrestrial Mammal Surveys (Day-time + Night-time)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Bird Surveys (Day-time + Night-time)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Herpetofauna Surveys (Day-time + Night-time)		✓				✓		✓	✓	✓	✓	
Butterfly and Odonate Surveys		✓				✓		✓	✓	✓	✓	
Freshwater Community Survey		✓				✓			✓			✓

7.5.2 The ecological field surveys involved an Assessment Area of 500m from the boundary of the Project (**Appendix 7.1, Figure 1**). The surveys covered the ecological context (both fauna and flora) associated with the Assessment Area and various fauna groups as required. Details of the methodology are as presented in **Appendix 7.1**.

7.6 Baseline Conditions

Habitat and Vegetation

7.6.1 Within the 500m Assessment Area, a total of 12 terrestrial and aquatic habitats were identified, including Secondary Woodland, Plantation, Shrubland/Grassland, Marsh, Mangrove, Semi-natural Watercourse, Channelised Watercourse, Pond, Agricultural Land, Village/Developed Area, and Sandy Shore.

7.6.2 The areas of each type of habitats present within the works area and the 500m Assessment Area are listed in **Table 7.2**, while a habitat map is provided in **Appendix 7.1, Figure 2**. Representative photographs of these habitats are provided in **Appendix 3** of **Appendix 7.1**.

Table 7.2 – Habitat Evaluation

Habitats	Area of Each Habitat Identified (ha)[1]		
	Works Area	500m Assessment Area excluding Works Area	Total
Secondary Woodland	-	~114.6	~114.6
Plantation	-	~1.8	~1.8
Shrubland/Grassland	-	~5.0	~5.0
Marsh	~0.7	~15.3	~16.0
Mangrove	-	~0.6	~0.6
Semi-natural Watercourse	(~0.7km*)	(~4.6km*)	(~5.3km*)

Habitats	Area of Each Habitat Identified (ha)[1]		
	Works Area	500m Assessment Area excluding Works Area	Total
Channelised watercourse	(~0.4km*)	(~1.6km*)	(~2.0km*)
Pond	-	~1.9	~1.9
Agricultural Land	~1.1	~32.3	~33.4
Village/Developed Area	~0.5	~45.3	~45.8
Sandy Shore	-	~1.2	~1.2
Total[1]	~2.3 (~1.1km*)	~218.0 (~6.2km*)	~220.3 (7.3km*)

Notes:

1. Figures above are rounded to the nearest hundredth. Hence, figures may not add to the total value.
2. * indicates length of semi-natural and channelized watercourse habitats potentially affected by the works.

7.6.3 A list of floral species recorded during the surveys with their relative abundance within each habitat is provided in **Appendix 1** of **Appendix 7.1**. Four flora species of conservation importance, namely *Aquilaria sinensis*, *Artocarpus hypargyreus*, *Azolla imbricata* and *Malaisia scandens*, were identified during the surveys. Details of the flora species of conservation importance are presented in **Appendix 7.1**. *Aquilaria sinensis* and *Artocarpus hypargyreus* were also identified from the Broad Brush Tree Survey as presented in **Appendix 8.2** of **Chapter 8**.

Secondary Woodland

7.6.4 Extensive hillside areas are covered by woodlands, however, most of them are located in the outer part of the Assessment Area. These woodlands are generally preserved in good condition, supporting moderate richness of native plant species. The overstorey is occupied by mature trees of *Alangium chinense, Aporosa dioica, Celtis sinensis, Litsea glutinosa, Machilus chekiangensis*, *Schefflera heptaphylla* and *Sterculia* lanceolata etc., forming a semi-close tree canopy of 8-12m tall on average. The understorey is vegetated with common ferns (*Blechnum orientale* and *Cyclosorus parasiticus*), climbers (*Desmos chinensis* and *Tetracera asiatica*), shrubs (*Ficus hirta, Psychotria asiatica* and *Phyllanthus cochinchinensis*), and saplings of the overstorey trees.

7.6.5 Trees *Aquilaria sinensis* and *Artocarpus hypargyreus*, which are considered of conservation concern, were found in secondary woodland north of Mui Wo town. Though *Artocarpus hypargyreus* is assessed as common in Hong Kong by Corlett *et al.* (2000), it is listed as Vulnerable globally and Near Threatened nationally (IUCN 2022, AFCD 2003).

Plantation

7.6.6 Only a few small areas of plantation were identified on the engineering slopes in the southern part of the Assessment Area. Vegetation of this habitat comprises of the widely cultivated exotic tree species *Acacia confusa*, however, some naturally colonised tree and shrub species such as *Bridelia tomentosa*, *Celtis sinensis*, *Cratoxylum cochinchinense*, *Ficus hispida*, *Macaranga tanarius var. tomentosa*, *Mallotus paniculatus* and *Sterculia lanceolate*. The understorey is vegetated by small herbs and ferns instead, most abundant species includes *Blechnum orientale*, *Cyclosorus parasiticus*, *Dicranopteris pedata* and *Lygodium scandens*.

Shrubland/Grassland

7.6.7 Shrubland/grassland, which is a densely vegetated habitat on hillside, is not commonly found within the Assessment Area. A high proportion of native species are present in shrubland/grassland. The more mature area of shrubland consists of shrubs and small trees of 3-6m tall in general, for example, *Alangium chinense, Aporosa dioica, Ilex asprella* and *Litsea rotundifolia* var. *oblongifolia*. The exposed area is dominated by fern *Dicranopteris pedata,* small shrubs *Glochidion eriocarpum, Rhodomyrtus tomentosa* and *Sapium discolor*.

7.6.8 Two small individuals of protected tree *Aquilaria sinensis* are recorded on the shrubland/grassland north of Mui Wo town. This species is listed as Vulnerable in China Plant Red Data Book and under State protection (Category II) in China (AFCD 2003). It is also assessed as Vulnerable globally by IUCN (2022). However, it is commonly found in lowland forests and *Fung Shui* woods in Hong Kong (Corlett *et al.* 2000).

Marsh

7.6.9 Patches of marsh are mainly situated near Wang Tong, Pak Ngan Heung and Luk Tei Tong. A very small area at the fringe of the marsh along Luk Tei Tong River is zoned within the Extent of River Revitalisation in the works area. This habitat is naturally turned from abandoned agricultural lands in low-lying areas receiving water from streams and rainwater. Aquatic plants are extensively distributed in marshes. Dominant species include *Colocasia esculenta, Cyclosorus interruptus, Hedychium coronarium, Hydrocotyle sibthorpioides, Phragmites australis* and *Panicum repens.* However, some of the areas begins to dry out with the invasion of terrestrial or exotic species, such as *Alocasia macrorrhizos, Bidens alba, Brachiaria mutica, Lantana camara* and *Mikania micrantha*.

7.6.10 Aquatic fern *Azolla imbricata,* which is accessed as Rare by Corlett *et al.* (2000), was found in Luk Tei Tong Marsh, within the Assessment Area.

Mangrove

7.6.11 Mangrove stands are only found near the Wang Tong River in the Assessment Area. The vegetation structure of this habitat is very simple that is formed by several species favouring brackish habitat, the dominant species includes *Hibiscus tiliaceus*, *Pandanus tectorius* and *Acanthus ilicifolius*. Mangrove species such as *Aegiceras corniculatum,* are sparsely distributed within the habitat.

Semi-natural Watercourse

7.6.12 The upper sections of the three abovementioned main streams in Mui Wo plus Wang Tong River, which are mostly located around marshes and agricultural lands, are the main semi-natural watercourses present in the Assessment Area. The works area of River Reprofiling are located along a section of Tai Tei Tong River. The diversity and abundance of native aquatic species in these areas within works area are not high given that many of the stream sections are shaded by trees such as *Macaranga tanarius* var. *tomentosa* and *Sterculia lanceolata*.

7.6.13 The semi-natural sections of Pak Ngan Heung River close to the agricultural land were overgrown with terrestrial plants, including *Alocasia macrorrhizos, Bidens alba, Boehmeria nivea, Microstegium ciliatum, Mikania micrantha* and *Neyraudia reynaudiana*. However, the semi-natural watercourses of Pak Ngan Heung River, Luk Tei Tong River and Wang Tong River located around the marshes were taken over by aquatic vegetation present in the neighbouring marshy area, such as *Commelina diffusa*, *Colocasia esculenta, Cyclosorus interruptus* and *Phragmites australis.* The lower courses of Wang Tong River are influenced by tidal motion, favouring the growth of mangroves and mangrove associates, for example, *Acanthus ilicifolius, Acrostichum aureum* and *Solanum torvum*.

Channelised Watercourse

7.6.14 Channelised watercourses are found in the lower courses of three main streams of Mui Wo (Pak Ngan Heung, Tai Tei Tong and Luk Tei Tong), which merge into the River Silver. Vegetation is very limited in these channelised sections. Since River Silver is heavily influenced by tidal motion, only small number of mangrove seedlings were recorded.

7.6.15 Moreover, the channelised section of Luk Tei Tong Bypass is included in the Extent of River Revitalisation within the works area. Plant species recorded in this habitat are mainly grasses and herbs, including native aquatic plants *Ludwigia hyssopifolia*, *Colocasia esculenta, Panicum repens*, grasses *Neyraudia reynaudiana, Microstegium ciliatum,* and exotic species *Alternanthera philoxeroides, Bidens alba, Myriophyllum aquaticum* and *Panicum maximum*.

Pond

7.6.16 Several active and abandoned ponds are found in the Assessment Area. Vegetation is very limited in active ponds which are frequently managed by owners for recreational fishing activities. Crops are found on the pond bund, for example, *Musa* x *paradisiaca* and *Carica papaya*. Most of the abandoned ponds are overgrown. Dominant species include native aquatic plants *Acrostichum aureum, Phragmites australis, Lemna minor*, terrestrial grass *Microstegium ciliatum,* and exotic species *Brachiaria mutica, Eichhornia crassipes* and *Panicum maximum*.

Agricultural Land

7.6.17 The lowland area of Mui Wo, including the works area of the proposed stormwater pumping station, is largely covered by abandoned agricultural land with dry soil layer. This habitat is dominated by herbaceous vegetation, such as *Alocasia macrorrhizos*, *Amaranthus viridis, Cynodon dactylon*, *Oxalis corniculata*, *Plantago major*, and exotic weeds, *Axonopus compressus*, *Hydrocotyle verticillata*, *Mimosa pudica*, *Oxalis debilis subsp. Corymbosa*, *Wedelia trilobata* and *Panicum maximum*. Individuals and small groups of young native trees, including *Ficus hispida*, *Macaranga tanarius var. tomentosa* and *Mallotus paniculatus*, are scattered in the abandoned agricultural land. Several minor areas of active agricultural lands are also present with the cultivation of common crops and fruit trees, for example, *Beta vulgaris var. rapacea*, *Brassica rapa chinensis*, *Carica papaya*, *Musa x paradisiaca*, *Dimocarpus longan* and *Clausena lansium*.

7.6.18 An individual of climber *Malaisia scandens*, which is assessed as Rare in Hong Kong (Corlett *et al.* 2000), was found North of Tai Tei Tong Village. Other known localities were mainly located on Lantau and nearby islands, including Tai O, Fan Lau, Shui Hou, Tong Fuk, Tai A Chau, Soko Islands and Tai A Chau (Corlett *et al.* 2000, AFCD 2007).

Village/Developed Area

7.6.19 Developed area comprises the town and several villages in Mui Wo. Vegetation found in this habitat included a lot of exotic species cultivated for ornamental or gardening purposes, such as *Aglaia odorata, Calliandra haematocephala, Dypsis lutescens* and *Rhododendron pulchrum*. Self-seeded invasive species are also abundant in this habitat, for example, *Bidens alba*, *Leucaena leucocephala, Ligustrum sinense, Lantana camara* and *Mikania micrantha*. The vegetation is usually of lower ecological value.

7.6.20 An individual of protected tree *Aquilaria sinensis* was found on the roadside adjacent to a secondary woodland in the southern part of the Assessment Area.

Sandy Shore

7.6.21 Silvermine Bay Beach is the only Sandy shore habitat identified in the Assessment Area. Floristic diversity and abundance are very limited in this artificial habitat. A number of individual trees are present on the beach, including *Casuarina equisetifolia, Hibiscus tiliaceus* and *Terminalia catappa*.

Terrestrial Mammals

7.6.22 The maximum count of all mammal species recorded within the works area and the Assessment Area has been reported in **Appendix 2** of **Appendix 7.1**, with their habitat(s) and conservation and protection status presented. Locations of species of conservation importance recorded in the surveys are presented on **Figure 7.2.**

7.6.23 One species of mammal was recorded in the works area and 15 were recorded within the 500m Assessment Area. Among the mammals recorded, 11 species are considered to be of conservation importance namely, Short-nosed Fruit Bat, Himalayan Leaf-nosed Bat, Chinese Noctule, Japanese Pipistrelle, Least Pipistrelle, Chinese Pipistrelle, Lesser Bamboo Bat, Lesser Yellow Bat, Greater Bent-winged Bat, Lesser Bent-winged Bat and

Red Muntjac. Details of the mammal species of conservation importance are presented in **Appendix 7.1**.

7.6.24 Two roosts of Short-nosed Fruit Bat were recorded during the survey period, one located in Mui Wo Town Centre next to the Mui Wo Swimming Pool, and the other within the Pak Ngan Heung Village area. Active usage of the Town Centre roost was observed during October 2021, June and July 2022, with a maximum of 10 bats during October, while the Pak Ngan Heung Village roost was observed to be active in December 2021, January and February 2022 with a maximum of 13 bats during December.

Birds

7.6.25 The maximum count of all bird species recorded within the works area and the Assessment Area has been reported in **Appendix 7.1**, with their habitat(s) and conservation and protection status presented.

7.6.26 A total of ten species of birds were recorded in the works area and 64 were recorded within the 500m Assessment Area. Among the birds recorded, 17 species are considered to be of conservation importance namely, Black-crowned Night Heron, Chinese Pond Heron, Eastern Cattle Egret, Grey Heron, Great Egret, Intermediate Egret, Little Egret, Pacific Reef Heron, Crested Serpent Eagle, Crested Goshawk, Besra, Black Kite, Watercock, Greater Coucal, Collared Scops Owl, Peregrine Falcon, Chinese Grosbeak. Details of the avifauna species of conservation importance are presented in **Appendix 7.1**. Locations of species of conservation importance recorded in the surveys are presented on **Figure 7.2**.

7.6.27 The Tai Wai Yuen night roost is located at the estuary of Wang Tong River next to the Wang Tong Bridge, as indicated on **Figure 7.2**. Since the commencement of the Project, Eastern Cattle Egret, Grey Heron, Great Egret, Intermediate Egret and Little Egret had been observed to arrive at the night roost starting earliest from 30 minutes before sunset to 20 minutes after sunset. Eastern Cattle Egret, Grey Heron, Great Egrets, Intermediate Egret and Little Egret were observed landed on top of the clumps of *Hibiscus tiliaceus* and slowly move inwards into the canopy, which makes room for more individuals to enter the roost. Meanwhile, individuals of Black-crowned Night Heron, which are primarily nocturnal, had been observed to emerge from the ardeid roost within the Hibiscus tiliaceus usually at sunset, and begin foraging at the Wang Tong River estuary, or flying Southward towards the sea if the tide is high. No breeding behaviour was recorded.

7.6.28 Little Egret is the most abundant species at the roost of from October 2021 to July 2022, with only April being an exception where the most abundant species observed was Eastern Cattle Egret. Usage of the night roost have drastically decreased towards the end of the survey period, with only one Little Egret observed during the September survey and no roosting diurnal Ardeids observed in the September survey. The diurnal Ardeids are suspected to have found a new night roost but no such roost was found in the Assessment Area within the remaining surveys. The reason for the apparent abandonment of the roost was not known.

Table 7.3 – Activity of Tai Wai Yuen Night Roost during the survey period

Month	2021						2022					
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Black-crowned Night Heron *Nycticorax nycticorax*	20	13	15	2	3	5	10	5	3	4	9	6
Eastern Cattle Egret *Bubulcus coromandus*	-	7	17	6	10	9	80	13	11	-	-	-
Grey Heron *Ardea cinerea*	3	3	1	-	2	-	-	-	-	-	-	-
Great Egret *Ardea alba*	88	23	3	6	21	18	7	7	5	-	-	-
Intermediate Egret *Ardea intermedia*	-	-	1	-	-	-	-	-	-	-	-	-
Little Egret *Egretta garzetta*	64	104	179	66	71	64	23	22	36	19	1	-
Total	**175**	**150**	**216**	**80**	**107**	**96**	**120**	**47**	**55**	**23**	**10**	**6**

Herpetofauna

7.6.29 The maximum count of all herpertofauna species recorded within the works area and the Assessment Area has been reported in **Appendix 2** of **Appendix 7.1**, with their habitat(s) and conservation and protection status presented.

7.6.30 A total of five amphibian and one reptile species were recorded in the works area, while 12 amphibian and 16 reptile species were recorded within the 500m Assessment Area. Among the herpetofauna recorded, nine species are considered to be of conservation importance namely, Hong Kong Newt, Short-legged Toad, Chinese Bullfrog, Romer's Tree Frog, Chinese Soft-shelled Turtle, Four-clawed Gecko, Tokay Gecko, Chinese Cobra, Buff-striped Keelback. Details of the herpetofauna species of conservation importance are presented in **Appendix 7.1**. Locations of species of conservation importance recorded in the surveys are presented on **Figure 7.2**.

Butterfly and Odonate

7.6.31 The maximum count of all butterflies and odonate species recorded within the works area and the Assessment Area has been reported in **Appendix 2** of **Appendix 7.1**, with their habitat(s) and conservation and protection status presented.

7.6.32 A total of 106 species of butterflies were recorded within the 500m Assessment Area. Among the butterflies recorded, 15 species are considered to be of conservation importance namely, Grey Scrub Hopper, Pale Palm Dart, Forget-me-not, Metallic Cerulean, Common Cerulean, Malayan, Tiny Grass Blue, Peacock Royal, Courtesan, Danaid Egg-fly, White Dragontail, Common Rose, Swallowtail, Small Cabbage White and Spotted Sawtooth. Details of the butterfly species of conservation importance are

presented in **Appendix 7.1**. Locations of species of conservation importance recorded in the surveys are presented on **Figure 7.2**.

7.6.33 A total of 25 species of odonates were recorded in the works area and 37 were recorded within the 500m Assessment Area. Among the odonates recorded, seven species are considered to be of conservation importance namely, Chinese Yellowface, Dingy Dusk-hawker, Least Clubtail, Mangrove Skimmer, Blue Chaser, Ruby Darter and Emerald Cascader. Details of the odonate species of conservation importance are presented in **Appendix 7.1**. Locations of species of conservation importance recorded in the surveys are presented on **Figure 7.2**.

Freshwater Community

7.6.34 The maximum count of all freshwater fish and aquatic invertebrate species recorded within the works area and the Assessment Area has been reported in **Appendix 2** of **Appendix 7.1**, with their habitat(s) and conservation and protection status presented.

7.6.35 A total of 38 species of freshwater fishes were recorded in the works area and 63 were recorded within the 500m Assessment Area. Among the freshwater fishes recorded, eight species are considered to be of conservation importance namely, Whitespotted Walking Catfish, Blue Neon Goby, Akihito's Neon Goby, Scaly Neon Goby, Sharptail Goby, Small Snakehead, Dark-margined Flagtail and Eclipse Puffer. Details of the freshwater fish species of conservation importance are presented in **Appendix 7.1**. Locations of species of conservation importance recorded in the surveys are presented on **Figure 7.2**.

7.6.36 A total of 21 species of aquatic invertebrates were recorded in the works area and 25 were recorded within the 500m Assessment Area. Among the aquatic invertebrates recorded, two species are considered to be of conservation importance namely, Emerald Cascader (Larva) and Greasyback Shrimp. Details of the aquatic invertebrate species of conservation importance are presented in **Appendix 7.1**. Locations of species of conservation importance recorded in the surveys are presented on **Figure 7.2**.

7.7 Ecological Evaluation of Habitats and Species

7.7.1 Evaluation of the habitats and species of conservation importance is provided in following tables (**Table 7.4** to **Table 7.19**), with reference made to the guidance of **Tables 2** and **3** of *Annex 8 of EIAO-TM*.

Table 7.4 – Habitat evaluation for Secondary Woodland

Criteria	Secondary Woodland
Naturalness	Derived from natural succession on shrubland
Size	Moderate within the Assessment Area
Diversity	Moderate to high floral and moderate faunal diversity within the Assessment Area

Criteria	Secondary Woodland
Rarity	Common habitat in Hong Kong. Species of conservation importance recorded includes *Aquilaria sinensis*, *Artocarpus hypargyreus*, Red Muntjac, Greater Coucal, Collared Scops Owl, Chinese Grosbeak, Romer's Tree Frog, Tokay Gecko, Forget-me-not, Metallic Cerulean, Common Cerulean, Tiny Grass Blue, White Dragontail, Swallowtail and Chinese Yellowface. Slaty-legged Crake, Orange Awlet, Common Awl and Falcate Oak Blue were also recorded in previous studies.
Re-creatability	Can be re-created but maturation of trees would take a long time
Fragmentation	Some fragmentation by road infrastructures and developed areas
Ecological Linkage	Ecologically linked to adjacent agricultural lands and marshes.
Potential Value	Potential for increase in value with maturation of nearby habitats.
Nursery/ breeding Ground	Presumably used for the mammals and butterflies of conservation importance.
Age	Not known.
Abundance/ richness of wildlife	Moderate.
Ecological Value	**MODERATE**

Table 7.5 – Habitat evaluation for Plantation

Criteria	Plantation
Naturalness	Artificial habitat derived from human action. Some area show various degree of natural vegetation succession and establishment of vegetation
Size	Small
Diversity	Low floral and faunal diversity
Rarity	Common habitat in Hong Kong. No species of conservation importance were recorded in this habitat.
Re-creatability	Readily re-creatable, but trees need time to mature
Fragmentation	Fragmented by South Lantau Road
Ecological Linkage	Linked to surrounding secondary woodland
Potential Value	Value would increase by natural succession if habitat left undisturbed
Nursery/ breeding Ground	Not known
Age	Not known
Abundance/ richness of wildlife	Low
Ecological Value	**LOW**

Table 7.6 – Habitat evaluation for Shrubland/Grassland

Criteria	Shrubland/Grassland
Naturalness	Natural habitat maintained by hill fire and human disturbance.
Size	Small.
Diversity	Moderate floral diversity and low diversity for all fauna except for butterflies, which has moderate diversity.
Rarity	Common habitat in Hong Kong. Species of conservation importance includes *Aquilaria sinensis*, Peacock Royal, Courtesan, Danaid Egg-fly and Swallowtail. Chinese Francolin, Slaty-legged Crake, Greater Coucal, Lesser Coucal and Falcate Oak Blue were also recorded in previous studies.
Re-creatability	Could be recreated on suitable land.
Fragmentation	Not fragmented.
Ecological Linkage	Ecologically linked by surrounding secondary woodland.
Potential Value	Value could be increased by natural vegetation succession and colonization.
Nursery/ breeding Ground	Presumably used for the butterflies of conservation importance.
Age	Not known.
Abundance/ richness of wildlife	Low to moderate.
Ecological Value	**LOW TO MODERATE**

Table 7.7 – Habitat evaluation for Marsh

Criteria	Marsh
Naturalness	Semi-natural.
Size	Medium.
Diversity	Low floral diversity. Moderate to high faunal diversity.
Rarity	Common habitat in lowlands of Lantau. Species of conservation importance recorded includes *Azolla imbricata*, Eastern Cattle Egret, Grey Heron, Great Egret, Intermediate Egret, Little Egret, Watercock, Chinese Bullfrog, Romer's Tree Frog, Buff-striped Keelback, Grey Scrub Hopper, Pale Palm Dart, Forget-me-not, Metallic Cerulean, Malayan, White Dragontail, Common Rose, Small Cabbage White, Mangrove Skimmer, Small Snakehead and *Somanniathelphusa zanklon*. Greater Coucal, White-throated Kingfisher, Red-billed Starling, Banded Demon and Grass Demon were also recorded in previous studies.
Re-creatability	Difficult to re-create in short time period.
Fragmentation	Fragmented by mosaic of agricultural land and village areas.
Ecological Linkage	Some linkages to adjacent agricultural land and secondary woodlands.
Potential Value	Potential value can be increased with appropriate management.

Criteria	Marsh
Nursery/ breeding Ground	Potentially utilised by wetland-dependent species such as Chinese Bullfrog as breeding ground
Age	Not known
Abundance/ richness of wildlife	Moderate
Ecological Value	**MODERATE TO HIGH**

Table 7.8 – Habitat evaluation for Mangrove

Criteria	Mangrove
Naturalness	Natural habitat created through natural succession
Size	Very small
Diversity	Low plant species diversity, dominated by common coastal vegetation with associated mangrove species scattered in this habitat. Fauna recorded are mostly birds with low diversity
Rarity	Mangrove habitats are considered scarce in Hong Kong. Species of conservation importance recorded includes Black-crowned Night Heron, Eastern Cattle Egret, Grey Heron, Great Egret, Intermediate Egret and Little Egret.
Re-creatability	Re-creatable but the mangrove community and associated mangrove species require time to develop and mature to their structural complexity and composition
Fragmentation	Not fragmented
Ecological Linkage	Some linkages to adjacent watercourses
Potential Value	Low
Nursery/ breeding Ground	Potential nursery for invertebrates and fish; used by Ardeids as night roost and day roost but no breeding record was found during the survey period.
Age	Not known
Abundance/ richness of wildlife	Moderate
Ecological Value	**LOW TO MODERATE**

Table 7.9 – Habitat evaluation for Watercourses – Luk Tei Tong River

Criteria	Luk Tei Tong River	
	Semi-natural Watercourse Sections	Channelised Watercourse Sections
Naturalness	Semi-natural habitat with some human disturbances and modifications	Low naturalness for the channelised section between the semi-natural upper sections and River Silver
Size	Moderate	Small to moderate
Diversity	Moderate diversity of microhabitats found along the river within the Assessment Area. Uppercourse of the	Limited diversity for flora, fauna and microhabitats.

Criteria	Luk Tei Tong River	
	Semi-natural Watercourse Sections	**Channelised Watercourse Sections**
	river consists of fast flowing segments with sandy bottom, leading into similarly sedimented low flow channel and concrete-based channelised segment	
Rarity	Semi-natural watercourses are reasonably common in Hong Kong but are rapidly declining as human impacts and channelisation increase. Species of conservation importance: Short-legged Toad, Emerald Cascader, and recorded. Dog-legged Clubtail was also recorded in previous studies.	Common habitat in Hong Kong. Species of conservation importance: Eastern Cattle Egret, Mangrove Skimmer, Ruby Darter and Greasyback Shrimp were recorded.
Re-creatability	Conditions will be difficult to re-create	Could be re-created with suitable design and hydrological conditions
Fragmentation	Not fragmented	Not fragmented
Ecological Linkage	Good linkages to adjacent woodland, agricultural land and marsh	Some linkages to adjacent marshes and agricultural land. Also provide functional linkages between the upstream section and the estuary for use of any diadromous species.
Potential Value	Potential for enhancement of current conditions by improving water conditions and enhancement of riparian vegetation	Potential for enhancement of current conditions by improving water conditions and enhancement of riparian vegetation
Nursery/ breeding Ground	Presumably used by various fishes and aquatic fauna	Potentially used by various fishes and aquatic fauna
Age	Not known	Not known
Abundance/ richness of wildlife	Moderate	Low to Moderate
Ecological Value	**MODERATE**	**MODERATE**

Table 7.10 – Habitat evaluation for Watercourses – Luk Tei Tong Bypass

Criteria	Luk Tei Tong Bypass
	Channelised Watercourse
Naturalness	Manmade habitat
Size	Low
Diversity	Low to moderate diversity of microhabitats found in the bypass, including small pools, segments covered by emergent vegetation and mangrove roosts
Rarity	Channelised watercourses are common habitats in Hong Kong.

Criteria	Luk Tei Tong Bypass
	Channelised Watercourse
Re-creatability	Easy to re-create
Fragmentation	Not fragmented
Ecological Linkage	Linked to Luk Tei Tong River during when flooded
Potential Value	May be some potential for enhancement of riparian vegetation and revitalisation
Nursery/ breeding Ground	Not known
Age	Not known
Abundance/ richness of wildlife	Low
Ecological Value	**LOW**

Table 7.11 – Habitat evaluation for Watercourses – Tai Tei Tong River

Criteria	Tai Tei Tong River	
	Semi-natural Watercourse Section	**Channelised Watercourse Section**
Naturalness	Semi-natural habitat with some human disturbances and modifications, especially in the lower reaches	Low naturalness for the channelised section between the semi-natural upper sections and River Silver
Size	Moderate	Small to moderate
Diversity	Riparian corridor and stream bed show moderate diversity of microhabitats; moderate to high faunal diversity present	Limited diversity for flora, fauna and microhabitats.
Rarity	Semi-natural watercourses are reasonably common in Hong Kong but are rapidly declining as human impacts and channelization increase. Species of Conservation Importance recorded includes Great Egret, Chinese Pond Heron, Little Egret, Hong Kong Newt, Short-legged Toad, Dingy Dusk-hawker, Least Clubtail sp., Blue Neon Goby, Akihito's Neon Goby, Scaly Neon Goby, Small Snakehead, Dark-margined Flagtail, Emerald Cascader (Larva) and Greasyback Shrimp. Blue Sprite and Japanese Eel were also recorded in previous surveys.	Common habitat in Hong Kong. No species of conservation importance were recorded.
Re-creatability	Conditions will be difficult to re-create	Could be re-created with suitable design and hydrological conditions
Fragmentation	Not fragmented	Not fragmented
Ecological Linkage	Well linked to adjacent agricultural lands, marsh and secondary woodlands	Some linkages to adjacent woodland, marshes and agricultural land. Also provide functional linkages between the

Criteria	Tai Tei Tong River	
	Semi-natural Watercourse Section	**Channelised Watercourse Section**
		upstream section and the estuary for use of any diadromous species.
Potential Value	Low to moderate	Potential for enhancement of current conditions by improving water conditions and enhancement of riparian vegetation
Nursery/ breeding Ground	Presumably used by various fishes and aquatic fauna	Potentially used by various fishes and aquatic fauna
Age	Not known	Not known
Abundance/ richness of wildlife	Moderate diversity and very high abundance of fauna recorded in different reaches of the river	Low to Moderate
Ecological Value	**MODERATE TO HIGH**	**LOW TO MODERATE**

Table 7.12 – Habitat evaluation for Watercourses – Pak Ngan Heung River

Criteria	Pak Ngan Heung River	
	Semi-natural Watercourse Sections	**Channelised Watercourse Sections**
Naturalness	Semi-natural habitat with some human disturbances and modifications, especially in the lower reaches	Low naturalness for the channelised section between the semi-natural upper sections and River Silver
Size	Low to moderate	Small to moderate
Diversity	Riparian corridor and stream bed show moderate diversity of microhabitats. Low to moderate faunal diversity present. Lower course is dominated by invasive species	Limited diversity for flora, fauna and microhabitats.
Rarity	Semi-natural watercourses are reasonably common in Hong Kong but are rapidly declining as human impacts and channelisation increase. Species of Conservation Importance recorded includes Chinese Soft-shelled Turtle, Chinese Bullfrog, Romer's Tree Frog, Whitespotted Walking Catfish, Eclipse Puffer, and *Somanniathelphusa zanklon*. Used by various bat species as foraging ground. Yellow Bittern, Angle-winged Cruiser, Ruby Darter, Dark-margined Flagtail, Blue Neon Goby and Scaly Neon Goby were recorded in previous studies.	Common habitat in Hong Kong. Species of conservation importance: Chinese Pond Heron and Greasyback Shrimp were recorded.
Re-creatability	Conditions will be difficult to re-create	Could be re-created with suitable design and hydrological conditions
Fragmentation	Not fragmented	Not fragmented

Criteria	Pak Ngan Heung River	
	Semi-natural Watercourse Sections	**Channelised Watercourse Sections**
Ecological Linkage	Well linked to adjacent agricultural lands, marsh and secondary woodlands	Some linkages to adjacent agricultural land. Also provide functional linkages between the upstream section and the estuary for use of any diadromous species.
Potential Value	Potential for enhancement of current conditions by removing invasive species and replacing the existing fish ladders with a more functional design under stormy weather to allow migration of amphidromous species beyond the channelised segments	Potential for enhancement of current conditions by improving water conditions and enhancement of riparian vegetation
Nursery/ breeding Ground	Presumably used by various fishes and aquatic fauna	Potentially used by various fishes and aquatic fauna
Age	Not known	Not known
Abundance/ richness of wildlife	Low to moderate	Low to Moderate
Ecological Value	**MODERATE TO HIGH**	**LOW TO MODERATE**

Table 7.13 – Habitat evaluation for Watercourses – Wang Tong River

Criteria	Wang Tong River	
	Semi-natural Watercourse Sections	**Channelised Watercourse Sections**
Naturalness	Semi-natural habitat, high degree of human disturbance at estuary as a result of constructions related to Wang Tong Bridge	Low naturalness for the channelised section between the semi-natural upper sections and River Silver
Size	Small	Very Small
Diversity	Low diversity of microhabitat. Moderate fish diversity.	Very limited diversity
Rarity	Semi-natural watercourses are reasonably common in Hong Kong but are rapidly declining as human impacts and channelisation increase. Sharptail Goby and Greasyback Shrimp recorded. Indo-Pacific Tropical Sand Goby was also recorded by previous studies.	Common habitat in Hong Kong. No species of conservation importance were recorded.
Re-creatability	Conditions will be difficult to re-create	Could be re-created with suitable design and hydrological conditions
Fragmentation	Not fragmented	Not fragmented
Ecological Linkage	Some linkages to adjacent mangrove and sandy shore. Also adjoins the ardeid night roost	Little functional linkage

Criteria	Wang Tong River	
	Semi-natural Watercourse Sections	**Channelised Watercourse Sections**
Potential Value	Potential for enhancement of current conditions by improving water conditions and enhancement of riparian vegetation	Low
Nursery/ breeding Ground	Presumably used by various fishes and aquatic fauna	Not known
Age	Not known	Not known
Abundance/ richness of wildlife	Moderate	Low to Moderate
Ecological Value	**MODERATE**	**LOW**

Table 7.14 – Habitat evaluation for Watercourses – River Silver

Criteria	River Silver
	Channelised Watercourse
Naturalness	Artificial habitat created by modification of semi-natural/ natural watercourses.
Size	Small.
Diversity	Low diversity of microhabitats. Low to moderate faunal diversity.
Rarity	A common habitat in Hong Kong. Species of conservation importance recorded includes Black-crowned Night Heron, Chinese Pond Heron, Grey Heron, Great Egret, Intermediate Egret, Little Egret, Eclipse Puffer and Greasyback Shrimp. Little Ringed Plover was also recorded in previous studies.
Re-creatability	Readily re-creatable.
Fragmentation	Not fragmented.
Ecological Linkage	Links Luk Tei Tong, Tai Tei Tong and Pak Ngan Heung rivers to the sea.
Potential Value	Low.
Nursery/ breeding Ground	Not known
Age	Not known
Abundance/ richness of wildlife	Moderate
Ecological Value	**LOW TO MODERATE**

Table 7.15 – Habitat evaluation for Other Minor Watercourses

Criteria	Semi-natural Watercourse Sections	Channelised Watercourse Sections
Naturalness	Semi-natural habitat with varying degree of human disturbances and modification	Low naturalness for the channelised watercourses
Size	Small	Very Small
Diversity	Low to moderate	Very low diversity
Rarity	Semi-natural watercourses are reasonably common in Hong Kong but are rapidly declining as human impacts and channelisation increase. No species of conservation importance were recorded.	Common habitat in Hong Kong. No species of conservation importance were recorded.
Re-creatability	Conditions will be difficult to re-create	Could be re-created with suitable design and hydrological conditions
Fragmentation	Not fragmented	Not fragmented
Ecological Linkage	Some linkages to adjacent habitats	Some linkages to adjacent habitats
Potential Value	Potential for enhancement of current conditions by improving water conditions and enhancement of riparian vegetation	Low
Nursery/ breeding Ground	Presumably used by various fishes and aquatic fauna	Not known
Age	Not known	Not known
Abundance/ richness of wildlife	Moderate	Low to Moderate
Ecological Value	**LOW TO MODERATE**	**LOW**

Table 7.16 – Habitat evaluation for Pond

Criteria	Pond
Naturalness	Ponds in this area are created artificially
Size	Small
Diversity	Low faunal and floral diversity. Mostly utilised by Ardeids as foraging grounds.
Rarity	Common habitat in Hong Kong. Species of conservation importance recorded includes Black-crowned Night Heron, Chinese Pond Heron, Eastern Cattle Egret, Grey Heron, Great Egret and Little Egret.
Re-creatability	Can be re-created on suitable land
Fragmentation	Not fragmented
Ecological Linkage	Some linkages to adjacent marsh and watercourses

Criteria	Pond
Potential Value	Value would be enhanced with appropriate management to increase habitat diversity
Nursery/ breeding Ground	Not known
Age	Not known
Abundance/ richness of wildlife	Low
Ecological Value	**LOW TO MODERATE**

Table 7.17 – Habitat evaluation for Agricultural Land

Criteria	Agricultural Land
Naturalness	Artificial habitat of mixed dry and wet agricultural land created and maintained by human activity, with some fields left fallow and undergoing vegetation succession
Size	Moderate, covers most of the central and northern parts of the Assessment Area
Diversity	Low to moderate diversity for plants, most species being cultivated exotics recorded in this habitat. Moderate faunal diversity, diversity is higher for amphibian and butterfly species
Rarity	A common habitat in Hong Kong. Species of Conservation Importance recorded includes: *Malaisia scandens*, Black-crowned Night Heron, Eastern Cattle Egret, Chinese Bullfrog, Romer's Tree Frog, Chinese Cobra, Forget-me-not, Metallic Cerulean, Common Cerulean, Tiny Grass Blue, Common Rose, Small Cabbage White, Spotted Sawtooth, Blue Chaser, Whitespotted Walking Catfish and Small Snakehead. Used by various bat species as foraging grounds. Chinese Pond Heron, White-throated Kingfisher, Zitting Cisticola and Blue Sprite were also recorded in previous studies.
Re-creatability	Could be re-created on suitable land
Fragmentation	Fragmented by patches of village areas
Ecological Linkage	Some linkages to adjacent marsh, secondary woodland and watercourses
Potential Value	Moderate. Value could be increased with appropriate management through conversion of wet agricultural practice
Nursery/ breeding Ground	Potential breeding ground for Chinese Bullfrog
Age	Not known
Abundance/ richness of wildlife	Moderate abundance for amphibians, low for other fauna
Ecological Value	**MODERATE**

Table 7.18 – Habitat evaluation for Village/Developed Area

Criteria	Village/Developed Area
Naturalness	Entirely man-made habitat with high human disturbance
Size	Medium
Diversity	Moderate plant diversity mostly comprising of cultivated exotics, moderate diversity of reptiles and butterflies, low diversity of other fauna.
Rarity	Common habitat in Hong Kong. Species of conservation importance recorded includes *Aquilaria sinensis*, Short-nosed Fruit Bat, Little Egret, Chinese Grosbeak, Romer's Tree Frog, Flow-clawed Gecko, Tokay Gecko, Chinese Gecko and Buff-striped Keelback, Forget-me-not, Metallic Cerulean, Tiny Grass Blue and Small Cabbage White; although most of these species are not typically found in this habitat and may be transient only. Red-billed Starling, White-shouldered Starling, Taiwan Kuhkri Snake and Grass Demon were also recorded in previous studies.
Re-creatability	Re-creatable
Fragmentation	Not fragmented
Ecological Linkage	Little ecological linkage
Potential Value	Low
Nursery/ breeding Ground	Active Short-nosed Fruit Bat roosts were observed in Mui Wo Town centre and Pak Ngan Heung Village. Village building are also potential roosting sites of some urban-associated bat species such as Japanese Pipistrelle
Age	Not known
Abundance/ richness of wildlife	Low
Ecological Value	**LOW**

Table 7.19 – Habitat evaluation for Sandy Shore

Criteria	Sandy Shore
Naturalness	Man-made habitat with high human disturbance
Size	Small
Diversity	Low floral and faunal diversity
Rarity	Common habitat in Hong Kong. Eastern Cattle Egret and Little Egret were recorded but were in low numbers. Grey Heron and Pacific Reef Heron were also recorded in previous studies.
Re-creatability	Readily re-creatable
Fragmentation	Not fragmented
Ecological Linkage	Little ecological linkage
Potential Value	Very low
Nursery/ breeding Ground	Not known

Criteria	Sandy Shore
Age	Not known
Abundance/ richness of wildlife	Low
Ecological Value	**LOW**

7.7.2 The ecological importance of the species of conservation importance recorded is evaluated and presented below in **Table 7.20** and **Table 7.21**.

Table 7.20 – Evaluation of Flora Species of Conservation Importance

Species	Conservation and Protection Status[1]	Distribution[1]	Rarity[1]
Aquilaria sinensis	*Cap. 586*; Near Threatened[(a)]; Wild plant under State Protection (Category II) [(a)]; Vulnerable[(g)(h)(i)]	Commonly found in lowland forest and *Fung Shui* wood	Common
Artocarpus hypargyreus	Status in China as Near Threatened[(a)]; Vulnerable[(g)]	Common in Hong Kong	Common
Azolla imbricata	-	Restricted in Hong Kong but widely distributed in Southeast Asia (KFBG 2003)	Rare[(f)]
Malaisia scandens	-	Known to occur in Man Kam To, Tai O, Fan Lau, Shui Hou, Tong Fuk, Tai A Chau.	Rare[(f)]

Note:

1. Conservation and Protection Status, and Status in Hong Kong refer to the below literatures.
   a. AFCD (2003);
   b. AFCD (2007);
   c. AFCD (2008);
   d. AFCD (2009);
   e. AFCD (2011);
   f. Corlett *et al.* (2000);
   g. IUCN (2022);
   h. Pang *et al.* (2011);
   i. Qin *et al.* (2017).

Table 7.21 – Evaluation of Fauna Species of Conservation Importance

Species	Conservation and Protection Status[1]	Distribution and Rarity[1]
Terrestrial Mammals		
Short-nosed Fruit Bat *Cynopterus sphinx*	RLCV(NT); *Cap.170*	Widespread; Very Common
Himalayan Leaf-nosed Bat *Hipposideros armiger*	(LC); *Cap.170*	Widespread; Very Common
Chinese Noctule *Nyctalus plancyi*	PRC (RC); *Cap.170*	Fairly widespread; Common

Species	Conservation and Protection Status[1]	Distribution and Rarity[1]
Japanese Pipistrelle *Pipistrellus abramus*	*Cap.170*	Widespread; Very Common
Least Pipistrelle *Pipistrellus tenuis*	RLCV(NT); *Cap.170*	Recorded in specific locations across Hong Kong; Uncommon
Chinese Pipistrelle *Hypsugo pulveratus*	(LC); RLCV(NT); *Cap.170*	Restricted; Rare; Species of Conservation Concern
Lesser Bamboo Bat *Tylonycteris pachypus*	(LC); *Cap.170*	Fairly widespread; Very Common
Lesser Yellow Bat *Scotophilus kuhlii*	(LC); *Cap.170*	Fairly widespread; Uncommon
Greater Bent-winged Bat *Miniopterus magnater*	PRC (RC); RLCV(NT); *Cap.170*	Data Deficient
Lesser Bent-winged Bat *Miniopterus pusillus*	(LC); RLCV(NT); *Cap.170*	Fairly widespread; Uncommon
Red Muntjac *Muntiacus muntjak*	PRC	Widespread; Very Common
Birds		
Black-crowned Night Heron *Nycticorax nycticorax*	(LC)	Common resident and migrant mainly in Deep Bay wetlands and at scattered breeding colonies, mostly around Starling Inlet and Tolo Harbour
Chinese Pond Heron *Ardeola bacchus*	PRC (RC)	Common in wetlands and damp areas, with winter, migrant and breeding populations
Eastern Cattle Egret *Bubulcus coromandus*	(LC)	Common in widespread freshwater wetlands and short grassland areas, with winter, migrant and breeding populations
Grey Heron *Ardea cinerea*	PRC	Common in wetlands and some coastal areas, mainly in the Deep Bay area, present all year with highest numbers in winter and very low numbers in summer
Great Egret *Ardea alba*	PRC (RC)	Abundant, present all year in wetlands, mainly in the Deep Bay area although breeding populations are found mainly around Starling Inlet and Tolo Harbour, migrants and winter visitors occur
Intermediate Egret *Ardea intermedia*	RC	Uncommon, present all year, though rather few in summer,

Species	Conservation and Protection Status[1]	Distribution and Rarity[1]
		mainly in freshwater wetlands in the Deep Bay area
Little Egret *Egretta garzetta*	PRC (RC)	Abundant, present all year in wetland areas throughout HK, mostly in the Deep Bay area
Pacific Reef Heron *Egretta sacra*	(LC); CSMPS(II)	Locally common resident in rocky coastal areas
Crested Serpent Eagle *Spilornis cheela*	(LC); RLCV(NT); CITES(II); CSMPS(II); *Cap.586*	Locally common, present all year and probably the largest resident, in woodland
Crested Goshawk *Accipiter trivirgatus*	RLCV(NT); CITES(II);CSMPS(II); *Cap.586*	Common resident in woodland throughout HK
Besra *Accipiter virgatus*	CSMPS(II); CITES(II); *Cap.586*	Common resident and migrant in shrubland and wooded areas
Black Kite *Milvus migrans*	(RC); CITES(II); CSMPS(II); *Cap.586*	Abundant, present all year and widespread, with increased numbers in winter between October and March
Watercock *Gallicrex cinerea*	RC	Scarce passage migrant, mostly in Autumn, with a few summer records to freshwater wetlands. A return to normal numbers after a good year in 2015, 3 recorded this year
Greater Coucal *Centropus sinensis*	CSMPS(II)	Widespread and common resident in lowland shrubland areas
Collared Scops owl *Otus lettia*	CITES(II); CSMPS(II); *Cap.586*	Common and widespread resident in lowland areas of closed-canopy shrubland and woodland
Peregrine Falcon *Falco peregrinus*	(LC); RLCV(NT); CITES(I); CSMPS(II); *Cap.586*	Locally common resident subspecies peregrinator with migrant northerly taxa in winter
Chinese Grosbeak *Eophona migratoria*	LC	Common winter visitor and scarce breeding species in recent years, in wooded, open-country habitats
Amphibian		
Hong Kong Newt *Paramesotriton hongkongensis*	PGC; RLCV(NT); IUCN(NT); *Cap.170*	Widely distributed in mountain streams throughout New Territories, Lantau Island and Hong Kong Island.
Short-legged Toad *Megophrys brachykolos*	PGC; RLCV(VU); IUCN(EN)	Widely distributed in upland forest streams throughout Hong Kong.

Species	Conservation and Protection Status[1]	Distribution and Rarity[1]
Chinese Bullfrog *Hoplobatrachus rugulosus*	PRC; RLCV(EN); CSMPS(II)	Widely distributed in Lantau Island and New Territories.
Romer's Tree Frog *Liuixalus romeri*	PGC; RLCV(VU); IUCN(EN); *Cap.170*	Distributed in woodlands on Lantau Island, Po Toi Island, Lamma Island, Hong Kong Island and New Territories.
Reptile		
Chinese Soft-shelled Turtle *Pelodiscus sinensis*	GC; RLCV(EN); IUCN(VU); *Cap.170*	Locally found in reservoirs and fishponds in Deep Bay area.
Four-clawed Gecko *Gehyra mutilata*	RLCV(VU)	Widely but thinly distributed throughout Hong Kong.
Tokay Gecko *Gekko gecko*	RC; RLCV(CR); CSMPS(II)	Distributed in rocky areas in Tung Chung and Sham Wat on Lantau Island, Lion Rock Country Park. Population on Hong Kong Island are considered as escaped from snake shops.
Chinese Cobra *Naja atra*	PRC: RLCV(VU); IUCN(VU); CITES(II); *Cap.586*	Found throughout the territory.
Buff-striped Keelback *Amphiesma stolatum*	LC	Distributed in lowland in central and northern New Territories and Lantau Island.
Butterfly		
Grey Scrub Hopper *Aeromachus jhora*	-	Restricted; Rare
Pale Palm Dart *Telicota colon*	LC	Widespread; Rare
Forget-me-not *Catochrysops strabo*	-	Widespread; Very Rare; Species of Conservation Concern
Metallic Cerulean *Jamides alecto*	-	Widespread; Very Rare
Common Cerulean *Jamides celeno*	-	Restricted; Rare
Malayan *Megisba malaya*	LC	Widespread; Very Rare; Species of Conservation Concern
Tiny Grass Blue *Zizula hylax*	-	Widespread; Very Rare; Species of Conservation Concern
Peacock Royal *Tajuria cippus*	LC	Widespread; Rare
Courtesan *Euripus nyctelius*	-	Restricted; Very Rare

Species	Conservation and Protection Status[1]	Distribution and Rarity[1]
Danaid Egg-fly *Hypolimnas misippus*	LC	Widespread; Uncommon
White Dragontail *Lamproptera curius*	LC	Widespread; Rare
Common Rose *Pachliopta aristolochiae*	-	Widespread; Rare
Swallowtail *Papilio xuthus*	-	Widespread; Rare
Small Cabbage White *Pieris rapae*	-	Widespread; Rare
Spotted Sawtooth *Prioneris thestylis*	LC	Widespread; Rare
Odonate		
Chinese Yellowface *Agriomorpha fusca*	LC	Widespread; Abundant
Dingy Dusk-hawker *Gynacantha subinterrupta*	LC	Widespread; Common
Least Clubtail *Stylogomphus* sp.	Restricted Species; previously treated as *Stylogomphus chunliuae* which is classified as LC	Restricted; Common
Mangrove Skimmer *Orthetrum poecilops*	GC; IUCN(VU)	Widespread; Uncommon
Blue Chaser *Potamarcha congener*	LC	Widespread; Common
Ruby Darter *Rhodothemis rufa*	LC	Widespread; Common
Emerald Cascader *Zygonyx iris*	PGC	Widespread; Abundant
Freshwater Fish		
Whitespotted Walking Catfish *Clarias fuscus*	KFBG(NT)	Distributed throughout Hong Kong particularly in the North District; Common
Blue Neon Goby *Stiphodon atropurpureus*	GC; RLCV(NT)	Records from a few streams in North-East of New Territories and on Lantau Island; Species of Conservation Concern
Akihito's Neon Goby *Stiphodon imperiorientis*	IUCN(VU); KFBG(CR)	Recorded in Hong Kong Island
Scaly Neon Goby *Stiphodon multisquamus*	GC; RLCV(EN); KFBG(EN)	Recorded in Lantau, Hong Kong Island and Sai Kung
Sharptail Goby	BSAP(NT)	Recorded in Sai Kung

Species	Conservation and Protection Status[1]	Distribution and Rarity[1]
Oligolepis acutipennis		
Small Snakehead *Channa asiatica*	LC	Records from a few streams in North district and on Lantau Island. Uncommon
Dark-margined Flagtail *Kuhlia marginata*	RC	Recorded in Lantau Island, Hong Kong Island and Sai Kung.
Eclipse Puffer *Takifugu ocellatus*	LC; IUCN(NT)	Recorded in estuaries from various districts.
Freshwater Invertebrate		
Emerald Cascader (Larva) *Zygonyx iris*	PGC	Widespread; Abundant
Greasyback Shrimp *Metapenaeus ensis*	CSRL(VU)	Common
Freshwater Crab *Somanniathelphusa zanklon*	GC; IUCN(EN)	Widespread; Common

Notes:

1. Conservation and protection status refers to Fellowes *et al*. (2002), Red List of China's Vertebrates (Jiang *et al.* 2016), China Species Red List (Wang & Xie, 2004), IUCN (2021), China State Major Protection Status, CITES (2021), Native fish of conservation concern in HK (KFBG, 2019), BSAP Marine Fishes Sub-group (2014), Cap. 170 and Cap. 586.
   a. Conservation status by 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 breeding and/or roosting sites rather than in general occurrence.
   b. Conservation status by Red List of China's Vertebrates (RLCV) (Jiang *et al.* 2016): NT = Near Threatened, VU = Vulnerable, EN = Endangered, CR = Critically Endangered.
   c. Conservation by China Species Red List (CSRL) (Wang & Xie, 2004): VU = Vulnerable.
   d. Conservation status by IUCN (2022): NT = Near Threatened, VU = Vulnerable, EN = Endangered.
   e. Protection status by China State Major Protection Status (CSMPS): II = Class II Protected Species in China.
   f. Protection status by CITES (2022): I = Listed in CITES Appendix I; II = Listed in CITES Appendix II.
   g. Conservation status by KFBG (2019): NT = Near Threatened; EN = Endangered; CR = Critically Endangered.
   h. Conservation status by BSAP Marine Fishes Sub-group (2014): NT = Near Threatened.
   i. Cap. 170 = Wild Animals Protection Ordinance. All wild bats and birds in Hong Kong are protected under Cap. 170.
   j. Cap. 586 = Protection of Endangered Species of Animals and Plants Ordinance.
2. Distribution and Rarity follows AFCD (2022) in general and the latest Hong Kong Bird Report for avifauna and AFCD Hong Kong Biodiversity Database (2014) for other fauna.

7.8 Habitat and Species Recorded within Works Area

Habitat and Vegetation

7.8.1 A total of 5 habitat types were recorded within the works area namely, agricultural land, semi-natural watercourse, channelised watercourse, marsh and village/developed area. The area of identified habitat within works area is stated in **Table 7.2**.

7.8.2 No flora species of conservation importance namely were recorded within the works area.

Terrestrial Mammals

7.8.3 No mammal species of conservation importance were recorded within the works area.

Birds

7.8.4 Five (5) bird species of conservation importance were recorded within the works area. Species of conservation importance recorded in the works area are presented below in **Table 7.22**. Locations of species of conservation importance recorded in the works area are presented on **Figure 7.2**.

Herpetofauna

7.8.5 One (1) amphibian species of conservation importance was recorded within the works area. Species of conservation importance recorded in the works area are presented below in **Table 7.22**. Locations of species of conservation importance recorded in the works area are presented on **Figure 7.2**.

Butterfly and Odonate

7.8.6 No butterfly species of conservation importance were recorded within the works area. Three (3) odonate species of conservation importance were recorded within the works area. Species of conservation importance recorded in the works area are presented below in **Table 7.22**. Locations of species of conservation importance recorded in the works area are presented on **Figure 7.2**.

Freshwater Community

7.8.7 Seven (7) freshwater community species of conservation importance were recorded within the works area, including 5 freshwater fish species and 2 aquatic invertebrate species. Species of conservation importance recorded in the works area are presented below in **Table 7.22**. Locations of species of conservation importance recorded in the works area are presented on **Figure 7.2**.

Table 7.22 – Species of Conservation Importance Recorded within the Works Area

Species	Conservation and Protection Status [1]	Status in Hong Kong [2]	Habitat within Works Area[3]
Birds			
Chinese Pond Heron *Ardeola bacchus*	PRC (RC)	Common in wetlands and damp areas, with winter, migrant and breeding populations	SWC, CWC
Eastern Cattle Egret *Bubulcus coromandus*	(LC)	Common in widespread freshwater wetlands and short grassland areas,	CWC

Species	Conservation and Protection Status [1]	Status in Hong Kong [2]	Habitat within Works Area[3]
		with winter, migrant and breeding populations	
Great Egret *Ardea alba*	PRC (RC)	Abundant, present all year in wetlands, mainly in the Deep Bay area although breeding populations are found mainly around Starling Inlet and Tolo Harbour, migrants and winter visitors occur	SWC
Intermediate Egret *Ardea intermedia*	RC	Uncommon, present all year, though rather few in summer, mainly in freshwater wetlands in the Deep Bay area	CWC
Little Egret *Egretta garzetta*	PRC (RC)	Abundant, present all year in wetland areas throughout HK, mostly in the Deep Bay area	SWC
Amphibian			
Hong Kong Newt *Paramesotriton hongkongensis*	PGC; RLCV(NT); IUCN(NT); *Cap.170*	Widely distributed in mountain streams throughout New Territories, Lantau Island and Hong Kong Island.	SWC
Odonate			
Least Clubtail *Stylogomphus* sp.	Restricted Species; previously treated as *Stylogomphus chunliuae* which is classified as LC	-	SWC
Mangrove Skimmer *Orthetrum poecilops*	GC; IUCN(VU)	Uncommon	CWC
Ruby Darter *Rhodothemis rufa*	LC	Common	CWC
Freshwater Fish			
Blue Neon Goby *Stiphodon atropurpureus*	GC; RLCV(NT)	Species of Conservation Concern	SWC
Akihito's Neon Goby *Stiphodon imperiorientis*	IUCN(VU); KFBG(CR)	-	SWC
Scaly Neon Goby *Stiphodon multisquamus*	GC; RLCV(EN); KFBG(EN)	-	SWC
Small Snakehead *Channa asiatica*	LC	Uncommon	SWC

Species	Conservation and Protection Status [1]	Status in Hong Kong [2]	Habitat within Works Area[3]
Dark-margined Flagtail *Kuhlia marginata*	RC	-	SWC
Freshwater Invertebrate			
Emerald Cascader (Larva) *Zygonyx iris*	PGC	Abundant	SWC
Greasyback Shrimp *Metapenaeus ensis*	CSRL(VU)	Common	SWC

Notes:

1. Conservation and protection status refers to Fellowes *et al*. (2002), Red List of China's Vertebrates (Jiang *et al.* 2016) , China Species Red List (Wang & Xie, 2004), IUCN (2022), China State Major Protection Status, KFBG (2019), Cap. 170.
   a. Conservation status by Fellowes *et al.* (2002): LC = Local Concern, RC = Regional Concern, PRC = Potential Regional Concern, GC = Global Concern, PGC = Potential Global Concern. Letters in parentheses indicate that the assessment is on the basis of restrictedness in breeding and/or roosting sites rather than in general occurrence.
   b. Conservation status by Red List of China's Vertebrates (RLCV) (Jiang et al. 2016): NT = Near Threatened, EN = Endangered.
   c. Conservation status by China Species Red List (CSRL) (Wang & Xie, 2004): VU = Vulnerable.
   d. Conservation status by IUCN (2022): VU = Vulnerable, EN = Endangered.
   e. Conservation status by KFBG (2019): NT = Near Threatened, CR = Critically Endangered.
   f. Cap. 170. Wild Animal Protection Ordinance. All wild birds in Hong Kong are protected under Cap. 170
2. Status in Hong Kong follows AFCD (2022).
3. Habitats: CWC = Channelised Watercourse, SWC = Semi-natural Watercourse.

7.9 Impact Assessment

7.9.1 The proposed works of the Project include, but not limited to, the following items:

Tai Tei Tong River

(a) Construction of flood walls;

(b) Reconstruction of gabion walls;

(c) River reprofiling;

(d) Modification of agricultural weirs; and

(e) Construction of fish ladders and associated works.

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(a) Construction of access across Pak Ngan Heung River;

(b) Construction of stormwater pumping station and the associated drainage works;

(c) Construction of diversion box culvert from Tai Tei Tong River to Luk Tei Tong Bypass Channel; and

(d) Construction of tidal gate at River Silver and other associated works.

Luk Tei Tong River (South) and Luk Tei Tong Bypass Channel

(a) Reconstruction of gabion walls;

(b) Construction of box culvert;

(c) Construction of mechanical penstock; and

(d) River revitalisation and associated works.

7.9.2 Construction method of the listed items are described in detail in **Section 2.14** of **Chapter 2**. Potential impacts on ecological resources based on the works mentioned above can arise from both construction and operation phases.

Impact Assessment Methodology

7.9.3 The potential ecological impacts associated with the above-mentioned works are listed below.

- Loss of habitats and associated vegetation;
- Impact on fauna species of conservation importance;
- Ecological impacts to the nearby recognised site of conservation importance at the Fung Shui Woods and Amphibian Hotspot in Mui Wo;
- Ecological impact to watercourses due to river reprofiling, temporary stream diversion and the associated change in water flow/ level;
- Physical disturbance to the surrounding habitats and associated wildlife due to noise, glare, dust, traffic and other human disturbance;
- Impacts on adjacent habitats that are ecologically and hydrologically linked to the watercourses due to construction activities;
- Indirect impact on Tai Wai Yuen night roost; and
- Habitat fragmentation and isolation, including restriction of wildlife utilisation of the area (i.e. transit, feeding and roosting).

7.9.4 Potential impacts that may arise from the construction and operation phases for the development of the Project are assessed following the *EIAO-TM Annex 16* guidelines, and the impacts evaluated based on the criteria in *EIAO-TM Annex 8*.

7.9.5 Additional measures for ecological impacts are then described. Finally, predicted unavoidable residual impacts, assuming implementation of all proposed mitigation measures are detailed and quantified wherever necessary.

Impact Evaluation – Construction Phase

Loss of habitats and associated vegetation

7.9.6 Potential direct habitat loss is expected to occur within the works area along Tai Tei Tong River (TTTR) in the sections near Tai Tei Tong, Nam Bin Wai, Ma Po Tsuen and Ling Tsui Tau; Luk Tei Tong Bypass Channel and Luk Tei Tong River (LTTR); and River Silver (RS). TTTR and LTTR are mainly semi-natural watercourses while RS is a channelised watercourse. The vegetation lost in these affected habitats confined to some common species (i.e. no species of conservation importance recorded within works area). The extent of habitat loss due to the proposed drainage improvement works is presented in **Table 7.23**.

7.9.7 Permanent loss of habitats beside watercourses are expected to be limited. Fringes of surrounding habitats next to riverbanks (i.e. agricultural land, marsh) and riparian zones of watercourses would be lost directly where vegetation clearance may occur during works such as construction of floodwall, reconstruction of gabion walls. A patch of agricultural land would be lost during the construction of stormwater pumping station and stormwater drainage. A patch of marsh would also be lost during the construction of flood wall, reconstruction of gabion wall, river revitalisation, and construction of box culvert in which open cut excavation method would be used.

7.9.8 Temporary loss of habitats are expected to occur for habitats in temporary works area within the works area, except for marsh which is difficult to be reinstated / recreated and thus considered as permanent loss. Loss of watercourses riverbed for river reprofiling (Tai Tei Tong River), construction of fish ladders (Tai Tei Tong River), construction of floodwall (Tai Tei Tong River), reconstruction of gabion walls (Tai Tei Tong River and Luk Tei Tong River) and construction of tidal gate (River Silver), in which excavation within river channel bottom would be required during construction phase, are all expected to be temporary as those affected area within the semi-natural and/or channelised watercourse habitats will be reinstated by backfilling of the excavated river sediment and/or boulders after the construction activities. Since the cross bridge of access across Pak Ngan Heung River will be constructed by prefabricated steel structure off-site, no construction activities will be carried out within the Pak Ngan Heung River and thus no habitat loss is anticipated.

Table 7.23 – Potential Direct Habitat Loss within Works Area

Habitat Type	Marsh	Semi-natural Watercourse	Channelised Watercourse	Agricultural Land	Village/Developed Area
Habitat Quality	Moderate to High	Moderate to High	Low to Moderate	Moderate	Low
Species	No flora species of conservation importance No fauna species of conservation importance	No flora species of conservation importance Fauna species of conservation importance include: Chinese Pond Heron, Great Egret, Little Egret, Hong Kong Newt, Blue Neon Goby, Akihito's Neon Goby, Scaly Neon Goby, Small Snakehead, Dark-margined Flagtail, Emerald Cascader (Larva), Greasyback Shrimp	No flora species of conservation importance Fauna species of conservation importance include: Chinese Pond Heron, Eastern Cattle Egret, Intermediate Egret, Mangrove Skimmer, Ruby Darter	No flora species of conservation importance No fauna species of conservation importance	No flora species of conservation importance No fauna species of conservation importance
Size/Abundance	~ 0.7ha (including ~0.5ha temporary works area), relatively very small in the context of Hong Kong Low diversity of flora and moderate diversity of fauna	~ 0.7km (including ~0.7km temporary works area), relatively very small in the context of Hong Kong Low diversity of flora and low to moderate diversity of fauna	~ 0.4km (including ~0.4km temporary works area), relatively small in the context of Hong Kong Low diversity of flora and low to moderate diversity of fauna	~ 1.1ha (including ~0.8ha of temporary works area), relatively small in the context of Hong Kong Low to moderate diversity of flora and fauna	~ 0.5ha (including ~0.5ha temporary works area), relatively small in the context of Hong Kong Moderate diversity of flora and low to moderate diversity of fauna

Habitat Type	Marsh	Semi-natural Watercourse	Channelised Watercourse	Agricultural Land	Village/Developed Area
Duration	The impact will persist during construction and operation phases	The impact will persist during construction phase for temporary works area, River Reprofiling and Fish Ladder works, of which the stream/river habitat will be reinstated after construction by backfilling of the excavated river sediment and/or boulders excavated during the works after the construction activities	The impact will persist during construction phase for temporary works area of which the habitat will be reinstated as far as practicable	The impact will persist during construction and operation phases, except for temporary works area of which the habitat will be reinstated as far as practicable	The impact will persist during construction phase for temporary works area of which the habitat will be reinstated as far as practicable
Reversibility	Irreversible	Fairly reversible	Reversible	Reversible	Reversible
Magnitude	Low because of the small area affected	Low because of the small area affected	Low because of the small area affected	Low because of the small area affected	Low because of the small area affected
Overall Impact Severity	Low to Moderate	Low to Moderate	Low	Low to Moderate	Low

Impact on fauna species of conservation importance

7.9.9 Five avifauna species were found in the works area, including Chinese Pond Heron, Eastern Cattle Egret, Great Egret, Intermediate Egret and Little Egret. These individuals were found near the semi-natural watercourse and channelised water course. Since these individuals are highly mobile, it is expected that bird species of conservation importance will not be significantly affected by the Project.

7.9.10 Three odonate species of conservation importance, including Least Clubtail, Mangrove Skimmer and Ruby Darter, were recorded within the works area. These individuals were found at the semi-natural watercourse and channelised water course. Due to the high mobility of adult odonates in nature, direct impacts on odonate species of conservation importance are considered insignificant.

7.9.11 For herpetofauna species, one amphibian species of conservation importance, Hong Kong Newt, was recorded in the works area at the semi-natural watercourse. And, for freshwater community, five freshwater fish and two aquatic invertebrates species of conservation importance were recorded within the works area, including Blue Neon Goby, Akihito's Neon Goby, Scaly Neon Goby, Small Snakehead, Dark-margined Flagtail, Emerald Cascader (Larva) and Greasyback Shrimp at TTTR and LTTR.

7.9.12 Recorded species of conservation importance for herpetofauna (amphibians) and freshwater community species (including freshwater fish and invertebrates e.g. larva of odonate) within the works area may be affected by construction works due to their limited mobility. As such mitigation measures are recommended for these fauna groups. It is expected that updated ecological surveys and translocation would be required prior to commencement of construction works as discussed in **Section 7.10.4-7.10.7** to minimise potential impact to these species of conservation importance.

7.9.13 The potential direct impacts on flora and fauna species of conservation importance are presented in **Table 7.24**.

Table 7.24 – Potential Direct Impact on Fauna Species of Conservation Importance

Criteria	Potential Direct Impact on Species of Conservation Importance
Species	Avifauna: Chinese Pond Heron, Eastern Cattle Egret, Great Egret, Intermediate Egret and Little Egret. Odonate: Mangrove Skimmer and Ruby Darter Herpetofauna: Hong Kong Newt Freshwater Community: including Blue Neon Goby, Akihito's Neon Goby, Scaly Neon Goby, Small Snakehead, Dark-margined Flagtail, Emerald Cascader (Larva) and Greasyback Shrimp
Protection Status	**Cap. 170 -** All wild bids, Hong Kong Newt **IUCN Red List (2022**) - Near Threatened: Hong Kong Newt; Vulnerable: Mangrove Skimmer, Akihito's Neon Goby
Distribution	None of the species are considered to be restricted in range.
Rarity	**Species listed in Fellowes et al. (2002)** – Local Concern: Eastern Cattle Egret, Ruby Darter, Small Snakehead; Potential Regional Concern: Chinese Pond Heron, Great Egret, Little Egret, Hong Kong Newt; Regional Concern: Intermediate Egret, Dark-margined Flagtail; Global Concern: Mangrove Skimmer, Blue Neon Goby, Scaly Neon

Criteria	Potential Direct Impact on Species of Conservation Importance
	Goby **Red List of China's Vertebrate (2016)** – Near Threatened: Hong Kong Newt
Abundance	Abundance of species of conservation importance was low.
Duration	Permanent
Reversibility	Irreversible in the absence of mitigation.
Magnitude	Magnitude would be low due to the small numbers of fauna individuals recorded, and the availability of similar or higher quality habitats nearby.
Overall Impact Severity	For fauna species of conservation importance: **Low to moderate** during construction and negligible during operational phases with improvement of ecological connectivity within watercourses after modification of agricultural weirs and provision of fish ladders.

Ecological impacts to the nearby recognised site of conservation importance

7.9.14 Two *Fung Shui* Woods were recorded within the 500m Assessment Area. Nevertheless, there is no Project works will be undertaken at the *Fung Shui* Woods, thus no direct impact to sites of conservation concern is anticipated. While Mui Wo is also identified as an amphibian hotspot within the Proposed Action Plan for the Conservation of Amphibians in Hong Kong, deterioration of water quality due to uncontrolled construction site surface run-off entering the sensitive amphibian habitats, including but not limited to watercourses, marsh, agricultural land and woodland, would not be anticipated with the implementation of good site practices as stated in **Section 5.10.1 of Chapter 5** and in view of large separation distances from the sites of conservation concern and its geographic features at lowland. Given the low abundance of amphibians recorded during the survey within the works area, the affected areas are not considered as the major habitats for amphibians in Mui Wo. In this regard, the proposed Project is anticipated to have low ecological impact to sites of conservation concern.

Ecological impact to watercourses due to river reprofiling, temporary stream diversion and the associated change in water flow/ level

7.9.15 River reprofiling works at Tai Tei Tong River comprised of reprofiling of riverbed gradient (i.e. lowering the riverbed) and modification of agricultural weirs at upstream of Tai Tei Tong River, during which excavation of river sediment within the watercourse would be required. The details of the river reprofiling works are presented in **Section 2.13.5** to **2.13.7** and **Appendix 2.1** of **Chapter 2**.

7.9.16 Temporary loss of habitat for amphibians and aquatic fauna, including the species of conservation importance (i.e. *Stiphodon* spp.) recorded within the works area at Tai Tei Tong River, are anticipated during excavation works for river reprofiling, modification of agricultural weirs and construction of fish ladders within river channels in which dry conditions are required and the subsequent need for temporary stream diversion for construction activities is expected.

7.9.17 The temporary stream diversion would temporarily disrupt hydrology, ecological connectivity of watercourses and result in the obstruction of wildlife movement,

including the *Stiphodon* spp., within river channels. The impact, however, would be limited as the excavation works would be limited to short sections (i.e. the longest section would be approx. 120m of the Tai Tei Tong River for river reprofiling works) while river sediment and / or boulders excavated during excavation works will be reused at respective affected watercourses as natural bedding substrate and / or as backfilling material at other works area. Such construction method could avoid the disposal of sediment and reduce the amount of construction site run-off (further discussed in **Section 7.9.26-7.9.27**). While the riverbed will be lowered due to the river reprofiling works, the water speed would not be significantly changed as the modified weirs will limit the water flow similar to the current agricultural weirs setting. Also, the semi-natural habitat at upstream of Tai Tei Tong River could be maintained during the construction phase, retaining a relatively natural sediment at upstream that would favour as a habitat for aquatic fauna.

7.9.18 The current design of agricultural weirs has a steep gradient that does not favour fish movement between downstream and upstream sections. However, fish ladder will be constructed after modification of agricultural weirs and it is expected to result in enhancement of movement for aquatic life especially the stream-ocean corridor for the migration of diadromous species of conservation concern recorded within Tai Tei Tong River (e.g. Dark-margined Flagtail). In addition, the proposed fish ladders at Tai Tei Tong River would further improve the ecological connectivity between the upstream and downstream areas for aquatic fauna, including but not limited to the *Stiphodon* spp., within the river channel.

7.9.19 Given the temporary nature of the proposed works, the overall impact severity to watercourses and aquatic fauna that inhabit herein due to river reprofiling, temporary stream diversion and the associated change in water flow/ level is expected to be low to moderate.

Physical disturbance to the surrounding habitats and associated wildlife

7.9.20 In view of the small-scale and localised nature of the Project, only habitats and associated wildlife adjacent to the works area may be subject to indirect impacts resulting from increased disturbances caused by the Project. Such impacts will be limited to construction phase; disturbance during the operational phase would not be anticipated as the activities will be limited to the minor disturbance from the operation of pumping station.

7.9.21 Habitats that would potentially receive increased disturbances due to the proposed works mainly include semi-natural watercourses, channelised watercourses, agricultural land, marsh, village/developed area and small area of secondary woodland. Indirect impact on other habitats, including plantation and shrubland/ grassland are not anticipated, since the disturbance would be separated/ screened considerably by agricultural land and developed area.

7.9.22 Construction noise, glare, dust generation, waste dumping, water pollution from uncontrolled site runoff, traffic and increased human activities caused by the proposed

drainage improvement work could induce potential disturbance to the adjacent habitats and associated fauna.

7.9.23 Dust generated due to drainage improvement works, if not effectively controlled, could affect the health of adjacent vegetation. Excessive dust covering leaves can lead to reduction in their photosynthetic rates, abrasion and blocking of stomata. Improper dumping of construction materials and waste within and/or near to the works area may result in environmental degradation of the surrounding habitat, which is more sensitive for the retained flora species of conservation importance.

7.9.24 Increased usage of artificial lighting for construction activities especially during nighttime may cause disturbance to wildlife especially nocturnal species. Glare may result in visual discomfort, disorientation and disrupt nocturnal activities of wildlife (i.e. birds, amphibians).

7.9.25 Potential disturbance by construction noise and increased human activities may cause wildlife to avoid using areas adjacent to the works area, and thereby reduce wildlife density in the area. Potential disturbance to nearby habitats are presented in **Table 7.25** below.

Table 7.25 – Potential Disturbance to Nearby Habitats within Assessment Area

Habitat Type	Secondary Woodland	Plantation	Shrubland / Grassland	Marsh	Mangrove	Semi-natural Watercourse	Channelised Watercourse	Pond	Agricultural Land	Village / Developed Area
Habitat Quality	Moderate	Low	Low to Moderate	Moderate to High	Low to Moderate	Moderate to High	Low to Moderate	Low to Moderate	Moderate	Low
Species	Flora species of conservation importance: *Aquilaria sinensis*, *Artocarpus hypargyreus* Fauna species of conservation importance: Red Muntjac, Greater Coucal, Collared Scops Owl, Chinese Grosbeak, Romer's Tree Frog, Tokay Gecko, Chinese Yellowface	No flora species of conservation importance No fauna species of conservation importance	Flora species of conservation importance: *Aquilaria sinensis* No fauna species of conservation importance	Flora species of conservation importance: *Azolla imbricata* Fauna species of conservation importance: Eastern Cattle Egret, Grey Heron, Great Egret, Intermediate Egret, Little Egret, Watercock, Chinese Bullfrog, Romer's Tree Frog, Buff-striped Keelback, Mangrove Skimmer, Small Snakehead,	No flora species of conservation importance Fauna species of conservation importance: Black-crowned Night Heron, Eastern Cattle Egret, Grey Heron, Great Egret, Intermediate Egret, Little Egret	No flora species of conservation importance Fauna species of conservation importance: Hong Kong Newt, Short-legged Toad, Chinese Soft-shelled Turtle, Dingy Dusk-hawker, Whitespotted Walking Catfish, Blue Neon Goby, Akihito's Neon Goby, Scaly Neon Goby, Small Snakehead, Dark-margined Flagtail, Sharptail Goby, Eclipse	No flora species of conservation importance Fauna species of conservation importance: Black-crowned Night Heron, Chinese Pond Heron, Eastern Cattle Egret, Grey Heron, Great Egret, Intermediate Egret, Little Egret, Eclipse Puffer, Greasyback Shrimp	No flora species of conservation importance Fauna species of conservation importance include: Black-crowned Night Heron, Chinese Pond Heron, Eastern Cattle Egret, Grey Heron, Great Egret, Little Egret	Flora species of conservation importance: *Malaisia scandens* Fauna species of conservation importance: Short-nosed Fruit Bat, Black-crowned Night Heron, Eastern Cattle Egret, Chinese Bullfrog, Romer's Tree Frog, Chinese Cobra, Blue Chaser, Whitespotted Walking Catfish, Small Snakehead, Freshwater Crab	Flora species of conservation importance: *Aquilaria sinensis* Fauna species of conservation importance: Little Egret, Chinese Grosbeak, Romer's Tree Frog, Four-clawed Gecko, Tokay Gecko, Chinese Cobra

Habitat Type	Secondary Woodland	Plantation	Shrubland / Grassland	Marsh	Mangrove	Semi-natural Watercourse	Channelised Watercourse	Pond	Agricultural Land	Village / Developed Area
				Freshwater Crab		Puffer, Emerald Cascader (Larva), Greasyback Shrimp				
Size / Abundance	~114.6ha Moderate abundance of fauna	~1.8ha Low abundance of fauna	~5.0ha Low to moderate abundance of fauna	~15.3ha Moderate abundance of fauna	~0.6ha Moderate abundance of fauna	~4.6km Low to moderate abundance of fauna	~1.6km Low to moderate abundance of fauna	~1.9ha Low abundance of fauna	~32.3ha Moderate abundance for amphibians, low for other fauna	45.3ha Low abundance of fauna
Duration	Last during working hours in construction phase									
Reversibility	Reversible, disturbance will be ceased once works stopped/ completed									
Magnitude	Low, as the works of the Project are relatively simple and small in scale									
Overall Impact Severity	Low to moderate significance in construction phase, and Negligible in operation phase	Low significance in construction phase, and Negligible in operation phase	Low significance in construction phase, and Negligible in operation phase	Low to moderate significance in construction phase, and Negligible in operation phase	Low significance in construction phase, and Negligible in operation phase	Low to moderate significance in construction phase, and Negligible in operation phase	Low to moderate significance in construction phase, and Negligible in operation phase	Low significance in construction phase, and Negligible in operation phase	Low to moderate significance in construction phase, and Negligible in operation phase	Low significance in construction phase, and Negligible in operation phase

Impacts on adjacent habitats that are ecologically and hydrologically linked to the watercourses due to construction activities

7.9.26 During the drainage improvement works, uncontrolled site runoff may be generated. The uncontrolled runoff may involve sediments, or the contaminants released from site surface, drainage channels, stockpiles, earth working area, concrete or cement material, wash water from dust suppression sprays, wheel washing facilities and fuel, oil, solvents/lubricants release from maintenance of construction vehicles and machinery. If the polluted water is discharged accidentally/ uncontrolled into nearby watercourses and channels, it may deteriorate the watercourse water quality, and negatively impact the freshwater flora and fauna communities inhabiting the watercourses and the habitats that are ecologically and hydrologically linked to the watercourses, including River Silver, Luk Tei Tong River, Tai Tei Tong River and Pak Ngan Heung River.

7.9.27 Nevertheless, considering the construction method as described in **Section 5.8 of Chapter 5**, potential water quality impact through release of sediment during construction is expected to be minimal and highly localised. It is considered that indirect impact on the watercourses and adjacent habitats in terms of water pollution would not be anticipated with the implementation of good site practices as stated in **Section 5.10.1 of Chapter *5***.

Indirect impact on Tai Wai Yuen night roost

7.9.28 An Ardeid night roost was found within the Assessment Area at Tai Wai Yuen, approximately 250m away from the works area of the proposed stormwater drain near Mui Wo Municipal Services Building, during the ecological survey. Active use of the night roost by Eastern Cattle Egret, Grey Heron, Great Egret, Intermediate Egret and Little Egret was recorded from October 2021 to August 2022.

7.9.29 Although the night roosting site is not located within the works area and appeared abandoned, increased human activities, noise, glare, dust and other disturbances due to the Project construction have the potential to affect ardeid's usage of the night roosting site. These potential impacts are expected to be low, due to its small scale, temporary nature of construction activities and with the implementation of recommended measures (restriction of working hours and strong artificial lighting) as specified in **Section 7.10.8**.

Habitat fragmentation and isolation

7.9.30 Although water flow within the watercourses of works area will be maintained during the course of the construction work especially to avoid local flooding, should the hydrological connectivity and ecological linkage between upstream and downstream of the work site being disrupted/interrupted for whatever reason (such as temporary blockage for construction need/process, the use of submerged water pump which prohibit passing of aquatic animal), the movement of the inhabited wildlife such as the freshwater crabs, freshwater fish, and larvae of odonate along the watercourse could be temporarily interrupted, and the potential local aggregation of those animals may attract predator (e.g., ardeids) and cause a temporal reduction of their local population.

However, only a low abundance of aquatic wildlife, including those species of conservation concern, has been recorded within or beyond the project sites and their population would be expected to restore through natural recruitment, as such the potential impact from this temporal habitat fragmentation would expect to be limited within the works area.

Impact Evaluation – Operation Phase

7.9.31 Dredging operation in the river channels is not expected during routine maintenance works in the operation phase, except when the sediment is affecting the operation of penstock and tidal barriers. Regular maintenance desilting and debris clearance will be necessary for the river channel of Tai Tei Tong River, Pak Ngan Heung River, Luk Tei Tong Bypass Channel and Luk Tei Tong River to remove excessive silts, vegetation growth, rubbish and obstructions. Channel desilting works will be scheduled section by section and the works will be confined in a small works zone which is isolated from the rest of the channel by temporary barrier walls to prevent suspended sediment being transport downstream. The maintenance works are considered localised, small scale and will require only light mechanical equipment such as small loader and crane truck and hand-held equipment. When maintenance dredging is being conducted, mitigation measures such as carry out works section by section and undertake works in confined and dry conditions shall be considered. It is anticipated that routine maintenance works to be carried out within a short period of time are relatively small scale compared with the construction works under this Project and will not cause any adverse water quality impact. The proposed stormwater pumping station would involve discharge of stormwater to existing storm drain, but the quality and quantity of the stormwater discharge is in similar level to the scenario without the pumping station. Thus, there will be no unacceptable adverse impacts due to the operation of the stormwater pumping station is anticipated.

7.9.32 The proposed tidal gate at RS and mechanical penstock at the outfall of LTTR (West) will be closed only in the event of high tide and heavy rainfall, blockage of the watercourses and/or barrier effect to wildlife movement, including the stream-ocean corridor, is not expected in normal circumstances. The current design of agricultural weirs has a steep gradient that does not favour fish movement between downstream and upstream sections while the modification of agricultural weirs and fish ladders proposed under the Project would result in enhancement of movement for aquatic life especially for the migration of diadromous species of conservation concern recorded within Tai Tei Tong River (e.g. Dark-margined Flagtail). In addition, the proposed fish ladders at Tai Tei Tong River would further improve the ecological connectivity in watercourses. Changes to hydrology and hydraulics of downstream river, watercourses and water bodies, and ground water flow regime due to the Project, and the associated negative effects on terrestrial and aquatic ecology during operation phase of the Project is not anticipated.

7.9.33 DSD commits to implement blue-green elements, including revitalised river channel as suggested in *DEVB TC(W) No. 9/2020 Blue-Green Drainage Infrastructure*, to the drainage channel design and that ecological enhancement features for restoring natural stream habitat will be incorporated into this Project. The Project will be

beneficial in the long term with the drainage efficiency enhancement and the incorporation of environmental friendly drainage structures into the proposed works including greening works and fish ladders to enhance rivers ecological connectivity and wildlife movement.

7.9.34 Overall, no significant impact on ecological resources is expected during operation phase of the Project.

Cumulative Impact

7.9.35 Referring to the latest information, the major concurrent project include Mui Wo Village sewerage works at Luk Tei Tong and Ma Po Tsuen and Desilting Works at River Silver, Mui Wo. Considered the scale and nature of the concurrent project, the adverse cumulative impact on the existing ecological resources within the Assessment Area, in particular watercourse or riverine habitat, would be minimal. As a precautionary approach, to further minimise the potential cumulative impacts during construction phase, it is recommended that the contractor shall plan the works area of the close proximity into work sections of different phasing which will not overlap with the works area of interfacing project as far as practical. The construction programme of the project and concurrent projects are as stated in **Appendix 2.4** and **Table 2.1** of **Chapter 2** respectively.

7.10 Mitigation Measures

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

Avoidance of Impacts to Ecologically Sensitive Habitats

7.10.2 The Project site has been selected based on environmental and other considerations (refer to **Chapter 2**). Potential impacts to the identified Night Roosting Site for ardeid have been avoided to the maximum extent practicable by adopting suitable Project's alignment/ works area. The Project site has also avoided encroaching onto Fung Shui Woods, Country Parks, and other ecologically sensitive receivers.

Minimisation of Habitat Disturbance and Impacts to Fauna Species of Conservation Importance

7.10.3 Unavoidable impacts to natural terrestrial habitats have been minimised by taking appropriate and practicable measures such as restriction of river reprofiling works at Tai Tei Tong River to dry season as far as practicable and confining works in specific area during daytime hours.

7.10.4 While the Project has avoided to affect any flora species of conservation importance recorded within the Assessment Area, as discussed in **Sections 7.9.9** to **7.9.13**, fauna species of conservation importance including Hong Kong Newt, Blue Neon Goby, Akihito's Neon Goby, Scaly Neon Goby, Small Snakehead, Dark-margined Flagtail,

Emerald Cascader (Larva) and Greasyback Shrimp were recorded within the works area.

7.10.5 To avoid the potential direct impact on these species, prior to commencement of construction at the affected watercourse(s), an update ecological survey should be conducted with focus to the presence of the herpetofauna and freshwater community. The survey should be conducted by a qualified ecologist as part of the Environmental Team (ET) and cover the stretch of the watercourse 5m upstream and downstream of the works area. Should species of conservation importance be found within the surveyed watercourse section(s), a Translocation Plan should be prepared. Translocation should be conducted to move the individuals from the works area to suitable recipient sites.

7.10.6 The Translocation Plan should be prepared by the qualified ecologist as a part of the ET, certified by the Independent Environmental Checker (IEC) and submitted to AFCD within one month upon completion of the update aquatic survey to agree the detailed translocation procedures including the identified receptor site(s). Agreement from relevant authorities (e.g. AFCD and EPD) should be sought prior to conducting the translocation work.

7.10.7 The translocation work should be conducted as close to the commencement of the relevant site works as possible, following the approved Translocation Plan. Upon the completion of the translocation work, post-translocation survey should be conducted at the recipient site to monitor the effectiveness of translocation.

Minimization of disturbance to Tai Wai Yuen night roost

7.10.8 As discussed in **Sections 7.9.28** to **7.9.29**, Tai Wai Yuen night roost was observed actively in use by Ardeids in October 2021 to August 2022. The night roost was 250 m away from the works area of the proposed stormwater drain near Mui Wo Municipal Services Building. As a precautionary measure, construction works at the works area of stormwater drain near Mui Wo Municipal Services Building during night-time from 17:00 to 07:00 should be avoided to minimize potential disturbance to the Ardeids. In addition, strong artificial lighting should not be used in the area at night to avoid disturbance to the roosting ardeids. Lighting required for safety purpose should keep minimal and pointed inward. Clear signs should be erected on site to alert all site staff and workers about the requirement.

Measures and Good Site Practice for Minimization of Physical Disturbance to the Surrounding Habitats

7.10.9 The following construction phase mitigation measures are proposed to reduce predicted disturbance impacts and impact of water pollution to an acceptable level:

- Restriction of river reprofiling works at Tai Tei Tong River under the Project to dry season as far as practicable;

- Implementing measures to minimise magnitude of construction runoff and to avoid/ minimise the potential impact of spillage events, if any, and

- Appropriate measures including the provision of temporary movable toilets should be adopted. Controlled wastewater discharge to the nearby water bodies will be implemented in accordance with the guidelines stipulated in Environmental Protection Department (EPD)'s *Practice Note for Professional Persons on Construction Site Drainage (ProPECC PN1/94)* during the construction works to properly control site run-off and drainage and to minimise the potential water quality impact.

7.10.10 Good site practice should also be adopted to minimize potential disturbances to the surrounding habitats, including:

- Avoid any damage and disturbance, particularly those caused by filling and illegal dumping to the surrounding habitats, especially wetland habitats and any watercourses;

- Excavated materials will be covered and/or properly disposed of as soon as possible to avoid being washed into nearby water bodies;

- Regularly check the site boundaries to ensure that they are not breached and that no damage occurs to surrounding ecologically sensitive habitats (e.g. woodlands, marsh and watercourses);

- Prohibit and prevent open fires within the site boundary during construction and provide temporary firefighting equipment in the works area;

- Reinstate temporary work sites/disturbed areas, immediately after completion of the construction works; and

- Only well-maintained plant to be operated on-site and plant to be serviced regularly during the construction program.

Mitigation measures for operation phase

7.10.11 As discussed in **Section 7.9.31** to **7.9.34**, there will be no major works such as dredging to be carried out during routine maintenance works in the operation phase. Hydrology and hydraulics would not be affected by the drainage improvement works of Project. Nevertheless, good site practice in **Section 7.10.12** should be followed during maintenance work, and also, the following measures are recommended to minimise potential impacts resulting from operational phase activities:

- For maintenance desilting of the re-profiled river channels, temporary barrier walls shall be used to provide a dry zone for desilting work;

- The implementation of de-silting and other activities that could disturb aquatic fauna should be scheduled section by section and the works will be confined in a small works zone which is isolated from the rest of the channel by temporary

barrier walls to ensure some areas of relatively undisturbed habitat remain available for resident aquatic fauna at all times; and

- Waste material produced during de-silting should be disposed of in a timely and appropriate manner.

7.10.12 In addition, DSD commits to implement blue-green elements, including revitalised river channel as suggested in *DEVB TC(W) No. 9/2020 Blue-Green Drainage Infrastructure*, to the drainage channel design and that ecological enhancement features for restoring natural stream habitat will be incorporated into this Project. The Project will be beneficial in the long term with the drainage efficiency enhancement and the incorporation of environmental friendly drainage structures into the proposed works including greening works and fish ladders (i.e. which will aid fish migration and perpetuate fish population in the area) to enhance rivers ecological connectivity and wildlife movement.

7.11 Evaluation of Residual Ecological Impacts

7.11.1 Based on the above assessment as well as review on similar measures, such as restriction of river reprofiling works to dry season as far as practicable, implementation of standard good site practice measures, ecological survey and translocation of species of conservation importance to be conducted prior to the commencement of constructing works, and etc., that have been adopted and with proven effectiveness in previous studies (for example, in Drainage Improvements in Southern Lantau (AEIAR-093/2005)), adverse residual impacts from the Project on the ecological resources within and in the vicinity of the works area would not be anticipated with the effective implementation of the suggested mitigation measures and good site practices in **Section 7.10**. Off-site mitigation measures are therefore not considered necessary to mitigate the residual impacts any further.

7.12 Environmental Monitoring and Audit Requirements

Construction Phase

7.12.1 The assessment presented above indicates that unacceptable construction phase impacts and operation phase impacts are not expected to occur to terrestrial ecological resources. The implementation of the ecological mitigation measures described in **Section 7.5** will be inspected and monitored regularly as part of the ecological monitoring programme during the construction period.

Translocation of Fauna Species of Conservation Importance

7.12.2 An update ecological survey shall be conducted by a qualified ecologist as part of the ET with focus to the presence of the herpetofauna and freshwater community prior to commencement of construction at the affected watercourse(s). Should species of conservation importance be found within the surveyed watercourse section(s), a Translocation Plan should be prepared. Translocation should be conducted to move the individuals from the works area to suitable recipient sites. The Translocation Plan should be prepared by the qualified ecologist as a part of the ET, certified by the IEC

and submitted to AFCD within one month upon completion of the update aquatic survey to agree the detailed translocation procedures including the identified receptor site(s). Agreement from relevant authorities (e.g. AFCD and EPD) should be sought prior to conducting the translocation work. The translocation work should be conducted as close to the commencement of the relevant site works as possible, following the agreed Translocation Plan. Upon the completion of the translocation work, post-translocation survey should be conducted at the recipient site to monitor the effectiveness of translocation.

Protection of Identified Night Roosting Site

7.12.3 As a precautionary measure, construction works at the works area of stormwater drain near Mui Wo Municipal Services Building during night-time from 17:00 to 07:00 should be avoided to minimize potential disturbance to the Ardeids. In addition, strong artificial lighting should not be used in the area at night to avoid disturbance to the roosting ardeids. Lighting required for safety purpose should keep minimal and pointed inward. Clear signs should be erected on site to alert all site staff and workers about the requirement.

Operational Phase

7.12.4 No operational phase monitoring is considered necessary.

7.13 Conclusion

7.13.1 The ecological impact assessment has been carried out based on literature reviews and the focused field surveys of twelve months covering both wet and dry seasons completed in 2022. According to the Project alignment, the Project will cause potential temporary and permanent habitat loss to marsh (~0.7ha; including ~0.5ha temporary works area), semi-natural watercourse (~0.7km; including ~0.7km temporary works area), channelised watercourses (~0.4km; including ~0.4km temporary works area), agricultural land (~1.1ha; including ~0.8ha of temporary works area) and village/developed area (~0.5ha; including ~0.5ha temporary works area).

7.13.2 Majority of the identified impacts are considered to be low in the absence of mitigation measures. However, the potential impact on direct loss (i.e., permanent and temporary losses) of marsh, watercourses and agricultural land, ecological impact on fauna species of conservation importance, and ecological impact to watercourses due to river reprofiling, temporary stream diversion and the associated change in water flow/ level are considered as low to moderate. Necessary mitigation measures and ecological monitoring programme were proposed for the above potential impacts.

7.13.3 It is predicted that the impacts will mainly arise during the construction phase, as no major activities would be conducted during the operation phase. The routine maintenance and the operation of the completed drainage channel and pumping station would not cause any significant ecological impact. Good site practice and mitigation measures are recommended to minimise potential impacts resulting from operational phase activities.

7.13.4 With the implementation of mitigation measures and precautionary measures, no adverse residual ecological impacts from the Project within and in the vicinity of the works area during construction and operation phases would be anticipated. Off-site mitigation measures are therefore not considered necessary to mitigate the residual impacts any further.

7.14 References

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