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8. ECOLOGY

8.1 Introduction

8.1.1 This Section presents the ecological impact assessment (EcoIA) associated with the construction and operation of the proposed project in accordance with Clause 3.4.5 and Appendix 8.3 of the EIA Study Brief No. ESB-322/2019. Baseline conditions for ecological components of the terrestrial and associated aquatic environment were evaluated based on information from available literature and recent ecological field surveys conducted during both dry and wet seasons for the purposes of this ecological impact assessment. Measures required to mitigate any identified ecological impacts have been recommended, where appropriate. The Study Area extends a distance of 500 m from the Project Site boundary (**Figure 8.1**). This area is rural in character, comprising mostly abandoned agricultural lands and village/developed areas.

8.2 Relevant Legislation and Guidelines

8.2.1 Reference has been made to the Technical Memorandum on Environmental Impact Assessment Process (EIAO-TM) issued under the Environmental Impact Assessment Ordinance (EIAO) in the evaluation of potential ecological impacts, particularly Annex 8 Criteria for Evaluating Ecological Impact and Annex 16 Guidelines for Ecological Assessment. The following Guidance Notes have also been taken to account:

- GN 6/2010 Some Observations on Ecological Assessment from the Environmental Impact Assessment Ordinance Perspective;
- GN 7/2010 Ecological Baseline Survey for Ecological Assessment; and
- GN 10/2010 Methodologies for Terrestrial and Freshwater Ecological Baseline Surveys.

8.2.2 In addition, the following legislation and guidelines provide the framework for conducting ecological surveys and the protection of species and habitats of ecological importance for ecological impact assessment in Hong Kong:

- Forests and Countryside Ordinance (Cap 96);
- Wild Animals Protection Ordinance (Cap 170);
- Country Parks Ordinance (Cap. 208)
- Protection of Endangered Species of Animals and Plants Ordinance (Cap 586);
- Development Bureau Technical Circular (Works) No. 4/2020, Tree Preservation
- Development Bureau Technical Circular (Works) No. 6/2015, Maintenance of Vegetation and Hard Landscape Features
- Hong Kong Plant Database of Hong Kong Herbarium, Agriculture, Fisheries and Conservation Department
(<https://www.herbarium.gov.hk/en/hk-plant-database/index.html>)
- Hong Kong Biodiversity Database of Agriculture, Fisheries and Conservation Department
(<https://bih.gov.hk/en/species-database/index.html>)

8.2.3 Other international conventions and guidelines that are relevant to this ecological baseline study include the followings:

- Convention on International Trade in Endangered Species of Wild Fauna and Flora

("CITES"). This Convention regulates international trade in animal and plant species considered to be at risk from such trade. The main categories of species relevant to Hong Kong are Appendices I and II. Species listed in Appendix I are species threatened with extinction that are or may be affected by trade; species listed in Appendix II are those that, while not necessarily under current threat of extinction, may become threatened unless trade is subject to strict regulation. Hong Kong's obligations under this Convention are enforced via the Protection of Endangered Species of Animals and Plants Ordinance.

- International Union for Conservation of Nature ("IUCN"): the World Conservation Union maintains, through its Species Survival Commission, a Red List of globally threatened species of wild plants and animals (see <http://www.redlist.org>). The Red List is considered the authoritative publication to classify species as critically endangered, endangered, vulnerable, or lower-risk.

8.3 Literature Review

8.3.1 Through desktop review of publicly available and relevant literature, the existing ecological baseline condition can be established and all available information will be collated and evaluated to identify any information gap relating to the establishment of the ecological profile of the Study Area, and to determine the ecological surveys needed.

8.3.2 The following previous studies were reviewed:

- AEIAR-035/2000 Shenzhen River Regulation Project Stage III - Environmental Impact Assessment
- AEIAR-136/2009 Construction of a Secondary Boundary Fence and new sections of Primary Boundary Fence and Boundary Patrol Road
- AEIAR-160/2011 Regulation of Shenzhen River Stage IV
- AEIAR-161/2011 Liantang / Heung Yuen Wai Boundary Control Point and Associated Works
- AEIAR-198/2016 Site Formation and Associated Infrastructural Works for Development of Columbarium, Crematorium and Related Facilities at Sandy Ridge Cemetery
- The Biodiversity Survey conducted by the Drainage Services Department (DSD) in Ping Yuen River
- Agreement No. CE 6/2002 (DS) Drainage Improvement in Northern New Territories - Package C Investigation, Design and Construction (Drainage Channel TKL05) (Unpublished)
- Agreement No. CE 60/2005 (TP) Land Use Planning for the Closed Area – Feasibility Study

8.3.3 Recognized sites of conservation importance identified within the Study Area included the following:

- Kan Tau Wai Fung Shui Wood;
- Ping Che Egrettry.

8.3.4 Kan Tau Wai Fung Shui Wood to the east and the south of Kan Tau Wai Village is within the Study

Area. It was reported to cover an area of 4043m². 11 species of vascular plants are recorded, with reference to the Committee Paper NCSC 9/06 of Advisory Council on the Environment Nature Conservation Subcommittee. The Proposed Works Limit does not encroach into the boundary of Kan Tau Wai Fung Shui Wood.

- 8.3.5 Ping Che Egretty is the nearest egretty, which is in the southeast of the 500m Study Area, approximately 20m northeast from the Ping Che Mini-soccer Pitch and adjacent to the Ng Chow Road. This egretty was first reported in 2009. Ping Che Egretty is located at a group of bamboo in Ping Che. One ardeid species was recorded nesting in this egretty since 2009 (**Table 8.1**), which is Chinese Pond Heron *Ardeola bacchus*. Ping Che Egretty is about 200m to the east of the Proposed Works Limit, as shown in **Figure 8.3**.
- 8.3.6 With reference to the EIA Study Brief, aquatic habitats, including mudflats, marshes, mangroves and streams outside 500m Study Area that are possibly impacted were reviewed.
- 8.3.7 The nesting population of ardeids in Ping Che Egretty is summarised in **Table 8.1**.

Table 8.1 Nesting Populations of Ardeid in Ping Che Egretty since 2009
(data from 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020)

Year	Chinese Pond Heron	Total nests (% of total in Hong Kong)
2009	5	5 (0.6)
2010	16	16 (2.2)
2011	7	7 (0.9)
2012	13	13 (1.5)
2013	11	11 (1.5)
2014	10	10 (1.0)
2015	6	6 (0.4)
2016	7	7 (0.6)
2017	13	13 (1.0)
2018	9	9 (0.8)
2019	11	11 (0.7)
2020	9	9 (0.5)

- 8.3.8 For the fauna and flora communities, across the reviewed studies, a total of 38 species of conservation importance were recorded within the Study Area of this study and their locations were accurately pinpointed on map. Four vascular plant species, two mammal species, 29 bird species and three herpetofauna species of conservation importance were recorded (**Table 8.2**). The locations of the species of conservation importance recorded within the Study Area and Proposed Works Limit from the reviewed literature are shown in **Figure 8.2**.

Table 8.2 Species of Conservation Importance Recorded within the Study Area from the Reviewed Literature

Species name	Rarity in Hong Kong 8,9,10	Habitat/Distribution in Hong Kong 8,9,10	Protection/Conservation status 11,12,13,14,15,16,17,18,19,20,21
Flora			
<i>Aquilaria sinensis</i>	Common	-	Cap. 586, China Red Data Book: (Vulnerable), State protection (category II), Threatened Species List of China's Higher Plants: (Vulnerable)
<i>Cephalanthus tetrandrus</i>	Very rare	-	-
<i>Neottopteris nidus</i>	Restricted	-	Cap. 96
<i>Pavetta hongkongensis</i>	Common	-	Cap. 96
Mammals			

Species name	Rarity in Hong Kong 8,9,10	Habitat/Distribution in Hong Kong 8,9,10	Protection/Conservation status 11,12,13,14,15,16,17,18,19,20,21
Small Asian Mongoose <i>Herpestes javanicus</i>	Uncommon	-	Cap. 170
Common Bent-winged Bat <i>Miniopterus Schreibersii</i>	Common	-	Cap. 170, China Red Data Book: (Endangered), Fellowes et al. (2002): (Local Concern)
Avifauna			
Eurasian Teal <i>Anas crecca</i>	Common winter visitor	Found in Deep Bay area, Shuen Wan, Tai Lam Chung Reservoir, Victoria Harbour, Urban Park	Fellowes et al. (2002): Regional Concern
Black-crowned Night Heron <i>Nycticorax nycticorax</i>	Common resident and winter visitor	Widely distributed in Hong Kong	Fellowes et al. (2002): (Local Concern)
Chinese Pond Heron <i>Ardeola bacchus</i>	Common resident	Widely distributed in Hong Kong	Fellowes et al. (2002): Potential Regional Concern, (Regional Concern)
Grey Heron <i>Ardea cinerea</i>	Common winter visitor	Found in Deep Bay area, Starling Inlet, Kowloon Park, Cape D'Aguiar	Fellowes et al. (2002): Potential Regional Concern
Great Egret <i>Ardea alba</i>	Common resident and winter visitor	Widely distributed in Hong Kong	Fellowes et al. (2002): Potential Regional Concern, (Regional Concern)
Little Egret <i>Egretta garzetta</i>	Common resident	Widely distributed in coastal area throughout Hong Kong	Fellowes et al. (2002): Potential Regional Concern, (Regional Concern)
Eastern Cattle Egret <i>Bubulcus coromandus</i>	Resident and common passage migrant	Widely distributed in Hong Kong	Fellowes et al. (2002): (Local Concern)
Striated Heron <i>Butorides striatus</i>	Present all year, locally uncommon in summer and scarce in winter	Widely distributed in Hong Kong	Fellowes et al. (2002): (Local Concern)
Great Cormorant <i>Phalacrocorax carbo</i>	Common winter visitor	Widely distributed in coastal areas throughout Hong Kong	Fellowes et al. (2002): Potential Regional Concern
Greater Painted-snipe <i>Rostratula benghalensis</i>	Passage migrant and winter visitor	Found in Ha Tsuen, Lok Ma Chau, Kam Tin, Long Valley, Hong Kong Wetland Park.	Fellowes et al. (2002): Local Concern
Crested Serpent Eagle <i>Spilornis cheela</i>	Uncommon resident	Widely distributed in shrublands on hillsides throughout Hong Kong	Cap. 586, China Red Data Book: (Vulnerable), Appendix 2 of CITES, Fellowes et al. (2002): (Local Concern)
Greater Spotted Eagle <i>Aquila clanga</i>	Scarce winter visitor	Found in Deep Bay area	Cap. 586, China Red Data Book: (Rare), Appendix 2 of CITES, Fellowes et al. (2002): Global Concern, IUCN: (Vulnerable)
Bonelli's Eagle <i>Aquila fasciata</i>	Scarce resident	Found in Deep Bay area, Hong Kong Island, Lamma Island, Lantau Island, Castle Peak, Sha Lo Tung.	Cap. 586, China Red Data Book: (Rare), Appendix 2 of CITES, Fellowes et al. (2002): Global Concern
Besra <i>Accipiter virgatus</i>	Scarce resident	Found in Tai Po Kau, Deep Bay area, Chek Lap Kok, Cheung Chau, Soko Islands	Cap. 586, Class 2 Protected Animal of China, Appendix 2 of CITES
Black Kite <i>Milvus migrans</i>	Common resident and winter visitor	Widely distributed in Hong Kong	Cap. 586, Appendix 2 of CITES, Fellowes et al. (2002): (Regional Concern)
Eastern Buzzard <i>Buteo japonicas</i>	Common winter visitor	Widely distributed in Hong Kong	Cap. 586, Appendix 2 of CITES
Common Emerald Dove <i>Chalcophaps indica</i>	Scarce but widespread resident	Widely distributed in woodland throughout Hong Kong	China Red Data Book: (Vulnerable)

Species name	Rarity in Hong Kong 8,9,10	Habitat/Distribution in Hong Kong 8,9,10	Protection/Conservation status 11,12,13,14,15,16,17,18,19,20,21
Common Kestrel <i>Falco tinnunculus</i>	Common autumn migrant and winter visitor	Widely distributed in Hong Kong	Cap. 586, Class 2 Protected Animal of China, Appendix 2 of CITES
Greater Coucal <i>Centropus sinensis</i>	Common resident	Widely distributed in Hong Kong	China Red Data Book: (Vulnerable), Class 2 Protected Animal of China
Lesser Coucal <i>Centropus bengalensis</i>	Common resident	Widely distributed in Hong Kong	China Red Data Book: (Vulnerable), Class 2 Protected Animal of China
Chinese Hwamei <i>Garrulax canorus</i>	Common resident	Widely distributed in hillside shrubland throughout Hong Kong	Cap. 586, Appendix 2 of CITES
Collared Crow <i>Corvus Torquatus</i>	Uncommon resident	Found in Inner Deep Bay area, Nam Chung, Kei Ling Ha, Tai Mei Tuk, Pok Fu Lam, Chek lap Kok, Shuen Wan, Lam Tsuen	Fellowes et al. (2002): Local Concern, IUCN: (Vulnerable)
Asian Barred Owlet <i>Glaucidium cuculoides</i>	Uncommon resident	Widely distributed in woodland throughout Hong Kong	Cap. 586, Appendix 2 of CITES, Class 2 Protected Animal of China
Collared Scops Owl <i>Otus lempii</i>	Common resident	Widely distributed in shrubland throughout Hong Kong	Cap. 586, Class 2 Protected Animal of China, Appendix 2 of CITES
Peregrine Falcon <i>Falco peregrinus</i>	Scarce resident and winter visitor	Widely distributed in Hong Kong	Cap. 586, Appendix 2 of CITES, Class 2 Protected Animal of China, Fellowes et al. (2002): (Local Concern)
White-throated Kingfisher <i>Halcyon smyrnensis</i>	Common resident	Widely distributed in coastal areas throughout Hong Kong	Fellowes et al. (2002): (Local Concern)
Golden-headed Cisticola <i>Cisticola exilis</i>	Scarce winter visitor	Widely distributed in grassland throughout Hong Kong	Fellowes et al. (2002): Local Concern
Zitting Cisticola <i>Cisticola juncidis</i>	Common passage migrant and winter visitor	Widely distributed in grassland throughout Hong Kong.	Fellowes et al. (2002): Local Concern
White-shouldered Starling <i>Sturnia sinensis</i>	Common passage migrant	Found in Kam Tin, Deep Bay area, Po Toi Island, Long Valley, Victoria Park, Ho Chung, Ma Tso Lung, Mui Wo, Lam Tsuen Valley	Fellowes et al. (2002): (Local Concern)
Herpetofauna			
Common Rat Snake <i>Ptyas mucosus</i>	-	Widely distributed throughout Hong Kong	Cap. 586, China Red Data Book: (Endangered), Fellowes et al. (2002): Potential Regional Concern, Appendix 2 of CITES
Chinese Bullfrog <i>Hoplobatrachus chinensis</i>	-	Widely distributed in Lantau Island and New Territories.	Class 2 Protected Animal of China, Fellowes et al. (2002): (Potential Regional Concern)
Burmese Python <i>Python bivittatus</i>	-	Widely distributed throughout Hong Kong.	Cap. 170, Cap. 586, Class 1 Protected Animal of China, China Red Data Book: (Critically Endangered), Fellowes et al. (2002): Potential Regional Concern, IUCN: (Vulnerable), Appendix 2 of CITES

Notes:

1. AEIAR-035/2000 Shenzhen River Regulation Project Stage III – Environmental Impact Assessment
2. AEIAR-136/2009 Construction of a Secondary Boundary Fence and new sections of Primary Boundary Fence and Boundary Patrol Road
3. AEIAR-160/2011 Regulation of Shenzhen River Stage IV
4. AEIAR-161/2011 Liantang / Heung Yuen Wai Boundary Control Point and Associated Works
5. AEIAR-198/2016 Site Formation and Associated Infrastructural Works for Development of Columbarium, Crematorium and Related Facilities at Sandy Ridge Cemetery

6. Agreement No. CE 6/2002 (DS) Drainage Improvement in Northern New Territories – Package C Investigation, Design and Construction (Drainage Channel TKL05)
7. Agreement No. CE 60/2005 (TP) Land Use Planning for the Closed Area – Feasibility Study
8. Corlett *et al.* (2000). Hong Kong Vascular Plants: Distribution and Status.
9. Cap. 96 Forests and Countryside Ordinance
10. AFCD (2019). Hong Kong Biodiversity Database.
11. Chan *et al.* (2005). A Field Guide to the Amphibians of Hong Kong.
12. Convention on International Trade in Endangered Species of Wild Flora and Fauna (2019). Appendices I, II and III.
13. Cap. 586 Protection of Endangered Species of Animals and Plants Ordinance
14. State Forestry Administration & Ministry of Agriculture (1999). List of Wild Plants under State Protection (Part 1).
15. Li-Kuo, F., & Jiang-ming, J. (1992). China plant red data book: rare and endangered plants: Vol. 1.
16. Qin, H. N., Yang, Y., Dong, S. Y., He, Q., Jia, Y., Zhao, L. N., ... & Xiang, J. Y. (2017). Threatened species list of China’s higher plants. Biodiversity science, 25(7), 696-744.
17. Cap. 170 Wild Animals Protection Ordinance
18. Fellowes *et al.* (2002). Wild animals to watch: Terrestrial and freshwater fauna of conservation concern in Hong Kong. (For conservation status listed by Fellowes *et al.* (2002), letters in parentheses indicate that the assessment is on the basis of restrictedness in breeding and/or roosting sites rather than in general occurrence)
19. Wang & Zhao (1998). China Red Data Book of Endangered Animals: Amphibia and Reptilia
20. Zheng and Wang (1998). China Red Data Book of Endangered Animals: Aves.
21. IUCN Red List of Threatened Species.

8.4 Ecological Baseline Survey Methodology

- 8.4.1 Ecological surveys were carried out, aiming at filling the information gap identified from literature review.
- 8.4.2 The Study Area for the purpose of ecological baseline surveys includes all areas within 500m distance from the boundary of the Proposed Works Limit (**Figure 8.3**).
- 8.4.3 Surveys on habitat and vegetation, terrestrial mammals, avifauna, herpetofauna, butterflies, odonates and freshwater fauna are proposed to be conducted between February 2020 and July 2020, in addition to November 2020 and December 2020, covering both dry and wet seasons. Survey on Ping Che Egrettry were carried out between March 2020 and August 2020. Ecological survey programme is shown in **Table 8.3**.

Table 8.3 Ecological Survey Programme

Surveys	2020																	
	Feb		Mar		Apr		May		Jun		Jul		Aug		Nov		Dec	
	DT	NT	DT	NT	DT	NT	DT	NT	DT	NT	DT	NT	DT	NT	DT	NT	DT	NT
Habitat and Vegetation	✓										✓							
Terrestrial Mammals	✓	✓	✓	✓					✓	✓	✓	✓			✓	✓	✓	✓
Avifauna	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓
Egrettry			✓		✓		✓		✓		✓		✓					
Herpetofauna	✓	✓	✓	✓			✓	✓	✓	✓					✓	✓	✓	✓
Butterflies and Odonates	✓		✓				✓				✓				✓		✓	
Freshwater Aquatic Assemblage	✓	✓	✓	✓			✓	✓	✓	✓								

Notes:

1. DT = Daytime; NT = Nighttime

- 8.4.4 The ecological surveys followed the requirements listed in Annexes 8 and 16 of the Technical Memorandum as well as Environmental Impact Assessment Ordinance Guidance Notes No. 7/2010 “Ecological Baseline Survey for Ecological Assessment” and No. 10/2010 “Methodologies for Terrestrial and Freshwater Ecological Baseline Survey. The survey methodology for each item is

described in the following sections.

- 8.4.5 **Habitat and Vegetation** – Field surveys focusing on habitat (including fish ponds) and vegetation (including trees) within the Study Area was performed during the dry and wet seasons to establish the general terrestrial ecological profile of the Study Area. Habitats were mapped based on recent aerial photos and field ground-truthing. Representative areas of each habitat type and the Proposed Works Limit was surveyed on foot. Special attention was paid to any habitat type shown seasonal patterns. Plant species of each habitat type encountered, and their relative abundance were recorded with special attention to rare or protected species (e.g. *Mucuna championii*). Nomenclature and conservation status of plant species will follows Corlett et al. (2000), Hu et al. (2003) and Hong Kong Herbarium (2012). Habitats were characterized and defined with reference to size, vegetation type, flora species present, dominant species, species diversity and abundance, community structure and seasonality, as well as the presence of any feature of ecological importance. Representative colour photos were taken for each habitat type and any important ecological features identified. Habitat maps of suitable scale (i.e. 1:1000 to 1:5000) was prepared.
- 8.4.6 **Terrestrial Mammals** – Mammal surveys (including day and night-time surveys, covering the dry and wet seasons) were carried out, with a frequency of at least twice in the dry season and twice in the wet season. As most mammals often occur at low densities, all sightings, tracks, and signs of mammals (including droppings) were actively searched along the tentative survey transects (**Figure 8.3**). Nomenclature for mammals follows Shek (2006). Quantification of abundance of mammals in the Study Area is difficult due to translating sights and tracks (e.g. burrows) to actual abundance. Dusk surveys were conducted for bats by direct observations and using a bat detector. All calls recorded were analysed to permit, as far as possible, identification of species from call structure (Shek and Lau 2006)
- 8.4.7 **Avifauna** – Bird surveys (including day and night-time surveys, covering the dry and wet seasons) were carried out, on a monthly basis. Daytime avifauna surveys were carried out in the early morning at the period of peak bird activity. Night surveys were be conducted after dusk to record nocturnal avifauna. The bird communities of each habitat type within the Study Area were surveyed along the tentative survey transects (**Figure 8.3**). All birds seen or heard within 30 m along the tentative survey transects were counted and identified to species wherever possible. Location of major foraging and roosting sites of waterbirds were marked on map. Signs of breeding (e.g. nests and/ or recently fledged juveniles) within the Study Area, especially in the Proposed Works Limit, were also recorded, if any. Observations were made using binoculars (at least 8x) and photographic records were taken, if possible. Ornithological nomenclature in this report followed the latest List of Hong Kong Birds by Hong Kong Bird Watching Society.
- 8.4.8 **Egretry Survey** – Within the 6-month baseline ecological survey, the breeding ardeid population of Ping Che egretty was surveyed monthly by direct observation using binoculars in the breeding season of 2020 (usually between March and August). The numbers of abandoned nests and nests with incubating adults or chicks of each breeding ardeid species in the egretty were recorded during each survey. The extent of the egretty was mapped and physical environment was noted. Particular attention was also paid to any other egretty, foraging ground and/or roosting habitat used by breeding ardeids within the Study Area.
- 8.4.9 **Herpetofauna** – Herpetofauna surveys (including day and night-time surveys, covering the dry and wet seasons) were carried out, at least twice in the dry season and twice in the wet season. Herpetofauna surveys were conducted through direct observation and active searching in all habitat types along the tentative survey transects (**Figure 8.3**) and in potential hiding places such as among leaf litter, inside holes, under stones and logs within the Study Area. Particular attention was given to streams and watercourses. Auditory detection of species-specific calls was used to survey frogs and toads. During the surveys, all reptiles and amphibians sighted and heard were recorded. Nomenclature and conservation status of reptiles has followed Karsen et al. (1998) and Chan et al. (2006), while those of amphibians follows Chan et al. (2005).
- 8.4.10 **Butterflies and Odonates** – Butterfly and odonate surveys were carried out, at least twice in the dry

season and twice in the wet season. Butterflies and odonates of different habitats within the Study Area were surveyed using a transect method (**Figure 8.3**). Butterflies and odonates along the tentative survey transects were identified and counted for each type of habitat. Butterflies and odonates encountered outside the transects but within the Study Area were also recorded in order to produce a complete species list. Nomenclature of butterflies and odonates follows Chan et al. (2011) and Tam et al. (2011).

- 8.4.11 **Freshwater Aquatic Assemblage** – Streams and watercourse (both perennial and seasonal) within the Study Area were visited, and aquatic fauna, including fish and arthropods, were studied by direct observation and active searching by hand nets and standard field sampling techniques (e.g. kick sampling), at least twice in the dry season and twice in the wet season. Active sampling was carried out at the tentative aquatic sampling locations shown in **Figure 8.4**. Organisms, expected to be mostly fish and aquatic macro-invertebrates (e.g. freshwater crabs & shrimps, freshwater molluscs and aquatic insect larvae) were recorded and identified. During each survey, all of the sampling points were covered. Nomenclature of fish followed Lee et al. (2004), while that of the macro-invertebrates followed Dudgeon (1999).
- 8.4.12 The survey transects for terrestrial mammals, avifauna, herpetofauna, butterflies and odonates are shown for indicative purpose in **Figure 8.3**. The sampling points for freshwater aquatic assemblage are illustrated in **Figure 8.4**.

8.5 Ecological Baseline Survey Results

Habitat

- 8.5.1 Eleven habitat types were identified within the 500m Study Area, namely abandoned agricultural land, agricultural land, channel, developed area, fung shui wood, plantation, pond, shrubland/grassland, wasteland, watercourse and woodland. The Proposed Works Limit only covers seven habitat types, including abandoned agricultural land, agricultural land, pond, channel, developed area, watercourse and woodland, as detailed in **Table 8.4**. The representative photos of identified habitats are shown in **Appendix 8.1**, where photo record of species of conservation importance are shown in **Appendix 8.2**. The full flora species list is shown in **Appendix 8.3** and fauna species list is shown in **Appendix 8.4** to **Appendix 8.10**.

Table 8.4 Habitats within the Study Area

Habitat	Project Site	Study Area
	Size (ha)	Size (ha)
Abandoned Agricultural Land	8.64	160.92
Agricultural Land	2.70	42.12
Channel	0.89 (257m)	7.85 (2849m)
Developed Area	4.24	147.03
Fung Shui Woodland	-	0.68
Plantation	-	1.94
Pond	0.13	0.49
Shrubland/Grassland	-	28.53
Wasteland	-	2.27
Watercourse	2.45 (4181m)	5.32 (11059m)
Woodland	1.05	47.68
Total	20.10	444.83

Abandoned Agricultural Land

- 8.5.2 Abandoned agricultural land accounts for the largest area within the 500m Study Area and were mostly in close vicinity to villages nearby. Agricultural land left abandoned by villagers underwent succession and was extensively colonized by invasive climber species *Ipomoea cairica* and *Mikania micrantha*, as well as thickets of herb species *Bidens alba*, *Brachiaria mutica*, *Panicum maximum* and *Pennisetum purpureum*. Fruit tree remnants and a few naturally dispersed tree species were also recorded. No flora species of conservation importance was recorded.

Agricultural Land

- 8.5.3 Adjacent to villages nearby, agricultural land within the 500m Study Area was cultivated with crop species *Fragaria x ananassa*, *Lactuca sativa*, *Lycium chinense*, *Lycopersicon esculentum* and fruit tree species *Artocarpus heterophyllus*, *Dimocarpus longan* and *Litchi chinensis*. Large amount of cultivated *Aquilaria sinensis* was also found in farms within this habitat.

Pond

- 8.5.4 Ponds within the 500m Study Area scattered and were most isolated from each other. The two ponds within Wun Chuen Sin Kwoon and next to Ping Che Kat Tin Children's Playground respectively were constructed with pavements and pavilions surrounding, they are considered constructed for landscaping purpose. The margin and sloping banks of these ponds were made of concrete and had limited growth space for vegetation. The rest of the ponds were of muddy banks and beds, weedy and/or hydrophilic species such as *Alternanthera sessilis*, *Bidens alba* and *Mikania micrantha* were found colonizing the banks of these ponds.

Channel

- 8.5.5 Channel within the 500m Study Area only encompasses part of the channelized section of Ping Yuen River, discharging water to Shenzhen River to the north and the section to the east of Ping Che Road. Ping Yuen River was channelized in 2006. Lined with gabion and grassed cellular concrete lining. Some sections of the channel bed were heavily covered by grass and wetland herbs, such as *Brachiaria mutica* and *Commelina diffusa*. Both sides of the river bank of a tributary running through Lei Uk area are lined with gabions. Vegetation growing on these gabions is limited.

Developed Area

- 8.5.6 Developed area within the 500m Study Area was composed of bridges, elderly home, fire station, playgrounds, police station, public schools, pumping station, roads, Taoist Temple and villages and was concrete-paved with limited space for the growth of plants. Landscaping and ornamental species were cultivated and exotic and weedy species was frequently recorded.

Fung Shui Wood

- 8.5.7 Fung Shui Wood within the 500m Study Area only includes Kan Tau Wai Fung Shui Wood adjacent to Kan Tau Wai outside the Proposed Works Limit but within the 500m Study Area. The canopy is very sparse and interspersed with light gaps. Some saplings of native tree species (e.g. *Aporosa dioica*) and fruit tree species (e.g. *Carica papaya* and *Dimocarpus longan*). *Agave americana*, an ornamental plant species, was also grown at the edge of the Fung Shui Wood, reflecting the disturbed nature of Kan Tau Wai Fung Shui Wood.

Plantation

- 8.5.8 A patch of plantation situated immediately to the north of Ping Yeung Public School and across Ping Yuen Road was planted with exotic and fast-growing tree species *Acacia confusa*, *Eucalyptus robusta* and *Lophostemon confertus* as tall as 15m. Regeneration of native tree species in its understorey, however, was lacking. Light gaps were prominent. The understorey of this plantation was rather disturbed and was composed of a mix of native and exotic plant species, including *Bidens alba* and *Ligustrum sinense*.

Shrubland/ Grassland

- 8.5.9 Except the northeast one in the hillslope of the Study Area, shrubland/grassland mostly occurred as

fragmented stands within the 500m Study Area and was dominated by native species common in other shrubland/grassland in Hong Kong, such as *Baeckea frutescens*, *Blechnum orientale*, *Cratogeomys cochinchinense*, *Litsea rotundifolia* var. *oblongifolia*, *Miscanthus sinensis*, *Rhaphiolepis indica*, *Rhodomyrtus tomentosa*, *Rhus succedanea* and *Smilax china*. *Ficus microcarpa* was occasionally observed.

Wasteland

- 8.5.10 Subject to intensive anthropogenic disturbance, wasteland patches scattered within the 500m Study Area and the original vegetation were mostly recently cleared, leaving exposed soil and the bare ground was rapidly colonized by invasive species, such as *Bidens alba*, *Ipomoea cairica*, *Panicum maximum* and *Wedelia trilobata*.

Watercourse

- 8.5.11 Watercourses within the 500m Study Area include agricultural ditches for crop irrigation, narrow nullahs with vertical and concrete banks and bed for drainage and semi-natural meanders as the tributaries of the pre-channelized Ping Yuen River.
- 8.5.12 Water level and quality were generally low in the man-made sections of the watercourses within the 500m Study Area. The bed and banks of agricultural ditches were mostly muddy, while that of nullahs were made of concrete. They were also subject to frequent disturbance and effluent discharge from villagers nearby.
- 8.5.13 The natural section of the watercourses within the 500m Study Area has variable water depth along its reach and their banks are mostly natural and vegetated with hydrophilic herb species *Boehmeria nivea* var. *tenacissima*, *Brachiaria mutica*, *Callipteris esculenta*, *Colocasia esculenta*, *Commelina diffusa* and *Persicaria barbata*.

Woodland

- 8.5.14 Occurred as isolated stands with closed canopy reaching as high as 12m within the 500m Study Area, woodland was mostly composed of native plant species. The canopy of these woodland stands was dominated by *Aporosa dioica*, *Cinnamomum camphora*, *Daphniphyllum calycinum*, *Dimocarpus longan*, *Ficus hispida*, *Litsea glutinosa*, *Microcos nervosa*, *Macaranga tanarius* var. *tomentosa*, *Machilus chekiangensis*, *Schefflera heptaphylla* and *Sterculia lanceolata*. The understorey was regenerated with native tree species and native shrub species *Litsea rotundifolia* var. *oblongifolia* and *Psychotria asiatica*, and climber species *Cansjera rheedii*, *Dalbergia benthamii*, *Desmos chinensis*, *Strophanthus divaricatus* and *Zanthoxylum nitidum*.

Vegetation

- 8.5.15 A total of 446 plant species were recorded within the 500m Study Area from February to August 2020, among which 223 are native to Hong Kong and 215 of them are exotic to Hong Kong and the rest are of uncertain origin. Among the 446 plant species recorded, six of them are considered of conservation importance, namely *Aquilaria sinensis*, *Cephalanthus tetrandrus*, *Mucuna championii*, *Neottopteris nidus*, *Pavetta hongkongensis* and *Xylosma longifolium* (Figure 8.2).
- 8.5.16 Wild individuals of *Aquilaria sinensis* were recorded in the watercourse within the Proposed Works Limit, agricultural land and woodland outside the Proposed Works Limit but within the Study Area. Clusters of cultivated *Aquilaria sinensis* (>700 individuals) were found in agricultural land within the Proposed Works Limit and outside the Proposed Works Limit but within the Study Area. *Aquilaria sinensis* is common in the lowland forests and fung shui woods of Hong Kong (Corlett *et al.* 2000) and was included in the book "Rare and Precious Plants of Hong Kong" (Hu *et al.* 2003). In south China, particularly Hong Kong, it is threatened by illegal felling and over-exploitation and is listed in Appendix II of CITES (CITES 2020) and is protected under Cap. 586 Protection of Endangered Species of Animals and Plants Ordinance in Hong Kong. Moreover, it is included in China Plant Red Data Book (Fu and Chin 1992) and Illustration of Rare & Endangered plant in

Guangdong Province (Wu and Hu 1988), and wild individuals are listed in Category II of the List of Wild Plants under State Protection (State Forestry Administration & Ministry of Agriculture 1999). It is also categorized as vulnerable in China Red Data Book (Fu and Chin 1992), the Threatened Species List of China's Higher Plants (Qin *et al.* 2017) and the IUCN Red List of Threatened Species (IUCN 2020).

- 8.5.17 Several individuals and one individual of *Cephalanthus tetrandrus* were recorded in the abandoned agricultural land opposite to a pond at Ping Che Kat Tin and in the watercourse within the Proposed Works Limit respectively. This species is a very rare native tree found in thickets by streams in Hong Kong (Corlett *et al.* 2000).
- 8.5.18 Dense thickets of *Mucuna championii* were recorded in the eastern woodland within the Proposed Works Limit, as well as the woodland near Ping Yeung Village outside the Proposed Works Limit but within the 500m Study Area. Generally found in lowland forests, *Mucuna championii* is a rare native climber species in Hong Kong (Corlett *et al.* 2000) included in the book "Rare and Precious Plants of Hong Kong" and was assessed as endangered in China (Hu *et al.* 2003).
- 8.5.19 Eight *Neottopteris nidus* individuals were recorded in developed area within the Proposed Works Limit. *Neottopteris nidus* is a native epiphytic and epilithic herb that is restricted in Hong Kong (Corlett *et al.* 2000) and is listed under Cap. 96 Forests and Countryside Ordinance in Hong Kong.
- 8.5.20 *Pavetta hongkongensis* was recorded in the woodland near Nga Yiu Ha outside the Proposed Works Limit but within the 500m Study Area. It is a common native shrub in fung shui woods and lowland forests in Hong Kong (Corlett *et al.* 2000) and is listed under Cap. 96 Forests and Countryside Ordinance in Hong Kong.
- 8.5.21 An individual of *Xylosma longifolium* was found in the developed area outside the Proposed Works Limit but within the 500m Study Area. This species is a rare native tree usually found in forest in Hong Kong (Corlett *et al.* 2000).
- 8.5.22 Although *Arundina graminifolia*, *Arundo donax*, *Persicaria jucunda*, *Podocarpus macrophyllus* and *Pycneus sanguinolentus* appear to fall into the criteria of being listed as species of conservation importance, they are eliminated from the list of species of conservation importance, due to their cultivated/naturalized nature, or unconfirmed commonness. While *Casuarina equisetifolia*, *Epipremnum pinnatum*, *Ficus altissima*, *Humulus scandens*, *Lagerstroemia indica*, *Lagerstroemia speciosa*, *Ocimum basilicum* and *Talinum paniculatum* are all exotic to Hong Kong and not considered of conservation importance, despite being considered rare or very rare by Corlett *et al.* (2000) or listed under Cap. 96 Forests and Countryside Ordinance.

Fauna

Mammals

- 8.5.23 One mammal species was recorded within the Study Area, which is Japanese Pipistrelle *Pipistrellus abramus*. This species is considered of conservation importance. Japanese Pipistrelle *Pipistrellus abramus* was recorded in Abandoned Agricultural Land and Watercourse within the Proposed Works Limit, and in Abandoned Agricultural Land, Agricultural Land, Channel, Developed Area, Pond and Woodland outside the Proposed Works Limit but within the Study Area (**Figure 8.2**). It is protected under Cap. 170 Wild Animals Protection Ordinance. It is widely distributed throughout Hong Kong.

Birds

- 8.5.24 74 species of bird were recorded within the Study Area. 42 species were recorded within the Proposed Works Limit, while 71 species were recorded outside the Proposed Works Limit but within the Study Area. Most of the recorded species are common and widespread in Hong Kong. Among all the 74 species recorded, 23 species are of conservation importance, including Eurasian Teal *Anas crecca*, Black-crowned Night Heron *Nycticorax nycticorax*, Chinese Pond Heron *Ardeola bacchus*, Eastern Cattle Egret *Bubulcus coromandus*, Grey Heron *Ardea cinerea*, Great Egret *Ardea alba*, Little Egret *Egretta garzetta*, Bonelli's Eagle *Aquila fasciata*, Black Kite *Milvus migrans*, Eastern Buzzard *Buteo*

japonicus, Little Ringed Plover *Charadrius dubius*, Greater Painted-snipe *Rostratula benghalensis*, Wood Sandpiper *Tringa glareola*, Common Emerald Dove *Chalcophaps indica*, Greater Coucal *Centropus sinensis*, Lesser Coucal *Centropus bengalensis*, Collared Scops Owl *Otus lettia*, Asian Barred Owllet *Glaucidium cuculoides*, Alexandrine Parakeet *Psittacula eupatria*, Collared Crow *Corvus torquatus*, Zitting Cisticola *Cisticola juncidis*, Rufous-capped Babbler *Stachyridopsis ruficeps* and Common Rosefinch *Carpodacus erythrinus*. The recorded locations are shown in (Figure 8.2)

- 8.5.25 Eurasian Teal *Anas crecca* was recorded in Channel outside the Proposed Works Limit but within the Study Area. It is considered as Regional Concern by Fellowes et al. (2002). It is a common winter visitor found in Deep Bay area, Shuen Wan, Tai Lam Chung Reservoir, Victoria Harbour, Urban Park.
- 8.5.26 Black-crowned Night Heron *Nycticorax nycticorax* was recorded in Watercourse within the Proposed Works Limit. It is considered as Local Concern by Fellowes et al. (2002). It is a common resident and winter visitor widely distributed in Hong Kong.
- 8.5.27 Chinese Pond Heron *Ardeola bacchus* was recorded in Agricultural land, Channel and Watercourse within the Proposed Works Limit, and in Abandoned Agricultural Land, Agricultural Land, Channel, Developed Area, Pond and Watercourse outside the Proposed Works Limit but within the Study Area. It is considered as Potential Regional Concern and (Regional Concern) by Fellowes et al. (2002). It is a common resident widely distributed in Hong Kong.
- 8.5.28 Eastern Cattle Egret *Bubulcus coromandus* was recorded in Agricultural land outside the Proposed Works Limit but within the Study Area. It is considered as Local Concern by Fellowes et al. (2002). It is a resident and common passage migrant widely distributed in Hong Kong.
- 8.5.29 Grey Heron *Ardea cinereal* was recorded in Watercourse within the Proposed Works Limit. It is considered as Potential Regional Concern by Fellowes et al. (2002). It is a common winter visitor found in Deep Bay area, Starling Inlet, Kowloon Park, Cape D'Aguilar.
- 8.5.30 Great Egret *Ardea alba* was recorded in Woodland outside the Proposed Works Limit but within the Study Area. It is considered as Potential Regional Concern and (Regional Concern) by Fellowes et al. (2002). It is a common resident and winter visitor widely distributed in Hong Kong.
- 8.5.31 Little Egret *Egretta garzetta* was recorded Channel within the Proposed Works Limit, and in Abandoned Agricultural Land, Agricultural Land and Channel outside the Proposed Works Limit but within the Study Area. It is considered as Potential Regional Concern and (Regional Concern) by Fellowes et al. (2002). It is a common resident widely distributed in coastal area throughout Hong Kong.
- 8.5.32 Bonelli's Eagle *Aquila fasciata* was seen soaring above Abandoned Agricultural Land outside the Proposed Works Limit but within the Study Area. It is listed in Appendix 2 of CITES, and considered as Rare in China Red Data Book, as Vulnerable in Red List of China's Vertebrates, and as (Regional Concern) by Fellowes et al. (2002). It is protected under Cap. 586 Protection of Endangered Species of Animals and Plants Ordinance. It is a scarce resident found in Deep Bay area, Hong Kong Island, Lamma Island, Lantau Island, Castle Peak, Sha Lo Tung.
- 8.5.33 Black Kite *Milvus migrans* was seen soaring above Abandoned Agricultural Land and Developed Area within Proposed Works Limit, and above Abandoned Agricultural Land, Developed Area, Shrubland/Grassland and Wasteland outside the Proposed Works Limit but within the Study Area. It is listed in Appendix 2 of CITES and considered as Regional Concern by Fellowes et al. (2002). It is protected under Cap. 586 Protection of Endangered Species of Animals and Plants Ordinance. It is a common resident and winter visitor widely distributed in Hong Kong.
- 8.5.34 Eastern Buzzard *Buteo japonicas* was seen soaring above Abandoned Agricultural Land outside the Proposed Works Limit but within the Study Area. It is listed in Appendix 2 of CITES and is protected under Cap. 586 Protection of Endangered Species of Animals and Plants Ordinance. It is a common winter visitor widely distributed in Hong Kong.

- 8.5.35 Little Ringed Plover *Charadrius dubius* was recorded in Channel within the Proposed Works Limit. It is considered as (Local Concern) by Fellowes et al. (2002). It is a common winter visitor and passage migrant widely distributed in freshwater areas throughout Hong Kong.
- 8.5.36 Greater Painted-snipe *Rostratula benghalensis* was recorded in Channel outside the Proposed Works Limit but within the Study Area. It is considered as Local Concern by Fellowes et al. (2002). It is a passage migrant and winter visitor found in Ha Tsuen, Lok Ma Chau, Kam Tin, Long Valley, Hong Kong Wetland Park.
- 8.5.37 Wood Sandpiper *Tringa glareola* was recorded in Channel outside the Proposed Works Limit but within the Study Area. It is considered as Local Concern by Fellowes et al. (2002). It is a common passage migrant and winter visitor widely distributed in wetland area throughout Hong Kong.
- 8.5.38 Common Emerald Dove *Chalcophaps indica* was recorded in Abandoned Agricultural Land outside the Proposed Works Limit but within the Study Area. It is considered as Vulnerable in China Red Data Book. It is a scarce but widespread resident widely distributed in woodland throughout Hong Kong.
- 8.5.39 Greater Coucal *Centropus sinensis* was recorded in Abandoned Agricultural Land, Agricultural Land and Watercourse within the Proposed Works Limit, and in Abandoned Agricultural Land, Agricultural Land, Channel, Developed Area, Fung Shui Wood and Woodland outside the Proposed Works Limit but within the Study Area. It is listed in Class 2 Protected Animal of China and considered as Vulnerable in China Red Data Book. It is a common resident widely distributed in Hong Kong.
- 8.5.40 Lesser Coucal *Centropus bengalensis* was recorded in Abandoned Agricultural Land and Agricultural Land outside the Proposed Works Limit but within the Study Area. It is listed in Class 2 Protected Animal of China and considered as Vulnerable in China Red Data Book. It is a common resident widely distributed in Hong Kong.
- 8.5.41 Collared Scops Owl *Otus lettia* was recorded in Developed Area and Woodland outside the Proposed Works Limit but within the Study Area. It is listed in Appendix 2 of CITES and in Class 2 Protected Animal of China. It is protected under Cap. 586 Protection of Endangered Species of Animals and Plants Ordinance. It is a common resident widely distributed in shrubland throughout Hong Kong.
- 8.5.42 Asian Barred Owlet *Glaucidium cuculoides* was recorded in Abandoned Agricultural Land, Developed Area and Woodland outside the Proposed Works Limit but within the Study Area. It is listed in Appendix 2 of CITES and in Class 2 Protected Animal of China. It is protected under Cap. 586 Protection of Endangered Species of Animals and Plants Ordinance. It is an uncommon resident widely distributed in woodland throughout Hong Kong.
- 8.5.43 Alexandrine Parakeet *Psittacula eupatria* was recorded in Abandoned Agricultural Land, Agricultural Land and Developed Area within the Proposed Works Limit, and in Abandoned Agricultural Land, Agricultural Land, Developed Area, Watercourse and Woodland outside the Proposed Works Limit but within the Study Area. It is listed in Appendix 2 of CITES and is protected under Cap. 586 Protection of Endangered Species of Animals and Plants Ordinance. It is a rare resident found in Kowloon Park.
- 8.5.44 Collared Crow *Corvus torquatus* was recorded in Abandoned Agricultural Land and Channel outside the Proposed Works Limit but within the Study Area. It is listed as Vulnerable in the IUCN Red List and is considered as Local Concern by Fellowes et al. (2002). It is an uncommon resident found in Inner Deep Bay area, Nam Chung, Kei Ling Ha, Tai Mei Tuk, Pok Fu Lam, Chek lap Kok, Shuen Wan, Lam Tsuen.
- 8.5.45 Zitting Cisticola *Cisticola juncidis* was recorded in Developed Area outside the Proposed Works Limit but within the Study Area. It is considered as Local Concern by Fellowes et al. (2002). It is a common passage migrant and winter visitor widely distributed in grassland throughout Hong Kong.
- 8.5.46 Rufous-capped Babbler *Stachyridopsis ruficeps* was recorded in Woodland outside the Proposed

Works Limit but within the Study Area. It is considered as Local Concern by Fellowes et al. (2002). It is an uncommon resident found in Shing Mun, Tai Po Kau, Tai Mek Tuk, Ng Tung Chai, Fo Tan, Tai Mo Shan, The Peak and Kadoorie Agricultural Research Centre.

- 8.5.47 Common Rosefinch *Carpodacus erythrinus* was recorded in Abandoned Agricultural Land outside the Proposed Works Limit but within the Study Area. It is considered as Local Concern by Fellowes et al. (2002). It is a rare winter visitor widely distributed in Hong Kong.

Ping Che Egretty

- 8.5.48 Chinese Pond Heron *Ardeola bacchus* were recorded nesting. The maximum number of active nests recorded was five. They were recorded on 27th May 2020. Records of nesting activities at the egretty are presented in **Table 8.5**. The Ping Che Egretty location is shown in (**Figure 8.3**).

Table 8.5 Ping Che Egretty Activity from March to August 2020

Date	Number of Chinese Pond Heron Nests
23/3/2020	0
22/4/2020	0
27/5/2020	5
15/6/2020	3
23/7/2020	1
20/8/2020	0

Herpetofauna

- 8.5.49 Eight reptile species were recorded within the Study Area. Four species were recorded within the Proposed Works Limit, while six species were recorded outside the Proposed Works Limit but within the Study Area. Most of the recorded species are common and widespread in Hong Kong. Among all the eight species recorded, three species are of conservation importance, including Copperhead Racer *Elaphe radiata*, Common Rat Snake *Ptyas mucosus* and Four-clawed Gecko *Gehyra mutilate* (**Figure 8.2**).
- 8.5.50 Copperhead Racer *Elaphe radiata* was recorded in Abandoned Agricultural Land within the Proposed Works Limit. It is considered as Endangered in China Red Data Book and in Red list of China's Vertebrates. It is considered as Potential Regional Concern by Fellowes et al. (2002). It is widely distributed throughout Hong Kong.
- 8.5.51 Common Rat Snake *Ptyas mucosus* was recorded in Developed Area outside the Proposed Works Limit but within the Study Area. It is considered as Endangered in China Red Data Book and in Red list of China's Vertebrates. It is listed in Appendix 2 of CITES and is protected under Cap. 586 Protection of Endangered Species of Animals and Plants Ordinance. It is considered as Potential Regional Concern by Fellowes et al. (2002). It is widely distributed throughout Hong Kong.
- 8.5.52 Four-clawed Gecko *Gehyra mutilata* was recorded in Abandoned Agricultural Land outside the Proposed Works Limit but within the Study Area. It is listed as Vulnerable in Red List of China's Vertebrates. It is widely but thinly distributed throughout Hong Kong.
- 8.5.53 10 amphibian species were recorded within the Study Area. All species were recorded within the Proposed Works Limit, while eight species were recorded outside the Proposed Works Limit but within the Study Area. Most of the recorded species are common and widespread in Hong Kong. Among all the 10 species recorded, one species is of conservation importance, which is Chinese Bullfrog *Hoplobatrachus chinensis*.
- 8.5.54 Chinese Bullfrog *Hoplobatrachus chinensis* was recorded in Abandoned Agricultural Land and Agricultural Land within the Proposed Works Limit. It is listed in Class 2 Protected Animal of China and considered as Endangered in Red List of China's Vertebrates. It is considered as Potential Regional Concern by Fellowes et al. (2002). It is widely distributed in Lantau Island and New

Territories.

Butterflies

- 8.5.55 64 species of butterfly were recorded within the Study Area. 23 species were recorded within the Proposed Works Limit, while 60 species were recorded outside the Proposed Works Limit but within the Study Area. Most of the recorded species are common and widespread in Hong Kong. Among all the 64 species recorded, five species are of conservation importance, including Grass Demon *Udaspes folus*, Cornelian *Deudorix epijarbas*, Danaid Eggfly *Hypolimnas misippus*, Swallowtail *Papilio xuthus*, Red-breast Jezebel *Delias acalis* (**Figure 8.2**).
- 8.5.56 Grass Demon *Udaspes folus* was recorded in Watercourse within the Proposed Works Limit. It is a rare species widely distributed in agricultural field throughout Hong Kong.
- 8.5.57 Cornelian *Deudorix epijarbas* was recorded in Abandoned Agricultural Land outside the Proposed Works Limit but within the Study Area. It is a rare species found in Lam Tsuen, Shan Liu, Wu Kau Tang, Pak Sha O, Fung Yuen.
- 8.5.58 Danaid Eggfly *Hypolimnas misippus* was recorded in Woodland within the Proposed Works Limit, and in Abandoned Agricultural Land outside the Proposed Works Limit but within the Study Area. It is considered as Local Concern by Fellowes et al. (2002). It is an uncommon species found in Ngau Ngak Shan, Lung Kwu Tan, Hong Kong Wetland Park, Mount Parker, Cloudy Hill, Lin Ma Hang.
- 8.5.59 Swallowtail *Papilio xuthus* was recorded in Developed Area within the Proposed Works Limit, and in Abandoned Agricultural Land, Agricultural Land, Shrubland/Grassland and Woodland outside the Proposed Works Limit but within the Study Area. It is a rare species found in Kap Lung, Ma On Shan, Tai Tam, Sha Lo Wan, Kat O, Lung Kwu Tan, Wu Kau Tang, Lung Kwu Chau.
- 8.5.60 Red-breast Jezebel *Delias acalis* was recorded in Agricultural Land outside the Proposed Works Limit but within the Study Area. It is considered as Local Concern by Fellowes et al. (2002). It is a rare species found in Tai Tam, Tai Mo Shan, Ngau Ngak Shan, Pat Sin Leng, Tai Pond Kau, Wu Kau Tang, Wong Nai Chung, Fung Yuen, Plover Cove.

Odonate

- 8.5.61 27 species of odonate were recorded within the Study Area. 18 species were recorded within the Proposed Works Limit, while 25 species were recorded outside the Proposed Works Limit but within the Study Area. All of the recorded species are common and widespread in Hong Kong. None of the recorded odonate species is considered of conservation importance.

Freshwater Fauna

- 8.5.62 A total of eight fish species and four aquatic invertebrate species were recorded within the Study Area, where seven fish species and all aquatic invertebrate species were recorded within the Proposed Works Limit. The recorded species are not considered as species of conservation importance.
- 8.5.63 The recorded fish and aquatic invertebrates are considered as common and a number of recorded species are exotic species, such as Nile Tilapia *Oreochromis niloticus*, Mosquito Fish *Gambusia affinis*, Dwarf Snakehead *Channa gachua* and Apple Snail *Pomacea canaliculata*. In particular, Nile Tilapia were observed as abundant in channel and watercourse within the Proposed Works Limit and Study Area.

8.6 Evaluation of Habitats and Species of Conservation Importance.

- 8.6.1 In accordance with Table 3, Annex 8 of the EIAO-TM, the ecological value of species was assessed in terms of protection status (e.g. fauna protected under WAPO (except birds), and flora and fauna protected under regional/global legislation/conventions), species distribution (e.g. endemic), and rarity (e.g. rare or restricted). The evaluation of habitats within the Proposed Works Limit is detailed in **Table 8.6**, where habitats in Study Area are detailed in **Table 8.7** to **Table 8.17**. The list and evaluation of flora species of conservation interest recorded within the Study Area, according to the

EIAO-TM, are given in **Table 8.18**. The list and evaluation of fauna species of conservation interest recorded within the Study Area, according to the EIAO-TM, are given in **Table 8.19**. The habitat map and species of conservation importance is illustrated in **Figure 8.5**.

Table 8.6 Evaluation of Habitats within the Proposed Works Limit

Criteria	Habitats within the Proposed Works Limit						
	Abandoned Agricultural Land	Agricultural Land	Pond	Channel	Developed Area	Watercourse	Woodland
Naturalness	Man-made but colonized naturally and largely by weeds	Man-made	Man-made	Man-made	Man-made	Both man-made and natural sections found	Largely natural
Size (ha)	8.64	2.7	0.13	0.89 (257m)	4.24	2.45 (4181m)	1.05
Diversity	Low diversity of flora and terrestrial fauna	Low diversity of flora and terrestrial fauna	Low diversity of flora and terrestrial fauna	Low to moderate diversity of flora Low diversity of terrestrial and freshwater fauna	Low diversity of flora and terrestrial fauna	Low to moderate diversity of flora Low diversity of terrestrial and freshwater fauna	Low diversity of flora and terrestrial fauna
Rarity	No flora species of conservation importance Fauna species of conservation importance: Black Kite <i>Milvus migrans</i> , Greater Coucal <i>Centropus sinensis</i> , Alexandrine Parakeet	No flora species of conservation importance Fauna species of conservation importance: Chinese Pond Heron <i>Ardeola bacchus</i> , Greater Coucal <i>Centropus sinensis</i> , Alexandrine	No flora and fauna species of conservation importance	No flora species of conservation importance Fauna species of conservation importance: Chinese Pond Heron <i>Ardeola bacchus</i> ,	Flora species of conservation importance: <i>Neottopteris nidus</i> Fauna species of conservation importance: Black Kite <i>Milvus migrans</i> , Alexandrine Parakeet	Flora species of conservation importance: <i>Aquilaria sinensis</i> , <i>Cephalanthus tetrandrus</i> Fauna species of conservation importance: Black-crowned Night Heron <i>Nycticorax nycticorax</i> , Chinese Pond Heron	Flora species of conservation importance: <i>Mucuna championii</i> Fauna species of conservation importance: Danaid Eggfly

Criteria	Habitats within the Proposed Works Limit						
	Abandoned Agricultural Land	Agricultural Land	Pond	Channel	Developed Area	Watercourse	Woodland
	<i>Psittacula eupatria</i> , Copperhead Racer <i>Elaphe radiata</i> , Chinese Bullfrog <i>Hoplobatrachus chinensis</i> , Japanese Pipistrelle <i>Pipistrellus abramus</i>	Parakeet <i>Psittacula eupatria</i> , Chinese Bullfrog <i>Hoplobatrachus chinensis</i>		Little Egret <i>Egretta garzetta</i> , Little Ringed Plover <i>Charadrius dubius</i>	<i>Psittacula eupatria</i> , Swallowtail <i>Papilio xuthus</i>	<i>Ardeola bacchus</i> , Grey Heron <i>Ardea cinerea</i> , Greater Coucal <i>Centropus sinensis</i> , Grass Demon <i>Udaspes folus</i> , Japanese Pipistrelle <i>Pipistrellus abramus</i>	<i>Hypolimnas misippus</i>
Re-creatability	Easy to re-create	Easy to re-create	Easy to re-create	Easy to re-create	Easy to re-create	Easy to re-create for man-made section; difficult to re-create for semi-natural section	Can be re-created
Fragmentation	Occurs extensively within the Proposed Works Limit	Occurs as patches adjacent to villages	Scattered and were most isolated from each other	None	None	Semi-natural section fragmented by man-made section	Occurred as isolated stands
Ecological linkage	Not functionally linked to habitats of conservation importance	Ditches and puddles are formed by diversion of water from watercourses nearby for irrigating crops by villagers	Not functionally linked to habitats of conservation importance	Linked to Watercourse	Not functionally linked to habitats of conservation importance	Partly linked to Shrubland/Grassland and Woodland; receive nutrient input from surrounding habitats in general	Structurally and functionally linked to Watercourse

Criteria	Habitats within the Proposed Works Limit						
	Abandoned Agricultural Land	Agricultural Land	Pond	Channel	Developed Area	Watercourse	Woodland
Potential value	Low						
Nursery/breeding ground	No significant record	No significant record	No significant record	No significant record	No significant record	No significant record	No significant record
Age	N/A	N/A	N/A	N/A	N/A	N/A	At least 20 years
Abundance/ richness of wildlife	Low abundance of terrestrial fauna	Low abundance of terrestrial fauna	Low abundance of terrestrial fauna	Low abundance of terrestrial fauna and freshwater fauna	Low abundance of terrestrial fauna	Low abundance of terrestrial fauna and freshwater fauna	Low abundance of terrestrial fauna
Overall ecological value of the Proposed Works Limit	Low	Low	Low	Low	Low	Low to Moderate	Low

Table 8.7 Evaluation of Abandoned Agricultural Land within the Study Area

Criterion	Abandoned Agricultural Land
Naturalness	Man-made habitat but colonized naturally and largely by weeds
Size (ha)	160.92
Diversity	Low to moderate diversity of flora Low to moderate diversity of bird and butterfly; low diversity of odonate, herpetofauna and mammal
Rarity	One flora species of conservation importance: <i>Cephalanthus tetrandrus</i> 19 fauna species of conservation importance: Chinese Pond Heron <i>Ardeola bacchus</i> , Little Egret <i>Egretta garzetta</i> , Bonelli's Eagle <i>Aquila fasciata</i> , Black Kite <i>Milvus migrans</i> , Eastern Buzzard <i>Buteo japonicus</i> , Common Emerald Dove <i>Chalcophaps indica</i> , Greater Coucal <i>Centropus sinensis</i> , Lesser Coucal <i>Centropus bengalensis</i> , Asian Barred Owlet <i>Glaucidium cuculoides</i> , Alexandrine Parakeet <i>Psittacula eupatria</i> , Collared Crow <i>Corvus torquatus</i> , Common Rosefinch <i>Carpodacus erythrinus</i> , Cornelian <i>Deudorix epijarbas</i> , Danaid Eggfly <i>Hypolimnas misippus</i> , Swallowtail <i>Papilio Xuthus</i> , Copperhead Racer <i>Elaphe radiata</i> , Chinese Bullfrog <i>Hoplobatrachus chinensis</i> , Japanese Pipistrelle <i>Pipistrellus abramus</i> , Four-clawed Gecko <i>Gehyra mutilata</i>
Re-creatability	Easy to re-create
Fragmentation	Occurs extensively within the Study Area
Ecological linkage	Not functionally linked to habitats of conservation importance
Potential value	Low
Nursery/breeding ground	No significant record, possibly due to significant disturbance
Age	N/A
Abundance/richness of wildlife	Low to moderate abundance of bird and butterfly; low abundance of odonate, herpetofauna and mammal
Overall ecological value	Low

Table 8.8 Evaluation of Agricultural Land within the Study Area

Criterion	Agricultural Land
Naturalness	Man-made habitat
Size (ha)	42.12
Diversity	Low diversity of flora and fauna
Rarity	One flora species of conservation importance: <i>Aquilaria sinensis</i> 10 fauna species of conservation importance: Chinese Pond Heron <i>Ardeola bacchus</i> , Eastern Cattle Egret <i>Bubulcus coromandus</i> , Little Egret <i>Egretta garzetta</i> , Greater Coucal <i>Centropus sinensis</i> , Lesser Coucal <i>Centropus bengalensis</i> ,

Criterion	Agricultural Land
	Alexandrine Parakeet <i>Psittacula eupatria</i> , Swallowtail <i>Papilio Xuthus</i> , Red-breast Jezebel <i>Delias acalis</i> , Chinese Bullfrog <i>Hoplobatrachus chinensis</i> , Japanese Pipistrelle <i>Pipistrellus abramus</i>
Re-creatability	Easy to re-create
Fragmentation	Occurs as patches adjacent to villages
Ecological linkage	Ditches and puddles are formed by diversion of water from watercourses nearby for irrigating crops by villagers
Potential value	Low to moderate
Nursery/breeding ground	No significant record, possibly due to significant disturbance
Age	N/A
Abundance/richness of wildlife	Low to moderate abundance of bird; low abundance of butterfly, odonate, herpetofauna and mammal
Overall ecological value	Low to moderate

Table 8.9 Evaluation of Channel within the Study Area

Criterion	Channel
Naturalness	Man-made habitat
Size (ha)	7.85 (2849m)
Diversity	Low diversity of flora and fauna
Rarity	No flora species of conservation importance Nine fauna species of conservation importance: Eurasian Teal <i>Anas crecca</i> , Chinese Pond Heron <i>Ardeola bacchus</i> , Little Egret <i>Egretta garzetta</i> , Little Ringed Plover <i>Charadrius dubius</i> , Greater Painted-snipe <i>Rostratula benghalensis</i> , Wood Sandpiper <i>Tringa glareola</i> , Greater Coucal <i>Centropus sinensis</i> , Collared Crow <i>Corvus torquatus</i> , Japanese Pipistrelle <i>Pipistrellus abramus</i>
Re-creatability	Easy to re-create
Fragmentation	None
Ecological linkage	Linked to Watercourse
Potential value	Low
Nursery/breeding ground	No significant record
Age	N/A
Abundance/richness of wildlife	Low abundance of all groups of terrestrial fauna and freshwater fauna
Overall ecological value	Low

Table 8.10 Evaluation of Developed Area within the Study Area

Criterion	Developed Area
Naturalness	Man-made habitat
Size (ha)	147.03
Diversity	Moderate diversity of flora; low diversity of fauna
Rarity	Two flora species conservation importance: <i>Neottopteris nidus</i> , <i>Xylosma longifolium</i> 10 fauna species of conservation importance: Chinese Pond

Criterion	Developed Area
	Heron <i>Ardeola bacchus</i> , Black Kite <i>Milvus migrans</i> , Greater Coucal <i>Centropus sinensis</i> , Collared Scops Owl <i>Otus lettia</i> , Asian Barred Owlet <i>Glaucidium cuculoides</i> , Alexandrine Parakeet <i>Psittacula eupatria</i> , Zitting Cisticola <i>Cisticola juncidis</i> , Swallowtail <i>Papilio Xuthus</i> , Common Rat Snake <i>Ptyas mucosus</i> , Japanese Pipistrelle <i>Pipistrellus abramus</i>
Re-creatability	Easy to re-create
Fragmentation	None
Ecological linkage	Not functionally linked to habitats of conservation importance
Potential value	Low
Nursery/breeding ground	No significant record, possibly due to significant disturbance
Age	N/A
Abundance/richness of wildlife	Low to moderate abundance of bird; low abundance of butterfly, odonate, herpetofauna and mammal
Overall ecological value	Low

Table 8.11 Evaluation of Fung Shui Wood within the Study Area

Criterion	Fung Shui Wood
Naturalness	Semi-natural habitat
Size (ha)	0.68
Diversity	Low diversity of flora and fauna
Rarity	No flora species of conservation importance One fauna species of conservation importance: Greater Coucal <i>Centropus sinensis</i>
Re-creatability	Not readily re-creatable
Fragmentation	Fragmented and isolated
Ecological linkage	Not functionally linked to habitats of conservation importance
Potential value	Moderate, given time for secondary succession
Nursery/breeding ground	No significant record
Age	At least 30 years
Abundance/richness of wildlife	Low abundance of bird and butterfly; odonate, herpetofauna and mammal were not recorded in this habitat.
Overall ecological value	Low to Moderate

Table 8.12 Evaluation of Plantation within the Study Area

Criterion	Plantation
Naturalness	Man-made habitat
Size (ha)	1.94
Diversity	Low diversity of flora and fauna
Rarity	No flora and fauna species of conservation importance
Re-creatability	Easy to re-create
Fragmentation	None

Criterion	Plantation
Ecological linkage	Not functionally linked to habitats of conservation importance
Potential value	Low
Nursery/breeding ground	No significant record
Age	N/A
Abundance/richness of wildlife	Low abundance of bird and butterfly; odonate, herpetofauna and mammal were not recorded in this habitat.
Overall ecological value	Low

Table 8.13 Evaluation of Pond within the Study Area

Criterion	Pond
Naturalness	Man-made habitat
Size (ha)	0.49
Diversity	Low diversity of flora and fauna
Rarity	No flora species of conservation importance Two fauna species of conservation importance: Chinese Pond Heron <i>Ardeola bacchus</i> , Japanese Pipistrelle <i>Pipistrellus abramus</i>
Re-creatability	Easy to re-create
Fragmentation	Scattered and were most isolated from each other
Ecological linkage	Not functionally linked to habitats of conservation importance
Potential value	Low
Nursery/breeding ground	No significant record
Age	N/A
Abundance/richness of wildlife	Low abundance of bird, butterfly, odonate and mammal; herpetofauna was not recorded in this habitat.
Overall ecological value	Low

Table 8.14 Evaluation of Shrubland/Grassland within the Study Area

Criterion	Shrubland/grassland
Naturalness	Natural
Size (ha)	28.53
Diversity	Low diversity of flora and fauna
Rarity	No flora species of conservation importance Two fauna species of conservation importance: Black Kite <i>Milvus migrans</i> , Swallowtail <i>Papilio xuthus</i>
Re-creatability	Easy to re-create
Fragmentation	Occurred as fragmented stands within the Study Area
Ecological linkage	Ecologically linked with adjacent Woodland
Potential value	Low to moderate
Nursery/breeding ground	No significant record
Age	N/A
Abundance/richness of wildlife	Low abundance of bird, butterfly, odonate and herpetofauna; mammal was not recorded in this habitat.
Overall ecological value	Low to moderate

Table 8.15 Evaluation of Wasteland within the Study Area

Criterion	Wasteland
Naturalness	Man-made habitat
Size (ha)	2.27
Diversity	Low diversity of flora and fauna
Rarity	No flora species of conservation importance One fauna species of conservation importance: Black Kite <i>Milvus migrans</i>
Re-creatability	Easy to re-create
Fragmentation	Occurs as patches adjacent to villages
Ecological linkage	Not functionally linked to habitats of conservation importance
Potential value	Low
Nursery/breeding ground	No significant record
Age	N/A
Abundance/richness of wildlife	Low abundance of bird, butterfly and odonate; herpetofauna and mammal were not recorded in this habitat.
Overall ecological value	Low

Table 8.16 Evaluation of Watercourse within the Study Area

Criterion	Watercourse
Naturalness	Both man-made and natural sections found
Size (ha)	5.32 (11059m)
Diversity	Low diversity of flora and fauna
Rarity	Two flora species of conservation importance: <i>Aquilaria sinensis</i> , <i>Cephalanthus tetrandrus</i> Seven fauna species of conservation importance: Black-crowned Night Heron <i>Nycticorax nycticorax</i> , Chinese Pond Heron <i>Ardeola bacchus</i> , Grey Heron <i>Ardea cinerea</i> , Greater Coucal <i>Centropus sinensis</i> , Alexandrine Parakeet <i>Psittacula eupatria</i> , Grass Demon <i>Udaspes folus</i> , Japanese Pipistrelle <i>Pipistrellus abramus</i>
Re-creatability	Easy to re-create for man-made section; difficult to re-create for semi-natural section
Fragmentation	Semi-natural section fragmented by man-made section
Ecological linkage	Partly linked to Shrubland/Grassland and Woodland; receive nutrient input from surrounding habitats in general
Potential value	Low
Nursery/breeding ground	No significant record
Age	N/A
Abundance/richness of wildlife	Low abundance of all groups of terrestrial fauna and freshwater fauna
Overall ecological value	Low for man-made section; low to moderate for semi-natural section

Table 8.17 Evaluation of Woodland within the Study Area

Criterion	Woodland
Naturalness	Largely natural
Size (ha)	47.68
Diversity	Low to moderate diversity of flora; low diversity of fauna
Rarity	Three flora species of conservation importance: <i>Aquilaria sinensis</i> , <i>Mucuna championii</i> , <i>Pavetta hongkongensis</i> Nine fauna species of conservation importance: Great Egret <i>Ardea alba</i> , Greater Coucal <i>Centropus sinensis</i> , Collared Scops Owl <i>Otus lettia</i> , Asian Barred Owlet <i>Glaucidium cuculoides</i> , Alexandrine Parakeet <i>Psittacula eupatria</i> , Rufous-capped Babbler <i>Stachyridopsis ruficeps</i> , Danaid Eggfly <i>Hypolimnas misippus</i> , Swallowtail <i>Papilio xuthus</i> , Japanese Pipistrelle <i>Pipistrellus abramus</i>
Re-creatability	Can be re-created
Fragmentation	Occurred as isolated stands
Ecological linkage	Structurally and functionally linked to Watercourse
Potential value	Low to moderate
Nursery/breeding ground	No significant record
Age	At least 20 years
Abundance/richness of wildlife	Low to moderate abundance of butterfly; low abundance of bird, odonate, herpetofauna and mammal
Overall ecological value	Low to moderate

Table 8.18 Evaluation of Flora Species of Conservation Importance Recorded within the Study Area

Scientific names	Locations	Rarity in Hong Kong ¹	Distribution ¹	Conservation/Protection status
<i>Aquilaria sinensis</i>	Watercourse within the Proposed Works Limit Agricultural land and woodland outside the Proposed Works Limit but within the Study Area	Common	Lowland forests and fung shui woods	IUCN Red List of Threatened Species (2020): Vulnerable ² Appendix II of CITES ³ Threatened Species List of China's Higher Plants: Vulnerable ⁴ China Plant Red Data Book: Vulnerable ⁵ Included in Illustrations of Rare & Endangered Plant in Guangdong Province ⁶ Listed in Rare and Precious Plants of Hong Kong ⁷ Cap. 586 ⁸ State Protection (Category II) ⁹
<i>Cephalanthus tetrandrus</i>	Watercourse within the Proposed Works Limit Abandoned agricultural land outside the Proposed Works Limit but within the Study Area	Very rare	-	-
<i>Mucuna championii</i>	Woodland within the Proposed Works Limit Woodland outside the Proposed Works Limit but within the Study Area	Rare	Lowland forests. Fung Yuen, Kuk Po and She Shan	Listed in Rare and Precious Plants of Hong Kong: Endangered in China ⁷
<i>Neottopteris nidus</i>	Developed area within the Proposed Works Limit	Restricted	Forests	Cap. 96A ¹⁰
<i>Pavetta hongkongensis</i>	Woodland outside the Proposed Works Limit but within the Study Area	Common	Fung shui woods and lowland forests	Cap. 96A ¹⁰
<i>Xylosma longifolium</i>	Developed area outside the Proposed Works Limit but within the Study Area	Rare	Forests Mui Tze Lam (Ma On Shan), Sha Tau Kok, Loi Tung and Lam Tsuen	-

Notes:

1. Corlett *et al.* (2000). Hong Kong Vascular Plants: Distribution and Status.
2. IUCN (2020). IUCN Red List Version 2019-3.
3. Convention on International Trade in Endangered Species of Wild Flora and Fauna (2020). Appendices I, II and III.
4. Qin *et al.* (2017). Threatened Species List of China's Higher Plants.
5. Fu & Chin (1992). China Plant Red Data Book – Rare and Endangered Plants.
6. Wu & Hu (1988). Illustration of Rare & endangered plant in Guangdong Province.
7. Hu *et al.* (2003). Rare and Precious Plants of Hong Kong.
8. Cap. 586 Protection of Endangered Species of Animals and Plants Ordinance
9. State Forestry Administration & Ministry of Agriculture (1999). List of Wild Plants under State Protection (Part 1).
10. Cap. 96A Forestry Regulations under Cap. 96 Forests and Countryside Ordinance

Table 8.19 Evaluation of Fauna Species of Conservation Importance Recorded within the Study Area

Species Name ₁	Conservation Status _{2,3,4,5,6,7,8,9,10}	Rarity and Distribution ₁	Location
Bird (Remark: all wild bird species are protected under Cap. 170 Wild Animals Protection Ordinance in Hong Kong ₂)			
Eurasian Teal <i>Anas crecca</i>	Fellowes et al. (2002): RC	Common winter visitor. Found in Deep Bay area, Shuen Wan, Tai Lam Chung Reservoir, Victoria Harbour, Urban Park.	Study Area (Channel)
Black-crowned Night Heron <i>Nycticorax nycticorax</i>	Fellowes et al. (2002): (LC)	Common resident and winter visitor. Widely distributed in Hong Kong.	Proposed Works Limit (Watercourse)
Chinese Pond Heron <i>Ardeola bacchus</i>	Fellowes et al. (2002): PRC,(RC)	Common resident. Widely distributed in Hong Kong.	Proposed Works Limit (Agricultural Land, Channel, Watercourse); Study Area (Abandoned Agricultural Land, Agricultural Land, Channel, Developed Area, Pond, Watercourse)
Eastern Cattle Egret <i>Bubulcus coromandus</i>	Fellowes et al. (2002): (LC)	Resident and common passage migrant. Widely distributed in Hong Kong.	Study Area (Agricultural Land)
Grey Heron <i>Ardea cinerea</i>	Fellowes et al. (2002): PRC	Common winter visitor. Found in Deep Bay area, Starling Inlet, Kowloon Park, Cape D'Aguilar.	Proposed Works Limit (Watercourse)
Great Egret <i>Ardea alba</i>	Fellowes et al. (2002): PRC,(RC)	Common resident and winter visitor. Widely distributed in Hong Kong.	Study Area (Woodland)
Little Egret <i>Egretta garzetta</i>	Fellowes et al. (2002): PRC,(RC)	Common resident. Widely distributed in coastal area throughout Hong Kong.	Proposed Works Limit (Channel); Study Area (Abandoned Agricultural Land, Agricultural Land, Channel)
Bonelli's Eagle <i>Aquila fasciata</i>	China Red Data Book Status: (Rare); Fellowes et al. (2002): (RC); Red list of China's vertebrates: (Vulnerable); Appendix 2 of CITES; Cap. 586	Scarce resident. Found in Deep Bay area, Hong Kong Island, Lamma Island, Lantau Island, Castle Peak, Sha Lo Tung.	Study Area (Abandoned Agricultural Land)
Black Kite <i>Milvus migrans</i>	Fellowes et al. (2002): (RC); Appendix 2 of CITES; Cap. 586	Common resident and winter visitor. Widely distributed in Hong Kong.	Proposed Works Limit (Abandoned Agricultural Land, Developed Area); Study Area (Abandoned Agricultural Land, Developed Area, Shrubland/Grassland, Wasteland)
Eastern Buzzard <i>Buteo japonicus</i>	Appendix 2 of CITES; Cap. 586	Common winter visitor. Widely distributed in Hong Kong.	Study Area (Abandoned Agricultural Land)
Little Ringed Plover <i>Charadrius dubius</i>	Fellowes et al. (2002): (LC)	Common winter visitor and passage migrant. Widely distributed in freshwater areas throughout Hong Kong.	Proposed Works Limit (Channel)
Greater Painted-snipe <i>Rostratula benghalensis</i>	Fellowes et al. (2002): LC	Passage migrant and winter visitor. Found in Ha Tsuen, Lok Ma Chau, Kam Tin, Long Valley, Hong Kong Wetland Park.	Study Area (Channel)
Wood Sandpiper <i>Tringa glareola</i>	Fellowes et al. (2002): LC	Common passage migrant and winter visitor. Widely distributed in wetland area throughout Hong Kong.	Study Area (Channel)
Common Emerald Dove <i>Chalcophaps indica</i>	China Red Data Book Status: (Vulnerable)	Scarce but widespread resident. Widely distributed in woodland throughout Hong Kong.	Study Area (Abandoned Agricultural Land)
Greater Coucal <i>Centropus sinensis</i>	Class 2 Protected Animal of China; China Red Data Book Status:	Common resident. Widely distributed in Hong Kong.	Proposed Works Limit (Abandoned Agricultural Land, Agricultural Land, Watercourse);

Species Name ₁	Conservation Status _{2,3,4,5,6,7,8,9,10}	Rarity and Distribution ₁	Location
	(Vulnerable)		Study Area (Abandoned Agricultural Land, Agricultural Land, Channel, Developed Area, Fung Shui Wood, Woodland)
Lesser Coucal <i>Centropus bengalensis</i>	Class 2 Protected Animal of China; China Red Data Book Status: (Vulnerable)	Common resident. Widely distributed in Hong Kong.	Study Area (Abandoned Agricultural Land, Agricultural Land)
Collared Scops Owl <i>Otus lettia</i>	Class 2 Protected Animal of China; Appendix 2 of CITES; Cap. 586	Common resident. Widely distributed in shrubland throughout Hong Kong.	Study Area (Developed Area, Woodland)
Asian Barred Owlet <i>Glaucidium cuculoides</i>	Class 2 Protected Animal of China; Appendix 2 of CITES; Cap. 586	Uncommon resident. Widely distributed in woodland throughout Hong Kong.	Study Area (Abandoned Agricultural Land, Developed Area, Woodland)
Alexandrine Parakeet <i>Psittacula eupatria</i>	Appendix 2 of CITES; Cap. 586	Rare resident. Found in Kowloon Park	Proposed Works Limit (Abandoned Agricultural Land, Agricultural Land, Developed Area); Study Area (Abandoned Agricultural Land, Agricultural Land, Developed Area, Watercourse, Woodland)
Collared Crow <i>Corvus torquatus</i>	Fellowes et al. (2002): LC; IUCN Red List Status: Vulnerable	Uncommon resident. Found in Inner Deep Bay area, Nam Chung, Kei Ling Ha, Tai Mei Tuk, Pok Fu Lam, Chek lap Kok, Shuen Wan, Lam Tsuen.	Study Area (Abandoned Agricultural Land, Channel)
Zitting Cisticola <i>Cisticola juncidis</i>	Fellowes et al. (2002): LC	Common passage migrant and winter visitor. Widely distributed in grassland throughout Hong Kong.	Study Area (Developed Area)
Rufous-capped Babbler <i>Stachyridopsis ruficeps</i>	Fellowes et al. (2002): LC	Uncommon resident. Found in Shing Mun, Tai Pond Kau, Tai Mek Tuk, Ng Tung Chai, Fo Tan, Tai Mo Shan, The Peak and Kadoorie Agricultural Research Centre.	Study Area (Woodland)
Common Rosefinch <i>Carpodacus erythrinus</i>	Fellowes et al. (2002): LC	Rare winter visitor. Widely distributed in Hong Kong.	Study Area (Abandoned Agricultural Land)
Butterfly			
Grass Demon <i>Udaspes folus</i>	-	Rare. Widely distributed in agricultural field throughout Hong Kong	Proposed Works Limit (Watercourse)
Cornelian <i>Deudorix epijarbas</i>	-	Rare. Lam Tsuen, Shan Liu, Wu Kau Tang, Pak Sha O, Fung Yuen	Study Area (Abandoned Agricultural Land)
Danaid Eggfly <i>Hypolimnas misippus</i>	Fellowes et al. (2002): LC	Uncommon. Ngau Ngak Shan, Lung Kwu Tan, Hong Kong Wetland Park, Mount Parker, Cloudy Hill, Lin Ma Hang	Proposed Works Limit (Woodland); Study Area (Abandoned Agricultural Land)
Swallowtail <i>Papilio xuthus</i>	-	Rare. Kap Lung, Ma On Shan, Tai Tam, Sha Lo Wan, Kat O, Lung Kwu Tan, Wu Kau Tang, Lung Kwu Chau	Proposed Works Limit (Developed Area); Study Area (Abandoned Agricultural Land, Agricultural Land, Shrubland/Grassland, Woodland)
Red-breast Jezebel <i>Delias acalis</i>	Fellowes et al. (2002): LC	Rare. Tai Tam, Tai Mo Shan, Ngau Ngak Shan, Pat Sin Leng, Tai Pond Kau, Wu Kau Tang, Wong Nai Chung, Fung Yuen, Plover Cove	Study Area (Agricultural Land)
Reptile			
Copperhead Racer <i>Elaphe radiata</i>	China Red Data Book Status: (Endangered); Fellowes et al. (2002): PRC; Red list of China's vertebrates: (Endangered)	Widely distributed throughout Hong Kong.	Proposed Works Limit (Abandoned Agricultural Land)

Species Name ¹	Conservation Status ^{2,3,4,5,6,7,8,9,10}	Rarity and Distribution ¹	Location
Common Rat Snake <i>Ptyas mucosus</i>	China Red Data Book Status: (Endangered); Fellowes et al. (2002): PRC; Red list of China's vertebrates: (Endangered); Appendix 2 of CITES; Cap. 586	Widely distributed throughout Hong Kong.	Study Area (Developed Area)
Four-clawed Gecko <i>Gehyra mutilata</i>	Red list of China's vertebrates: (Vulnerable)	Widely but thinly distributed throughout Hong Kong.	Study Area (Abandoned Agricultural Land)
Amphibian			
Chinese Bullfrog <i>Hoplobatrachus chinensis</i>	Class 2 Protected Animal of China; Fellowes et al. (2002): PRC; Red list of China's vertebrates: (Endangered)	Widely distributed in Lantau Island and New Territories.	Proposed Works Limit (Abandoned Agricultural Land, Agricultural Land)
Mammal			
Japanese Pipistrelle <i>Pipistrellus abramus</i>	(Cap. 170)	Widely distributed throughout Hong Kong.	Proposed Works Limit (Abandoned Agricultural Land, Watercourse); Study Area (Abandoned Agricultural Land, Agricultural Land, Channel, Developed Area, Pond, Woodland)

Notes:

1. AFCD. Hong Kong Biodiversity Database.
2. Cap. 170 Wild Animals Protection Ordinance.
3. Cap. 586 Protection of Endangered Species of Animals and Plants Ordinance.
4. Convention on International Trade in Endangered Species of Wild Flora and Fauna. Appendices I, II and III.
5. Fellowes *et al.* (2002). Wild animals to watch: Terrestrial and freshwater fauna of conservation concern in Hong Kong.
 - For conservation status listed by Fellowes *et al.* (2002), letters in parentheses indicate that the assessment is on the basis of restrictedness in breeding and/or roosting sites rather than in general occurrence.
6. International Union of Conservation for Nature. The IUCN Red List of Threatened Species. Version 2020-1.
7. Jiang, Z. G., Jiang, J. P., Wang, Y. Z., Zhang, E., Zhang, Y. Y., Li, L. L., ... & Dong, L. (2016). Red list of China's vertebrates
8. List of State Protected Wild Animals, promulgated by the State Council
9. Zhao, E. (1998). China red data book of endangered animals: Amphibia and Reptilia.
10. Zheng and Wang (1998). China Red Data Book of Endangered Animals: Aves.

Abbreviations:

Conservation Status in Fellowes et al. (2002): LC = Local Concern; PRC = Potential Regional Concern; RC = Regional Concern

8.7 Impact Assessment

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

- **Improvement works to tributary sections TKL04 and TKL05 of Ping Yuen River**
 - Construct embankments along the sides of the river with average height from 3m to 3.5m, for most of the sections of TLK04.
 - For the downstream section of TLK04 located between the Ping Che Road and TLK05, widening and construction of embankments of 3.5m.
 - For TLK05 of Ping Yuen River, construct the embankments along both sides of the river with average height from 3m to 3.5m to provide artificial flood plain with an average width from 10m to 21m for high flow conditions.
- **Drainage improvement works at Ping Yeung Village**
 - Construction 825mm to 1200mm wide u-channels and 1200mm diameter drain pipes. With the completion of the recommended works, a local sub-catchment covering the northern part of village will be re-distributed and discharged into Ping Yuen River at the north instead of TKL04.
- **Construction of road drainage pipes at Ping Che Road**
 - Laying 1200mm pipe along Ping Che Road to collect runoff from the road via gullies which will then be discharged into Ping Yuen River.
- **Re-provision of vehicular crossing and footbridges**
 - Vehicular crossing and footbridges construction along TKL04 and TKL05.

Impact Assessment Methodology

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

- Direct loss of habitat resulted from vegetation clearance for construction of embankments, widening and laying of drainage system;
- Direct impact on flora and fauna species of conservation importance;
- Indirect impacts on surrounding habitats and associated wildlife due to increased disturbance, esp. disturbance to Ping Che Egret;
- Indirect impacts (pollution) on watercourses due to construction run-off; and
- Fragmentation and cumulative impacts

8.7.3 The potential to reduce adverse ecological impacts by design changes following the principle of *Avoidance* elucidated in EIAO Technical Memorandum Annex 8 was then considered with respect to (a) their technical feasibility and (b) their necessity, given the extent of the predicted impacts.

8.7.4 Additional measures for *Minimisation* of the remaining 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

Potential Direct Habitat Loss

8.7.5 Potential direct habitat loss will occur in the Proposed Site Limit for improvement works to

tributary sections TKL04 and TKL05 of Ping Yuen River in Ta Kwu Ling as illustrated in layout plan of **198799/B&V/PP/001**. The existing rivers TKL04 and TKL05 are mainly natural streams, with few sections of engineering channels, located at the east and west of Ping Che Road respectively. **Table 8.20** outlines the assessment criteria and discussion for the habitat to be lost to the proposed drainage improvement works in the absence of mitigation measures.

Table 8.20 Potential Direct Habitat Loss in Proposed Works Limit

Site Code	Abandoned Agricultural Land	Agricultural Land	Pond	Channel	Developed Area	Watercourse	Woodland
Habitat Quality	Low	Low	Low	Low	Low	Low to moderate	Low
Species	No flora species of conservation importance Fauna species of conservation importance: Black Kite <i>Milvus migrans</i> , Greater Coucal <i>Centropus sinensis</i> , Alexandrine Parakeet <i>Psittacula eupatria</i> , Copperhead Racer <i>Elaphe radiata</i> , Chinese Bullfrog <i>Hoplobatrachus chinensis</i> , Japanese Pipistrelle <i>Pipistrellus abramus</i>	No flora species of conservation importance Fauna species of conservation importance: Chinese Pond Heron <i>Ardeola bacchus</i> , Greater Coucal <i>Centropus sinensis</i> , Alexandrine Parakeet <i>Psittacula eupatria</i> , Chinese Bullfrog <i>Hoplobatrachus chinensis</i>	No flora and fauna species of conservation importance	No flora species of conservation importance Fauna species of conservation importance: Chinese Pond Heron <i>Ardeola bacchus</i> , Little Egret <i>Egretta garzetta</i> , Little Ringed Plover <i>Charadrius dubius</i>	Flora species of conservation importance: <i>Neottopteris nidus</i> Fauna species of conservation importance: Black Kite <i>Milvus migrans</i> , Alexandrine Parakeet <i>Psittacula eupatria</i> , Swallowtail <i>Papilio xuthus</i>	Flora species of conservation importance: <i>Aquilaria sinensis</i> , <i>Cephalanthus tetrandrus</i> Fauna species of conservation importance: Black-crowned Night Heron <i>Nycticorax nycticorax</i> , Chinese Pond Heron <i>Ardeola bacchus</i> , Grey Heron <i>Ardea cinerea</i> , Greater Coucal <i>Centropus sinensis</i> , Grass Demon <i>Udaspes folus</i> , Japanese Pipistrelle <i>Pipistrellus abramus</i>	Flora species of conservation importance: <i>Mucuna championii</i> Fauna species of conservation importance: Danaid Eggfly <i>Hypolimnas misippus</i>
Size/Abundance	Approx. 8.64ha, very small in a Hong Kong context. Low diversity of flora and terrestrial fauna.	Approx. 2.70ha, very small in a Hong Kong context. Low diversity of flora and terrestrial fauna.	Approx. 0.13ha, very small in a Hong Kong context. Low diversity of flora and terrestrial fauna.	Approx. 0.89ha (257m), very small in a Hong Kong context. Low to moderate diversity of flora and low diversity of terrestrial and freshwater fauna	Approx. 4.24ha, very small in a Hong Kong context. Low diversity of flora and terrestrial fauna.	Approx. 2.45ha (4181m), very small in a Hong Kong context. Low to moderate diversity of flora and low diversity of terrestrial and freshwater fauna	Approx. 1.05ha, very small in a Hong Kong context. Low diversity of flora and terrestrial fauna.
Duration	Permanent; associated works area will be reinstated upon works completion.	Permanent; associated works area will be reinstated upon works completion.	Permanent; associated works area will be reinstated upon works completion.	Permanent; associated works area will be reinstated upon works completion.	Permanent; associated works area will be reinstated upon works completion.	Permanent; associated works area will be reinstated upon works completion.	Permanent; associated works area will be reinstated upon works completion.
Reversibility	Irreversible; reversible for works area	Irreversible; reversible for works area	Irreversible; reversible for works area	Irreversible; reversible for works area	Irreversible; reversible for works area	Irreversible; reversible for works area	Irreversible; reversible for works area

Site Code	Abandoned Agricultural Land	Agricultural Land	Pond	Channel	Developed Area	Watercourse	Woodland
Magnitude	Habitat in the Proposed Works Limit will be affected.	Habitat in the Proposed Works Limit will be affected.	Habitat in the Proposed Works Limit will be affected.	Habitat in the Proposed Works Limit will be affected.	Habitat in the Proposed Works Limit will be affected.	Habitat in the Proposed Works Limit will be affected.	Habitat in the Proposed Works Limit will be affected.
Overall Impact Severity	Low	Low	Low	Low to Moderate	Low	Low to Moderate	Low to Moderate

Direct Impact on Flora and Fauna Species of Conservation Importance

- 8.7.6 According to the survey findings, four flora species of conservation importance are located within the Project Site, including *Aquilaria sinensis*, *Cephalanthus tetrandrus*, *Mucuna championii* and *Neottopteris nidus*.
- 8.7.7 Wild individuals of *Aquilaria sinensis* were recorded in the watercourse within the Proposed Works Limit. *Aquilaria sinensis* is common in the lowland forests and fung shui woods of Hong Kong (Corlett *et al.* 2000) and was included in the book “Rare and Precious Plants of Hong Kong” (Hu *et al.* 2003). In south China, particularly Hong Kong, it is threatened by illegal felling and over-exploitation and is listed in Appendix II of CITES (CITES 2020) and is protected under Cap. 586 Protection of Endangered Species of Animals and Plants Ordinance in Hong Kong. Moreover, it is included in China Plant Red Data Book (Fu and Chin 1992) and Illustration of Rare & Endangered plant in Guangdong Province (Wu and Hu 1988), and wild individuals are listed in Category II of the List of Wild Plants under State Protection (State Forestry Administration & Ministry of Agriculture 1999). It is also categorized as vulnerable in China Red Data Book (Fu and Chin 1992), the Threatened Species List of China's Higher Plants (Qin *et al.* 2017) and the IUCN Red List of Threatened Species (IUCN 2020).
- 8.7.8 One individual of *Cephalanthus tetrandrus* was recorded in the watercourse within the Proposed Works Limit. This species is a very rare native tree found in thickets by streams in Hong Kong (Corlett *et al.* 2000).
- 8.7.9 Dense thickets of *Mucuna championii* were recorded in the eastern woodland within the Proposed Works Limit. This species is generally found in lowland forests, *Mucuna championii* is a rare native climber species in Hong Kong (Corlett *et al.* 2000) included in the book “Rare and Precious Plants of Hong Kong” and was assessed as endangered in China (Hu *et al.* 2003).
- 8.7.10 Eight *Neottopteris nidus* individuals were recorded in developed area within the Proposed Works Limit. *Neottopteris nidus* is a native epiphytic and epilithic herb that is restricted in Hong Kong (Corlett *et al.* 2000) and is listed under Cap. 96 Forests and Countryside Ordinance in Hong Kong.
- 8.7.11 The identified flora species of conservation importance would be avoided as much as possible during the construction and operational phase of the Project. Where the individuals could not be avoided due to technical constraint, transplantation of the concerned species should be considered.
- 8.7.12 In terms of the fauna species of conservation importance, Japanese Pipistrelle, Alexandrine Parakeet, Asian Barred Owllet, Black-crowned Night Heron, Black Kite, Chinese Pond Heron, Collared Scops Owl, Common Buzzard, Great Cormorant, Grey Heron, Greater Coucal, Little Egret, Little Ringed Plover, Copperhead Racer, Chinese Bullfrog, Danaid Eggfly, Grass Demon and Swallowtail were recorded within the Project Site. Among these species, Asian Barred Owllet, Collared Scops Owl, Common Buzzard and Great Cormorant were recorded to literature review findings where they were not recorded within the Proposed Work Limit during this baseline study. The identified bat, bird, snake and butterfly species are highly mobile, and therefore unlikely to be significantly affected by the drainage improvement works. However, Chinese Bullfrog is less mobile; in the absence of mitigation measures, it may be directly affected by the construction works.
- 8.7.13 The potential direct impacts of the Project on these flora and fauna species of conservation importance, including the species identified from literature review are discussed in **Table 8.21**.

Table 8.21 Potential Direct Ecological Impacts on Species of Conservation Importance

Criteria	Potential Direct Ecological Impacts on Species of Conservation Importance
Species	Flora: <i>Aquilaria sinensis</i> , <i>Cephalanthus tetrandrus</i> , <i>Mucuna championii</i> and <i>Neottopteris nidus</i> Mammal: Japanese Pipistrelle Avifauna: Alexandrine Parakeet, Asian Barred Owl*, Black-crowned Night Heron, Black Kite, Chinese Pond Heron, Collared Scops Owl*, Common Buzzard*, Great Cormorant*, Grey Heron, Greater Coucal, Little Egret, Little Ringed Plover Reptile: Copperhead Racer Amphibian: Chinese Bullfrog Butterfly: Danaid Eggfly, Grass Demon, Swallowtail
Protection Status	Cap. 586: <i>Aquilaria sinensis</i> , Black Kite Cap. 96A: <i>Neottopteris nidus</i> Class 2 Protected Animal of China: Greater Coucal, Chinese Bullfrog Cap. 170: Japanese Pipistrelle, all wild birds
Distribution	None of the species are considered to be restricted in range.
Rarity	AFCD Assessment – Rare: Grass Demon, Swallowtail Species listed in Fellowes et al. (2002) – Local Concern: Danaid Eggfly, Black-crowned Night Heron, Little Ringed Plover; Potential Regional Concern: Chinese Pond Heron, Little Egret, Grey Heron, Chinese Bullfrog; Regional Concern: Black Kite Listed as Near Threatened in Red List of China’s Vertebrate (2016) – Endangered: Copperhead Racer, Chinese Bullfrog
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 flora species of conservation importance: Low to moderate during construction and negligible during operational phases. For fauna species of conservation importance: Low to moderate during construction (to Chinese Bullfrog in particular) and negligible during operational phases.
Note: * Species were recorded within the Project Boundary according to literature review result. However, these species were not recorded during current ecological baseline survey.	

Indirect Impacts on Surrounding Habitats in SA and Associated Wildlife

- 8.7.14 In view of the small-scale and localised nature of current Project, only the habitats and associated wildlife adjacent to the Project Site may be subject to indirect impacts resulting from increased disturbances caused by the Project. Such impact will be limited to construction phase; disturbance during the operational phase would not be anticipated as the activities will be limited to the disturbance from vehicular crossing.
- 8.7.15 Habitats that would potentially receive increased disturbances as a result of the proposed works mainly include the watercourses, channel, adjacent abandoned agricultural land, active agricultural land, ponds, woodland and to a lesser extent, wasteland and developed area. Indirect impact on other habitats, including fung shui wood, plantation and shrubland/ grassland are not anticipated, since the disturbance would be separated/ screened considerably by abandoned agricultural land, active agricultural land and developed area.
- 8.7.16 Disturbance to the adjacent habitats and associated fauna to the proposed alignment could result from such things as dust generation, waste dumping, water pollution from uncontrolled site runoff,

construction noise and increased human activities.

- 8.7.17 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 areas may result in environmental degradation of the surrounding habitat, which is more sensitive for the retained flora species of conservation importance.
- 8.7.18 Potential disturbance by construction noise and increased human activities may cause wildlife to avoid using areas adjacent to the alignment, and thereby reduce wildlife density in the area. Discussion on the potential disturbances of the construction works to the habitats within the Study Area is given in **Table 8.22** below.

Table 8.22 Potential Disturbance on Habitats in Study Area

Criteria	Watercourse	Channel	Abandoned Agricultural Land	Agricultural Land	Pond	Woodland	Wasteland	Developed Area
Habitat Quality	Low for man-made section; low to moderate for semi-natural section	Low	Low	Low to moderate	Low	Low to moderate	Low	Low
Species	Two flora species of conservation importance: <i>Aquilaria sinensis</i> , <i>Cephalanthus tetrandrus</i> Seven fauna species of conservation importance: Black-crowned Night Heron, Chinese Pond Heron, Grey Heron, Greater Coucal, Alexandrine Parakeet, Grass Demon, Japanese Pipistrelle	No flora species of conservation importance Nine fauna species of conservation importance: Eurasian Teal, Chinese Pond Heron, Little Egret, Little Ringed Plover, Greater Painted-snipe, Wood Sandpiper, Greater Coucal, Collared Crow, Japanese Pipistrelle	One flora species of conservation importance: <i>Cephalanthus tetrandrus</i> Nineteen fauna species of conservation importance: Chinese Pond Heron, Little Egret, Bonelli's Eagle, Black Kite Eastern Buzzard, Common Emerald Dove, Greater Coucal, Lesser Coucal, Asian Barred Owllet, Alexandrine Parakeet, Collared Crow, Common Rosefinch, Cornelian, Danaid Eggfly, Swallowtail, Four-clawed Gecko, Copperhead Racer, Chinese Bullfrog, Japanese Pipistrelle	One flora species of conservation importance: <i>Aquilaria sinensis</i> Ten fauna species of conservation importance: Chinese Pond Heron, Eastern Cattle Egret, Little Egret, Greater Coucal, Lesser Coucal, Alexandrine Parakeet, Swallowtail, Red-breast Jezebel, Chinese Bullfrog, Japanese Pipistrelle	No flora species of conservation importance Two fauna species of conservation importance: Chinese Pond Heron, Japanese Pipistrelle	Three flora species of conservation importance: <i>Aquilaria sinensis</i> , <i>Mucuna championii</i> , <i>Pavetta hongkongensis</i> Nine fauna species of conservation importance: Great Egret, Greater Coucal, Collared Scops Owl, Asian Barred Owllet, Alexandrine Parakeet, Rufous-capped Babbler, Danaid Eggfly, Swallowtail, Japanese Pipistrelle	No flora species of conservation importance One fauna species of conservation importance: Black Kite <i>Milvus migrans</i>	Two flora species of conservation importance: <i>Neottopteris nidus</i> , <i>Xylosma longifolium</i> Ten fauna species of conservation importance: Chinese Pond Heron, Black Kite, Greater Coucal, Collared Scops Owl, Asian Barred Owllet, Alexandrine Parakeet, Zitting Cisticola, Swallowtail, Common Rat Snake, Japanese Pipistrelle

Criteria	Watercourse	Channel	Abandoned Agricultural Land	Agricultural Land	Pond	Woodland	Wasteland	Developed Area
Size/Abundance	5.32 ha (11059m) Low abundance of all groups of terrestrial fauna and freshwater fauna	7.85 ha (2849m) Low abundance of all groups of terrestrial fauna and freshwater fauna	160.92 ha Low to moderate abundance of bird and butterfly; low abundance of odonate, herpetofauna and mammal	42.12 ha Low to moderate abundance of bird; low abundance of butterfly, odonate, herpetofauna and mammal	0.49 ha Low abundance of bird, butterfly, odonate and mammal; herpetofauna was not recorded in this habitat.	47.68 ha Low to moderate abundance of butterfly; low abundance of bird, odonate, herpetofauna and mammal	2.27 ha Low abundance of bird, butterfly and odonate; herpetofauna and mammal were not recorded in this habitat.	147.03 ha Low to moderate abundance of bird; low abundance of butterfly, odonate, herpetofauna and mammal
Duration	Last during working hours in construction phase							
Reversibility	Reversible, disturbance will be ceased once works stopped/ completed							
Magnitude	Low, considering the Study Area generally consist of man-made habitat with disturbance from developed area							
Overall Impact Severity	Low significance in construction phase, and Very Low in operational phase.	Low significance in construction phase, and Very Low in operational phase.	Low significance, mainly in construction phase, and Negligible in operational phase.	Low significance, mainly in construction phase, and Negligible in operational phase.	Low significance, mainly in construction phase, and Negligible in operational phase.	Low significance, mainly in construction phase, and Negligible in operational phase.	Low significance, mainly in construction phase, and Negligible in operational phase.	Low significance, mainly in construction phase, and Negligible in operational phase.

Indirect Impact to Ping Che Egretty

- 8.7.19 Active use of the Ping Che Egretty by Chinese Pond Heron has been recorded since 2009, where a maximum of five Chinese Pond Heron nests were recorded during the survey in May 2020. The egretty is about 200m to the east of the Proposed Works Limit.
- 8.7.20 Although the egretty is not located within the Proposed Works Limit, breeding ardeids could cover a wide foraging range. Therefore, the potential disturbance impact on the egretty is assessed for precautionary purposes. Barrier hindering the breeding herons from travelling between their breeding and foraging sites would require them habituating the barrier by adjusting their flight altitude, distance or direction, which would demand higher energy consumption and may indirectly affect the breeding successful rate. The breeding Chinese Pond Heron will be prone to disturbance arising from construction during the breeding period, i.e. March to August.

Table 8.23 Potential Indirect Disturbance to Ping Che Egretty

Criteria	Potential Indirect Disturbance to Ping Che Egretty
Species	Chinese Pond Heron
Protection Status	Cap. 170 – Wild Animals Protection Ordinance
Abundance	Maximum of five active nests were recorded during the baseline survey in 2020.
Duration	During breeding season (Mar - Aug) throughout construction phase
Reversibility	Disturbance would be ceased after construction period
Magnitude	Low to moderate considering the small number of breeding ardeids
Overall Impact Severity	Low to moderate significance in the construction phases

Potential Impact (Pollution) on watercourses due to Construction Run-off

- 8.7.21 During the drainage improvement works, uncontrolled site runoff may be generated. The uncontrolled runoff may involve sediments released during excavation, chemical waste from mechanical equipment, especially oils and lubricants and probably sewerage. If the polluted water is discharged accidentally/ uncontrolled into nearby watercourses and channels. Such pollution may deteriorate the watercourse water quality, and negatively impact the freshwater flora and fauna communities inhabiting the streams and the habitats connected with the streams.
- 8.7.22 Nevertheless, considering the construction method, potential water quality impact through release of sediment during construction is expected to be minimal and highly localised. It is considered that significance of indirect impact on the watercourses in terms of water pollution would be **Low to Moderate**, and such impact on watercourse will limit to construction phase only.

Habitat Fragmentation

- 8.7.23 As the watercourses are existing habitats, small scale of improvement works such as widening would therefore be of **Low** significance. Site rehabilitation works will be conducted for temporary affected areas upon completion of the drainage improvement works, habitat fragmentation during the operational phase would be of **Very Low** significance.

Operational Phase Impact

- 8.7.24 During the operational phase of the project, the works will primarily be the routine maintenance and operation of the completed drainage channel. No other major activities (e.g. dredging) are expected from the proposed drainage channel nor the associated drainage facilities. Therefore, it is not expected that the Project will cause any significant

environmental impacts in the operation phase. Changes to hydrology and hydraulics of downstream river, watercourses and water bodies, and ground water flow regime, and the associated effects on terrestrial and aquatic ecology and fisheries during operation phase of the Project is not expected.

Cumulative Impacts

- 8.7.25 Referring to the latest information provided by DSD on the interfacing projects, the major concurrent projects include sewerage system upgrading works nearby Ping Che Road and drainage improvement works in Ping Yuen River. With the implementation of control measures during construction as presented in the Preliminary Environmental Review Reports of these concurrent projects, no adverse impact is anticipated. Considered the scale and nature of the cumulative project, no adverse cumulative impact would be anticipated. 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 work sections which will not overlap with the works area of interfacing project as far as practical.

8.8 Mitigation Measures

Mitigation Measures for Woodland Habitat to be Lost

- 8.8.1 Trees in the Proposed Works Limit (esp. the woodland habitat) will be affected as a result of potential direct habitat loss. All trees should be preserved as far as possible, especially species of high conservation or amenity value. Where trees are to be preserved in-situ, but are likely to be disturbed by works activities, protective fencing/hoarding should be carefully set up around the affected trees.
- 8.8.2 Trees that cannot be retain due to unresolvable conflict with the engineering design should be transplanted to appropriate receptor site. If transplantation is not feasible, compensatory planting for the trees should be carried out in the receptor site as well, with a minimum ratio of 1:1. Recommendations provided in the Tree Preservation and Removal Proposal TPRP should be fully followed.
- 8.8.3 Planting of trees and other vegetation to reinstate the works area will also be conducted upon completion of the drainage improvement works. Such rehabilitation works should use native plants of the same species that occur in the adjacent woodland habitat and have flowers/fruits attractive to wildlife.

Mitigation Measures for Flora Species of Conservation Importance

- 8.8.4 The four flora species of conservation importance were identified within the Proposed Works Limit, including *Aquilaria sinensis*, *Cephalanthus tetrandrus*, *Mucuna championii* and *Neottopteris nidus* should be preserved as far as possible. As a precautionary measure, it is recommended to conduct a vegetation survey within the works area prior to the commencement of drainage improvement works. The survey should be conducted by a qualified ecologist/ botanist. Should any rare/protected plant species be found within the area, the survey will record their conditions, numbers and locations. The survey will also determine the number and locations of the individuals to be affected and evaluate the suitability and/or practicality of transplantation.
- 8.8.5 Where avoidance is not possible due to technical feasibility, transplantation to appropriate receptor site should be considered. A Transplantation Plan should be prepared by a qualified ecologist/ botanist with full details of the findings of the flora survey, locations of the receptor site, transplantation methodology, implementation programme of transplantation, post-transplantation monitoring and maintenance programme. The Plan should be submitted to and approved by AFCD and other relevant departments prior to the site clearance. The approved transplantation works should be supervised by a qualified botanist/ horticulturist/ arborist with relevant experience in transplanting floral species of conservation importance.

Mitigation Measures for Fauna Species of Conservation Importance

- 8.8.6 To avoid the potential direct impact on Chinese Bullfrog, prior to commencement of the construction, an update aquatic survey should be conducted with focus to the presence of Chinese Bullfrog. 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 Chinese Bullfrog be found within the surveyed watercourse sections, a Translocation Plan should be prepared and capture and translocation should be conducted to move the individuals from the Project Site to suitable recipient sites.
- 8.8.7 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 four months upon completion of the update aquatic survey to agree the detailed translocation procedures including the identified receptor site(s). Approval from the Authority (e.g. AFCD and EPD) should be sought prior to conducting the translocation work.
- 8.8.8 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.
- 8.8.9 Furthermore, in order to maintain the ecological connectivity among areas in adjacent to Ping Yuen River, provision of animal corridors at the upgraded channels as an enhancement measure would be provided. Access points of the animal corridors would be provided in certain intervals and located away from traffic road as far as practicable. The indicative locations and conceptual design of the animal corridor are shown in **Figure 8.6**. The proposed design, number, and location of the animal corridor subject to further change in the detailed design stage.

Mitigation Measures for Ping Che Egretry

- 8.8.10 The Ping Che Egretry has been known to be active since and used by breeding Chinese Pond Heron since 2009. In order to mitigate for the potential disturbance toward the active Ping Che Egretry, proposed construction works within 100m radius from the Ping Che Egretry should be scheduled outside the ardeids breeding season, i.e. March to August. As a precautionary measure, monthly egretry count during the breeding season within construction phase should be conducted at Ping Che Egretry by qualified ecologist to monitor for any abnormal changes in nesting ardeids due to indirect impacts from the construction activities.

Mitigation Measures for Operational Phase

- 8.8.11 As discussed in Section 8.7.24, there will be no major works such as dredging and hydrology and hydraulics would not be affected. Thus, mitigation measures are not required for the operational phase works. However, good site practice should be followed during maintenance work.

Mitigation Measures to Potential Disturbances and Water Pollution

- 8.8.12 As no significant ecological impacts arising from the operation of the Project are anticipated, the proposed mitigation measures to minimise disturbances focus on the construction phase. The following construction phase mitigation measures are proposed to reduce predicted disturbance impacts and impact of water pollution to an acceptable level:
- Tree protection zone should be established practically where necessary to minimise damage to the trees preserved in-situ;
 - 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.

8.8.13 Other mitigation measures to minimise disturbance during construction include good site practice and noise management. The site practices listed below will be followed throughout the construction phase:

- 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 and streams);
- Prohibit and prevent open fires within the site boundary during construction and provide temporary firefighting equipment in the work areas;
- 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.

8.9 Summary of Mitigation Measures

8.9.1 With the implementation of the mitigation measures discussed above, it is predicted that the Project will fully mitigate for its potential adverse ecological impacts. Predicted potential ecological impacts arising from the proposed water mains, mitigation measures required and post-mitigation acceptability of the Project are summarized in **Table 8.24**.

Table 8.24 Summary of Potential Ecological Impacts

Description of impact	Significance of Impact in the Absence of Mitigation Measures	Proposed Mitigation Measures	Residual Impact
Direct loss of abandoned agricultural land	Low significance.	No mitigation measure is required.	Negligible significance
Direct loss of agricultural land	Low significance.	No mitigation measure is required.	Low significance.
Direct loss of pond	Low significance.	No mitigation measure is required.	Negligible significance
Direct loss of channel	Low to moderate significance.	Mitigation Measures to Potential Disturbances and Water Pollution as detailed under Section 8.8.7 and 8.8.8.	Low significance.
Direct loss of developed area	Low significance.	No mitigation measure is required.	Negligible significance
Direct loss of watercourse	Low to moderate significance.	Mitigation Measures to Potential Disturbances and Water Pollution as detailed under Section 8.8.7 and 8.8.8.	Low significance.

Description of impact	Significance of Impact in the Absence of Mitigation Measures	Proposed Mitigation Measures	Residual Impact
Direct loss of woodland	Low to moderate significance.	Avoidance of tree felling as far as possible. If avoidable, trees should be transplanted to the receptor site or compensated with a minimum ratio of 1:1. Tree protection zone should be established practically where necessary to minimise damage to the trees preserved in-situ. Recommendations provided in the TPRP should be fully followed. Site rehabilitation by planting native trees and vegetation that occur in adjacent woodland.	Low significance.
Direct ecological impact on flora species of conservation importance	<u>Construction Phase:</u> Low to moderate significance. <u>Operational Phase:</u> Negligible significance.	Pre-construction survey to identify species of conservation importance for preservation and evaluate the feasibility of transplantation as needed.	<u>Construction Phase:</u> Low significance. <u>Operational Phase:</u> Low significance.
Direct ecological impact on fauna species of conservation importance	<u>Construction Phase:</u> Low to moderate significance (in particular to Chinese Bullfrog), <u>Operational Phase:</u> Negligible significance.	Update aquatic survey to be conducted with focus to Chinese Bullfrog and other amphibian/aquatic species of conservation importance and, where necessary, prepare Translocation Plan and conduct translocation work as close to the commencement of the relevant works as possible, provision of animal corridors at the upgraded channels as an enhancement measure.	<u>Construction Phase:</u> Low significance. <u>Operational Phase:</u> Low significance.
Indirect disturbance on watercourse and associated wildlife	<u>Construction Phase:</u> Low significance. <u>Operational Phase:</u> Very Low significance.	No mitigation measure is required.	<u>Construction Phase:</u> Low significance. <u>Operational Phase:</u> Very Low significance.
Indirect disturbance on channel and associated wildlife	<u>Construction Phase:</u> Low significance. <u>Operational Phase:</u> Very Low significance.	No mitigation measure is required.	<u>Construction Phase:</u> Low significance. <u>Operational Phase:</u> Very Low significance.
Indirect disturbance on abandoned agricultural land and associated wildlife	<u>Construction Phase:</u> Low significance. <u>Operational Phase:</u> Negligible significance.	No mitigation measure is required.	<u>Construction Phase:</u> Low significance. <u>Operational Phase:</u> Negligible significance.
Indirect disturbance on agricultural land and associated wildlife	<u>Construction Phase:</u> Low significance. <u>Operational Phase:</u> Negligible significance.	No mitigation measure is required.	<u>Construction Phase:</u> Low significance. <u>Operational Phase:</u> Negligible significance.

Description of impact	Significance of Impact in the Absence of Mitigation Measures	Proposed Mitigation Measures	Residual Impact
Indirect disturbance on pond and associated wildlife	<u>Construction Phase:</u> Low significance. <u>Operational Phase:</u> Negligible significance.	No mitigation measure is required.	<u>Construction Phase:</u> Low significance. <u>Operational Phase:</u> Negligible significance.
Indirect disturbance on woodland and associated wildlife	<u>Construction Phase:</u> Low significance. <u>Operational Phase:</u> Negligible significance.	No mitigation measure is required.	<u>Construction Phase:</u> Low significance. <u>Operational Phase:</u> Negligible significance.
Indirect disturbance on developed area and associated wildlife	<u>Construction Phase:</u> Low significance. <u>Operational Phase:</u> Negligible significance.	No mitigation measure is required.	<u>Construction Phase:</u> Low significance. <u>Operational Phase:</u> Negligible significance.
Indirect disturbance to Ping Che Egretty	<u>Construction Phase:</u> Low to moderate significance. <u>Operational Phase:</u> Negligible significance.	Avoidance of construction works within 100m radius from the egretty during breeding season. As a precautionary measure, monthly egretty survey to be conducted during breeding months in construction period.	<u>Construction Phase:</u> Low significance. <u>Operational Phase:</u> Negligible significance.
Impact of water pollution due to construction run-off	<u>Construction Phase:</u> Low to Moderate significance. <u>Operational Phase:</u> Negligible significance.	Mitigation Measures to Potential Disturbances and Water Pollution as detailed under Section 8.8.7 and 8.8.8.	<u>Construction Phase:</u> Low significance. <u>Operational Phase:</u> Negligible significance.
Habitat fragmentation	<u>Construction Phase:</u> Low significance. <u>Operational Phase:</u> Very Low significance.	No mitigation measure is required.	<u>Construction Phase:</u> Low significance. <u>Operational Phase:</u> Very Low significance.
Cumulative impacts	Nil.	No mitigation measure is required.	Nil.

8.10 Evaluation of Residual Ecological Impacts

8.10.1 Based on the above assessment as well as with the effective implementation of the suggested mitigation and precautionary measures, adverse residual impacts from the Project on the ecological resources within and in the vicinity of the Project Area would not be anticipated. Off-site mitigation measures are therefore not considered necessary to mitigate the residual impacts any further.

8.11 Environmental Monitoring and Audit Programme

8.11.1 Implementation of the recommended mitigation measures described in Section 8.8 should be conducted as presented in the standalone Environmental Monitoring and Audit (EM&A) Manual.

Egretty

8.11.2 Prior to any construction activities, surveys of the Ping Che egretty should be conducted to confirm its location and status.

- 8.11.3 During the construction phase, construction works within 100m radius from the egretty will be avoided during breeding months (March – August). Also, monthly egretty survey during breeding months in construction period will be conducted.

Transplantation of Flora Species of Conservation Importance

- 8.11.4 As a precautionary measure, it is recommended to conduct a vegetation survey within the works area prior to the commencement of drainage improvement works. The survey should be conducted by a qualified ecologist/ botanist. Should any rare/protected plant species be found within the area, the survey will record their conditions, numbers and locations. The survey will also determine the number and locations of the individuals to be affected and evaluate the suitability and/or practicality of transplantation, where identified plants could not be avoided.

Translocation of Amphibian Species of Conservation Importance

- 8.11.5 Monitoring surveys will be conducted for the translocated amphibians. The effectiveness of the translocation programme will be assessed through surveys in breeding habitats and determine whether breeding occurs. Evidence of breeding will include calling males, findings of eggs and tadpoles. At least three surveys will be conducted in each release site after the translocation. Surveys will be carried out during the breeding season of Chinese Bullfrog (March to September). In addition, the monitoring survey should also record presence of aquatic fauna species (if any).

8.12 Conclusion

- 8.12.1 The ecological impact assessment has been carried out based on literature reviews and the updated ecological survey conducted between February 2020 and December 2020, which covered both wet and dry seasons. According to the Project alignment, the Project will cause potential habitat loss to abandoned agricultural land (8.64ha), agricultural land (2.70ha), channel (0.89ha), developed area (4.24ha), pond (0.13ha), watercourse (2.45ha) and woodland (1.05ha).
- 8.12.2 Majority of the identified impacts are considered to be low or negligible in the absence of mitigation measures. However, the potential impact on direct loss of watercourse, direct loss of woodland, direct ecological impact on flora and fauna species of conservation importance, indirect disturbance to Ping Che Egretty and impact of water pollution due to construction run-off are considered as low to moderate. Necessary mitigation measures were proposed for the above potential impacts.
- 8.12.3 It is predicted that the impacts will mainly arise during the construction phase, as no major activities would be conducted during the operational phase. The routine maintenance and the operation of the completed drainage channel would not cause any significant ecological impact.
- 8.12.4 With the implementation of mitigation measures and precautionary measures, adverse residual impacts from the Project on the ecological resources within and in the vicinity of the Project Area during construction and operation phase would not be anticipated. Off-site mitigation measures are therefore not considered necessary to mitigate the residual impacts any further.

8.13 Reference

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