

## 9 Ecological Impact (Terrestrial and Aquatic)

### 9.1 Introduction

This section addresses the potential ecological impacts that may arise from the construction and operation of proposed Police Facilities in Kong Nga Po. It presents the findings of literature review and supplementary field surveys conducted from March to August 2015. The potential impacts on the ecological sensitive receivers within the Study Area were assessed in accordance with the criteria and guidelines identified in Annexes 8 and 16 of the Technical Memorandum on Environmental Impact Assessment Process (EIAO-TM) and Section 3.4.8 of the EIA Study Brief (ESB-276/2014). Suitable mitigation measures were proposed to mitigate the adverse impacts to an environmentally acceptable level.

### 9.2 Environmental Legislation, Standards and Guidelines

A number of international conventions, local legislation and guidelines provide the framework for the protection of species and habitats of ecological importance. Those related to this Project are:

- *Forests and Countryside Ordinance* (Cap. 96), which protects the rare plant species from selling, offering for sale, or possession illegally;
- *Forestry Regulations* (Cap. 96 sub. leg.) are subsidiary legislation of the *Forests and Countryside Ordinance* (Cap. 96). Under these regulations, no person shall without lawful excuse sell, offer for sale, or have in his possession or under his custody or control any portion of any of the plants scheduled under the *Forestry Regulations*. These regulations do not apply to plants grown outside Hong Kong or on any land held from the Government under a lease, licence or permit or by virtue of an Ordinance;
- *Wild Animals Protection Ordinance* (Cap. 170), which protects wild animals listed under the second schedule from being hunted, possession, sale or export, disturbance of their nest or egg without permission by authorised officer;
- *Protection of Endangered Species of Animals and Plants Ordinance* (Cap. 586), which regulates the import, introduction from the sea, export, re-export, and possession of specimens of a scheduled species, including live, dead, parts or derivatives. The Ordinance applies to all activities involving endangered species which include the parties of traders, tourists and individuals;
- *Environmental Impact Assessment Ordinance (EIAO)* (Cap. 499), which specifies designated projects under Schedule 2 of the Ordinance, unless exempted, must follow the statutory environmental impact assessment (EIA) process and require environmental permits for their construction and operation;
- *EIAO Guidance Notes No. 6/2010, 7/2010 and 10/2010*. These guidance notes provide the observations on Ecological Assessment from the EIAO perspective, providing the general guidelines for conducting an ecological baseline survey for ecological assessment, introducing some methodologies in conducting terrestrial and freshwater ecological baseline surveys, and methodologies for marine ecological baseline surveys respectively;
- *Annexes 8 and 16 of the Technical Memorandum on Environmental Impact Assessment Process (EIAO-TM)*: Annex 8 recommends the criteria for evaluating ecological impacts. Annex 16 sets out the general approach and methodology for assessment of ecological impacts arising from a project or

proposal, to allow a complete and objective identification, prediction and evaluation of the potential ecological impacts;

- *Town Planning Ordinance* (Cap. 131) which gives designation to country parks, conservation area, green belts, sites of special scientific interest, coastal protection area and other specified uses to promote conservation, protection and education of the valuable environment;
- *Hong Kong Planning Standards and Guidelines Chapter 10* (HKPSG) provides the guidelines on landscape and conservation to achieve a balance between the need for development and the need to minimise disruption of the landscape and natural resources.
- *The IUCN Red List of Threatened Species* is widely recognised as the most comprehensive, objective global approach for evaluating the conservation status of plant and animal species. The goal of the IUCN Red List is to provide information and analyses on the status, trends and threats to species in order to inform and catalyse action for biodiversity conservation;
- *The Convention on International Trade in Endangered Species of Wild Fauna and Flora* (CITES) is an international agreement between Governments. Its aim is to ensure that international trade in specimens of wild animals and plants does not threaten their survival;
- *The Convention on the Conservation of Migratory Species of Wild Animals* (the Bonn Convention) is an intergovernmental treaty concluded under the aegis of the United Nations Environment Programme concerned with the conservation of wildlife and habitats on a global scale. Its aim is to conserve terrestrial, marine and avian migratory species throughout their range;
- *United Nations Convention on Biological Diversity* (CBD) (1992) is an international legally binding treaty. Its aim is to develop national strategies for the conservation and sustainable use of biological diversity; and
- *Wild Animal Protection Law of the Peoples' Republic of China* (PRC) is formulated for the purpose of protecting and saving the species of wildlife which are rare or near extinction, protecting, developing and rationally utilising wildlife resources and maintaining ecological balances.

### 9.3 Study Area and Methodology

The ecological baseline information of the Study Area was collected through a combination of both literature review and field survey.

#### 9.3.1 Study Area

According to Section 3.4.8.2 of the EIA Study Brief No. ESB-276/2014, the Study Area for the purpose of ecological impact assessment includes area within 500 meters distance from the boundary of the Project is defined and shown in **Figure 9.1**, and any other areas potentially affected by the Project.

### 9.3.2 Literature Review

A preliminary desktop study and literature review have been conducted to investigate the existing conditions within the Study Area and identify habitats or species having conservation interest. The available information relevant to this Project including approved EIA reports, Government and private sector reports, published literature, academic study reports and unpublished data requested were covered in the literature review. Examples for these are as follows:

- Recent aerial photographs
- Field Guides to flora and fauna groups (individual books)
- Hong Kong Biodiversity Database (AFCD, 2015a)
- Hong Kong Biodiversity Newsletter published by AFCD
- Hong Kong Bird Report and other survey reports by Hong Kong Bird Watching Society (HKBWS)
- HKBWS Breeding Bird Survey (Carey *et al.*, 2001)
- EIA, Environmental Review reports and other relevant reports for projects within the Study Area and relevant projects, including:
  - Data collected during field surveys for “Land Use Planning for the Closed Area – Feasibility Study” (hereafter as ‘CA Study’) (Ove Arup, 2010)
  - North East New Territories New Development Areas – Planning and Engineering Study – Investigation (hereafter as ‘NENT NDAs Study’): Final Environmental Impact Assessment Report (Ove Arup, 2013)
  - Organic Waste Treatment Facilities Phase 2 – Feasibility Study (hereafter as ‘OWTF2’): Environmental Impact Assessment Report (MMHK, 2013)
  - Engineering Feasibility Study for Kong Nga Po – Feasibility Study: Preliminary Environmental Review (MMHK, 2014): This previous study is directly related to the present EIA study for this Project. Its project area and study area are largely the same as those for this EIA Study. The information collected in the previous ecological survey for this PER in 2013 provides a closely relevant reference for this EIA study. The study is hereafter referred as the ‘KNP PER’.
  - Construction of a Secondary Boundary Fence and new sections of Primary Boundary Fence and Boundary Patrol Road (hereafter as ‘SBF’): Environmental Impact Assessment Report (MMHK, 2009)

Site specific and updated ecological information were collected through ecological field survey to fill the information gaps identified in literature review.

### 9.3.3 Ecological Field Survey Methodology

The ecological field surveys under this Assignment follow the requirements set forth in:

- EIA Study Brief No. ESB-276/2014 for Police Facilities in Kong Nga Po;

- Technical Memorandum on Environmental Impact Assessment Process;
- EIAO Guidance Note No. 6/2010 “Some Observations on Ecological Assessment From the Environmental Impact Assessment Ordinance Perspective”;
- EIAO Guidance Note No. 7/2010 “Ecological Baseline Survey for Ecological Assessment”; and
- EIAO Guidance Note No. 10/2010 “Methodologies for Terrestrial and Freshwater Ecological Baseline Surveys”.

The ecological field surveys covered the 500m boundary of the Project site (see **Figure 9.1**) with focus on areas potentially receiving direct impacts and indirect disturbance during the construction and operation phases. Ecological field surveys were conducted in the period between March 2015 and August 2015 covering both the wet and dry seasons. Details of the field survey programme are described in the following sections and the survey locations and routes are presented in **Figure 9.1**. The field survey schedule is presented in **Table 9.1**.

**Table 9.1: Ecological Field Survey Schedule**

Year 2015	Dry Season		Wet Season			
Ecological Field Surveys	Mar	Apr	May	Jun	Jul	Aug
Habitat and vegetation	✓		✓			
Daytime Transect Survey (Mammals, Birds, Herpetofauna, Butterfly and Dragonfly)	✓	✓	✓	✓	✓	✓
Night-time Transect Survey (Bird, Mammal, Herpetofauna)	✓		✓		✓	
Egretty Survey		✓	✓	✓	✓	
Aquatic Fauna Surveys	✓			✓		

#### 9.3.3.1 Habitat and Vegetation Survey

Habitat mapping and vegetation surveys were conducted throughout both the wet and dry seasons to generate the ecological profile of the Study Area. Habitat map was produced based on updated aerial photos and ground-truthing. Representative areas of each habitat were surveyed by direct observation on foot. The types and locations of habitats and species of conservation interest in the Study Area were marked on **Figures 9.2a to 9.2d**.

Plant species within the Study Area and their relative abundance were recorded with special attention to rare, protected and threatened species and other species of conservation interest. Nomenclature and conservation status of plant species follows Xing *et al.* (2000), Wu and Lee (2000), Siu (2000), AFCD (2003), Barretto *et al.* (2011) and AFCD (2015a). Representative photographs of each habitat type and ecological resources of importance were taken.

### 9.3.3.2 Fauna Survey

#### Transect Survey Route

Transect routes for terrestrial ecological surveys for avifauna, mammal, herpetofauna, butterfly and dragonfly are proposed and indicated in **Figure 9.1**, covering representative habitats and accessible areas within both the Project site and Study Area.

#### Avifauna Survey

Bird surveys were conducted during both day and night times using walk transect survey method with the aid of binoculars. Bird surveys were conducted once a month whilst the night bird survey was conducted bi-monthly during the survey period.

All birds seen or heard during the transect survey were identified and counted. Special attention was paid to any grassland, plantation and shrubland/woodland habitat that would be directly affected by the Project and the adjacent area where indirect disturbance might arise. Species showing notable breeding behaviour was also recorded in detail to identify any important breeding ground, special attention was paid to grassland specialist bird; location of any egret within the Study Area was identified and counted. Binoculars and digital camera was the main instrument used. Ornithological nomenclature and protection status of the species follows the latest available List of HK Birds (HKBWS, 2015).

#### Mammal Survey

Mammal surveys were conducted during both day and night time by direct observation and active searching of traits such as scats, footprints and feeding signs within the Study Area and along the Kong Nga Po Road respectively. Mammal surveys were conducted once a month whilst the night bird survey was conducted bi-monthly during the survey period.

Any observed sightings, tracks and signs of mammals were identified and recorded. Bat surveys were carried out by direct counting at potential roosting and foraging sites. Night surveys for nocturnal mammals particularly in wooded areas were conducted. Species, abundance and their feeding/ foraging behavior was identified and recorded. Nomenclature and protection status of the species follows Shek (2006).

#### Herpetofauna Survey (Amphibians and Reptiles)

Herpetofauna surveys were conducted through active searching and detection of the mating calls during day and night times. Survey area covered both terrestrial and aquatic environment, including watercourses, fishponds, agricultural areas, seasonal marsh and wooded areas. Herpetofauna surveys were conducted once per month whilst night surveys were carried out bi-monthly during the survey period. Nomenclature and protection status of the species follows Chan *et al.* (2005) and Karsen *et al.* (1998).

### Butterfly and Dragonfly Survey

Butterfly and dragonfly surveys were carried out by walk transect survey method. The survey was conducted once a month.

All butterflies and dragonflies observed during the transect survey was identified and counted. Special attention was paid to any preferable habitats of these fauna groups, including watercourses, fishponds and vegetated areas. Hand netting was used for collecting specimen to confirm the species identification if necessary and the live specimen was released in-situ after identification. Nomenclature and protection status of the species followed Lo *et al.* (2005) for butterfly and Tam *et al.* (2011) for dragonfly.

### Aquatic Fauna Survey

Aquatic fauna surveys were conducted at representative aquatic habitats (including pond, natural and man-made watercourse) for once during daytime in both dry and wet seasons. The aquatic habitats of the sampling points as shown in **Figure 9.1** are presented in the following **Table 9.2**:

Table 9.2: Aquatic habitats of the sampling points

Sampling Point	Aquatic Habitat
P1	Channelised watercourse
P2	Watercourse
P3	Watercourse
P4	Pond
P5	Watercourse
P6	Pond
P7	Watercourse

One or a combination of the following techniques, including bankside observation with the aid of binoculars, active searching with hand nets, pot trapping of fish, kick sampling and individual stone sampling, were used wherever applicable depending on the habitat characteristics of the sampling points. Species was released in-situ as soon as possible upon identification and counting. Aquatic organisms, mostly fish and aquatic invertebrates and macro-invertebrates, were recorded and identified to the lowest possible taxonomic level, and their relative abundance was noted. Nomenclature of fish follows Lee *et al.* (2004).

## 9.4 Baseline Condition and Ecological Sensitive Receivers

### 9.4.1 General Description of the Project Site and Study Area

The proposed Kong Nga Po Development locates in the North District roughly in midway between Sheung Shui / Fanling urban area and Shenzhen River, east to the Man Kam To Road and north to Ng Tung River. Kong Nga Po in the North District is a rural area with very limited existing developments. The northern part

of the site is generally a rural area. There is no settlement within the Project site except a pig farm located at the southern part. The nearest settlements to the Kong Nga Po site include San Uk Ling, Sha Ling and Hung Lung Hang.

It was observed from the reconnaissance survey that the dominant habitats of the Project site are grassland, shrubland, plantation and orchard. The canopy of the plantation is sparse.

Most of the watercourses observed during reconnaissance survey were artificially modified drainage channels that were partially dry at sections.

#### **9.4.2 Recognized Sites of Conservation Importance**

No Site of Special Scientific Interest (SSSI), Nature Reserve, Special Area or nature conservation related Restricted Area was found within the Study Area.

The watercourses in the vicinity of the Project site are connected to the drainage channel at Man Kam To Road and eventually lead to Shenzhen River. The complex of wetland at Inner Deep Bay located at downstream of Shenzhen River is recognised as ecologically important and protected wetland through designation of Ramsar Site, SSSI and Nature Reserve.

##### **9.4.2.1 Man Kam To Road Egrettry**

The Man Kam To Road Egrettry is located at Man Kam To Road, approximately 1 km from the Project site. The egrettry has been first discovered in June 2009 during the course of ecological surveys conducted under the NENT NDAs Study (Ove Arup, 2013). It has been mainly used by Chinese Pond Heron (Anon, 2014). It was recorded with a maximum of 27 Chinese Pond Heron nests and 5 Little Egret nests in 2014 (Anon, 2014);

The egrettry is located outside the 500 m Study Area. Nevertheless, given the large coverage of forage range of ardeid, which can cover more than 1 km of their roosting site, baseline condition and potential impact on this egrettry were assessed under this EIA study.

#### **9.4.3 Habitat and Vegetation**

There are 12 major habitats identified in the Study Area, namely:

- Secondary Woodland
- Plantation
- Shrubland
- Grassland/ Shrubland
- Grassland
- Seasonally Wet Grassland
- Agricultural Land

- Orchard
- Channelised Watercourse
- Watercourse
- Pond
- Developed Area

The distribution of each habitat type is shown in the Habitat Map in **Figures 9.2a to 9.2d**. The areas of each habitat type within the Study Area and Project Site are listed in **Table 9.3** and **Table 9.4** respectively.

**Table 9.3: Habitats Present in the Study Area (excluding the Project Site)**

Habitat	Study Area	
	Area (ha)	%
Secondary Woodland	39.83	11.92
Plantation	33.10	9.90
Shrubland	16.31	4.88
Grassland/ Shrubland	5.94	1.78
Grassland	109.50	32.77
Seasonally Wet Grassland	4.64	1.39
Agricultural Land	14.49	4.33
Orchard	8.21	2.46
Channelised Watercourse	1.13	0.34
Watercourse	2.60	0.78
Pond	7.88	2.36
Developed Area	90.58	27.10
<b>Total</b>	<b>334.19</b>	<b>100.00</b>

**Table 9.4: Habitats Present in the Project Site**

Habitat	Proposed Development Area		Proposed Road Improvement Works	
	Area (ha)	%	Area (ha)	%
Grassland	11.03	59.71	0.07	3.18
Grassland/Shrubland	2.94	15.91	-	-
Orchard	0.43	2.33	-	-
Plantation	2.98	16.1	0.76	34.82
Developed Area	1.1	5.95	1.35	62.00
<b>Total</b>	<b>18.48</b>	<b>100</b>	<b>2.17</b>	<b>100</b>

Representative photographs of each type of habitats are illustrated in **Plates 1 to 12** in **Appendix 9.1**.



#### 9.4.3.1 Habitats within the Project Site

Habitats within the Project site include grassland, grassland/shrubland, plantation, orchard and developed area. Most plant species recorded are common and typical to these habitats, except Ladies Tresses *Spiranthes sinensis*, Fortune's Keteleeria *Keteleeria fortunei* and Cycad-fern *Brainea insignis* which were observed in grassland within the Project site beside a U-channel and close to the existing road separately. List of flora species recorded within each habitat within the Project site is provided in **Appendix 9.2**.

##### Plantation

The plantation habitat within the Project site comprises of hillside plantation and roadside plantation. Roadside plantation of tall and relatively mature trees planted for screening purpose is dominated by *Acacia confusa*, *Acacia auriculiformis*, *Acacia mangium*, *Melaleuca cajuputi* subsp. *cumingiana* and *Lophostemon confertus* along the existing Kong Nga Po Road. Due to limited management over time, natural colonization primarily by small trees and shrubs is ongoing in its understorey. These understorey species usually include *Litsea cubeba*, *Litsea glutinosa*, *Bridelia tomentosa*, *Macaranga tanarius* var. *tomentosa*, *Panicum maximum*, *Miscanthus floridulus*, *Aporosa dioica*, and *Lantana camara*. However, there is evidence showing that such succession was halted by a recent fire at several locations where most crowns of the trees are burned and the understory vegetation has largely gone.

Hillside plantations for the purposes of soil erosion control and landscape integration are established at the slopes and hills behind the roadside plantation within the KNP Development Area. Although linked to the nearby upland shrubland and grassland/shrubland, its ecological function is compromised by the domination of exotic species such as *Acacia mangium*, *Acacia auriculiformis* and *Pinus elliottii*. These exotic trees would impede the recovery process of native forest. In addition, the ground cover vegetation of the hillside plantations, which mainly comprises of *Dicranopteris pedata*, *Palhinhaea cernua*, *Helicteres angustifolia*, and *Melastoma dodecandrum*, is limited, probably due to a recent hill fire, which further reduces the ecological value of these areas.

At least two individuals of Cycad-fern *Brainea insignis* were present in this habitat where evidence of recent burning was observed (see **Figure 9.2d** for the indicative location). In China, the status of this fern is "VU" (AFCD, 2003), and it is under State Protection (Category II).

More than 80 individuals of *Keteleeria fortunei* of various sizes were recorded along both sides of Kong Nga Po Road, east of Boarder District Police Headquarters from the combination of both ecological field survey and LVIA broad-brush tree survey. They are estimated to be less than 25 years of age. Wild-grown individuals of this species are regarded as "Very Rare" in Xing *et al.* (2000) and classified as "Near Threatened" in IUCN Red List (2015). It is considered as "VU" in China Plant Red Data Book (AFCD, 2003). In Hong Kong, this species is protected under the Forestry Regulations Cap. 96A.

##### Grassland

Most of the upland areas within the KNP Development Area are covered by grassland. This habitat, similar to many other hillside grasslands in Hong Kong, receives periodic hill fires which prevent it from

succeeding into the next stage of higher structural complexity. The structure of grassland is generally open and simple, with an average plant height of half to one metre. A number of fire-resistant plant and/or light-demanding species dominate the habitat, which include *Dicranopteris pedata*, *Imperata cylindrica* var. *major*, *Rhaphiolepis indica*, *Rhodomyrtus tomentosa* and *Smilax china*. Isolated trees such as *Cratoxylum cochinchinense*, *Phyllanthus emblica*, *Rhus succedanea*, *Litsea glutinosa*, and *Trema tomentosa* were also recorded in the habitat.

An orchid species, Ladies' Tresses *Spiranthes sinensis*, was found to have a small population in the grassy area in the eastern portion of the KNP Development Area (see **Figure 9.2b** for the indicative location). In the family of Orchidaceae, *S. sinensis* is locally protected under Cap. 96A and Cap. 586. It is regarded as "Very Common" in Xing *et al.* (2000), and "Abundant Widespread" in The Wild Orchids of Hong Kong (Barretto *et al.*, 2011). This species in Hong Kong usually grows in damp but well-drained sunny locations. Within the Project site, its population is at least 20 individuals based on the observation in March 2015, when the plants were flowering and therefore very conspicuous. In addition, several small populations of Cycad-fern *Brainea insignis* were found in the grassy area adjacent to the access road at the upland, flat area (see **Figure 9.2d** for indicative location).

#### Grassland / Shrubland

As an intermediate between grassland and shrubland, grassland/shrubland is a widespread habitat in Hong Kong. Its balance between grasses and shrubs varies as a result of the increase or decrease in fire frequency. Within the Project site, natural succession of vegetation from grassland to grassland/shrubland occurs where the land on hillsides has been left undisturbed by fires for several years. If such lacking of disturbance remains, the area could continue to succeed to shrubland and ideally secondary woodland over time. Additionally, the speed of succession to shrubland also depends on the soil and hydrological conditions present at the site.

Dominant shrub species of this habitat include *Bridelia tomentosa*, *Ficus hispida*, *Glochidion hirsutum*, *Rhodomyrtus tomentosa* and *Rhaphiolepis indica*, while some of the most abundant grasses/ herbs are *Cymbopogon tortilis*, *Miscanthus floridulus*, *Panicum maximum* and *Sesbania cannabina*. Among the small tree groups that occur in this habitat, the invasive weed *Leucaena leucocephala* is the most abundant. Its dominance along the fringe of grassland/shrubland and spreading into the adjacent plantation blur the boundary of these two habitats.

#### Developed Area

Developed area within the Project site mainly refers to the existing Kong Nga Po Road and some access roads/ tracks that branch off the Road and some areas outside the pig farms in the southern portion of the Project site. Most of these areas are paved with concrete, therefore supporting limited flora species in terms of both diversity and abundance. Vegetation of this habitat is primarily weedy grasses and herbs along roadside verges, of which the common species include *Bidens alba*, *Cynodon dactylon*, *Chloris barbata* and *Tridax procumbens*.

## Orchard

A small portion of the orchard to the south of the pig farm falls within the southern fringe of the Project site. Sharing the same flora species composition with the rest part within the Study Area, the orchard is cultivated with fruit crops including *Artocarpus heterophyllus*, *Carica papaya*, *Eriobotrya japonica*, *Litchi chinensis* and *Clausena lansium*. This habitat is subject to regular vegetation management (including weeding) and human disturbance, which result into a general paucity of ground cover vegetation and a low level of overall flora diversity of the habitat.

### 9.4.3.2 Habitat within the Study Area

#### Secondary Woodland

A number of woodland patches are scattered across the Study Area, either as woodland regenerated from plantation along hillside or as remnants of old woods behind villages in lowland areas.

Naturally regenerated woodland usually border large areas of plantation within the Study Area. In these wooded areas, trees which are common in young secondary woodland (e.g. *Acronychia pedunculata*, *Mallotus paniculatus*, *Machilus pauhoi*, *Schefflera heptaphylla*, *Sapium discolor* and *Sterculia lanceolata*) out-compete *Acacia* spp. and *Pinus massoniana* which still dominate the adjacent plantation, and become dominant in the overstorey. The understorey of these secondary woodland patches is dominated by shrub species such as *Psychotria asiatica*, *Ligustrum sinense*, *Litsea rotundifolia* var. *oblongifolia*, and the climbing shrubs *Desmos chinensis*, *Mussadena pubescens* and *Uvaria macrophylla*. The woodland structure and the dominance of light-demanding plant species suggest that these woodlands are relatively young and at the early stage of woodland succession.

The woodland areas in the village environ are disturbed by human activities, and their understorey vegetation ground cover are sparse. Woodland in these areas supports several large trees such as *Cinnamomum camphora*, *Celtis sinensis* and *Melia azedarach*, and the woodland fringes are characterized by a mixture of fruit trees (e.g. *Artocarpus heterophyllus*, *Dimocarpus longan*, *Litchi chinensis* and *Mangifera indica*) and some self-sown tree species (e.g. *Bridelia tomentosa*, *Macaranga tanarius* var. *tomentosa* and *Melia azedarach*).

Flora diversity of the woodland habitat within the Study Area is relatively high, with a total of 228 plant species recorded (refer to **Appendix 9.2**). A few saplings and mature tree specimens of *Aquilaria sinensis* were recorded in this habitat. This species is common in lowland woodland, but is locally protected under Cap. 586. It is also listed as "Vulnerable" in China Plant Red Data Book, and under State protection (Category II) in China (AFCD, 2003). In the IUCN Red List (2015), it is classified as "Vulnerable".

## Plantation

Most of the hillside plantation at Kong Nga Po and Cheung Po Tau are dominated by widely planted tree species *Acacia confusa*, *Acacia auriculiformis*, *Acacia mangium*, *Melaleuca cajuputi* subsp. *cumingiana*, *Lophostemon confertus*, *Pinus massoniana* and *Eucalyptus* spp. They formed semi-closed canopies at a

largely uniform height of about 10m. Although plantations in general have the features of low species diversity and simpler structure compared to secondary woodland of similar age, the hillside plantations in the Study Area are relatively old, and therefore have a relatively well-developed understorey. Many young, native trees grow vigorously at this level, which include *Acronychia pedunculata*, *Bridelia tomentosa*, *Litsea cubeba*, *Litsea glutinosa*, *Microcos nervosa*, *Sapium discolor* and *Sterculia lanceolata*. In terms of ground cover, it is dominated by *Imperata cylindrica* var. *major*, *Miscanthus floridulus*, *Panicum maximum* and *Microstegium ciliatum*.

The plantation habitat within the Study Area also includes some small areas of plantation at Sandy Ridge Cemetery. Tree composition in these areas is very different from that of hillside plantation, as people consider the landscaping function rather than the adaptability to poor soil conditions when they choose tree species to suit the cemetery environment. As a result, these plantations comprise more diverse landscaping plants, including *Dalbergia assamica*, *Delonix regia*, *Cycas revoluta*, *Platyclusus orientalis* and *Araucaria heterophylla*.

A total of 197 plant species were recorded in this habitat (refer to **Appendix 9.2**). These include four flora species of conservation importance, i.e. *Aquilaria sinensis*, *Keteleeria fortunei*, *Pecteilis susannae* and *Spathoglottis pubescens*. Two individuals of Incense Tree were located along the road leading to Boarder District Police Headquarters. More than 50 individuals of *K. fortunei* of various sizes were recorded along both sides of Kong Nga Po Road, east of Boarder District Police Headquarters. Wild-grown individuals of this species are regarded as "Very Rare" in Xing *et al.* (2000) and classified as "Near Threatened" in IUCN Red List (2015). It is considered as "VU" in China Plant Red Data Book (AFCD, 2003). In Hong Kong, this species is protected under the Forestry Regulations Cap. 96A. Two flowering orchid species *P. susannae* and *S. pubescens* were found along the road leading to Table Hill Service Reservoir at Cheung Po Tau. As members of the family Orchidaceae, both of them are locally protected under Cap. 96A and Cap. 586. The former species is regarded as Restricted in Xing *et al.* (2000) and Infrequent Restricted in The Wild Orchids of Hong Kong (Barretto *et al.*, 2011), while the latter is regarded as Very Common in Xing *et al.* (2000) and Abundant Widespread in The Wild Orchids of Hong Kong (Barretto *et al.*, 2011).

### Shrubland

Within the Study Area, hillside shrubland is found in the areas that have not been burned for at least a decade. In these areas, grassland has been invaded by shrub species in the period of no fire. Typical shrub species include *Rhodomyrtus tomentosa*, *Litsea rotundifolia* var. *oblongifolia*, *Melastoma sanguineum*, *Rhaphiolepis indica*, along with woody climbers *Embelia laeta* and *Zanthoxylum nitidum*.

In lowland areas, patches of shrubland are located at Hung Lung Hang, where they are surrounded by car parks and open storage. Disturbance caused by human activities may impede succession of the shrubland in these areas. While the weedy tree *Leucaena leucocephala* dominates some areas, the lowland shrubland is dominated by native species such as *Bridelia tomentosa*, *Ficus hispida*, *Litsea glutinosa*, *Ligustrum sinense* and *Rhus succedanea*, with an average height ranging from 2 to 4m. The understorey consists of ferns (e.g. *Blechnum orientale* and *Cyclosorus parasiticus*) and herbs (e.g. *Alocasia macrorrhizos*, *Panicum maximum*, *Pennisetum purpureum*, *Cuscuta chinensis* and *Wedelia trilobata*),

which again reflect the disturbed nature of the habitat. List of flora species recorded within this habitat is provided in **Appendix 9.2**.

#### Grassland

Upland grassland is the most extensive habitat present within the Study Area. Due to the proximity to grave sites and inhabited villages, these grassy areas are exposed to regular hill fires, and the species that dominate the habitat are largely fire-resistant and/or fast-regenerated. These species include grasses/herbs *Cymbopogon tortilis*, *Ischaemum barbatum* and *Imperata cylindrica* var. *major*, climbers *Smilax china* and *Passiflora foetida*, and the creeping fern *Dicranopteris pedata*.

Despite occasional scattered shrubs and isolated small trees, this habitat is generally open and simple in structure and has an average plant height of 1 to 2m. A total of 167 flora species were recorded in this habitat, as provided in **Appendix 9.2**. One flora species of conservation concern, Cycad-fern was found at the hill slope south of the road leading to the Table Hill Service Reservoir. In China, its status is "VU" (AFCD, 2003), and it is under State protection (Category II).

#### Grassland / Shrubland

The grassland/shrubland within the Study Area shares the same habitat characteristics and flora species composition with that in the Project site. List of flora species recorded within this habitat is provided in **Appendix 9.2**. The dominant shrub species of these areas include *Glochidion eriocarpum*, *Ilex asprella*, *Litsea rotundifolia* var. *oblongifolia*, *Melastoma malabathricum* and *Rhus chinensis*. When these shrubs shade out the existing grasses such as *Microstegium ciliatum*, *Miscanthus floridulus* and *Pennisetum purpureum*, the community becomes less flammable and more resilient to disturbances. In the absence of hill fires, the habitat would gradually develop into the next succession stage – shrubland.

#### Seasonally Wet Grassland

Seasonally wet grassland was identified to the south of Lo Wu Station Road. This low-lying habitat is derived from some abandoned agricultural fields. It could be flooded for a prolonged period in the wet season while the substrate of this area is dry in the dry season. Only 21 plant species were recorded in this habitat as provided in **Appendix 9.2**, which generally supports a rather simple structural complexity and is dominated by a low diversity of herbaceous plants. Common wetland-associated herbs have been established extensively in these grassy areas, including *Hedychium coronarium*, *Cyclosorus interruptus*, *Ludwigia hyssopifolia* and *Persicaria hydropiper*. Colonisation of shrubs or trees in this habitat was hardly observed.

#### Agricultural Land

Most of the agricultural lands present in the Study Area are active. In the eastern and northern portions of the Study Area (near Lo Wu Station Road and to the east of Sha Ling Road), they are relatively continuous and large in size, while in the central and southeastern portions of the Study Area, agricultural lands are

fragmented and confined to small areas only. List of flora species recorded within this habitat is provided in **Appendix 9.2**.

Typical crops and vegetables include *Brassica* spp., *Benincasa* spp., *Beta vulgaris*, *Cucurbita moschata*, *Ipomoea batatas*, *Lactuca sativa*, *Luffa acutangula* and *Solanum melongena*. Clumps of fruit trees such as *Musa x paradisiaca*, *Dimocarpus longan*, *Litchi chinensis*, *Citrus limonia*, *Artocarpus heterophyllus* and *Morus alba* were also present. Ground vegetation is generally dominated by common herbaceous species including *Ageratum* spp., *Bidens alba*, *Hedyotis auricularia*, *Kyllinga* spp., *Lindernia* spp., *Oxalis* spp. and *Youngia japonica*.

In a small piece of cultivated land near San Uk Ling Holding Centre, several individuals of Tea *Camellia sinensis* were observed grown in the field. Individuals of this species in their wild form are regarded as Rare by Xing *et al.* (2000) and locally protected by Cap.96A.

#### Orchard

Orchards of various sizes were identified to the south of Lo Wu Station Road, to the north and south of Kong Ng Po Road, and in San Uk Ling and Hung Lung Hang areas. List of flora species recorded within this habitat is provided in **Appendix 9.2**. These orchards are usually cultivated with economic fruit trees such as *Artocarpus heterophyllus*, *Averrhoa carambola*, *Carica papaya*, *Dimocarpus longan*, *Litchi chinensis*, *Mangifera indica* and *Musa x paradisiaca*, but some young woodland species (e.g. *Machilus pauhoi*, *Melicope pteleifolia* and *Microcos nervosa*) could also been found within the habitat due to its proximity to the woodland. Although the areas are under intensive management, vegetation has colonises the ground spontaneously, which is mostly composed of weedy herbaceous species, in particular the herbs *Alocasia macrorrhizos*, *Bidens alba*, *Cynodon dactylon*, *Eleusine indica* and *Panicum maximum*.

#### Watercourse and Channelised Watercourse

Watercourses flow through the agricultural lands, villages and wooded areas within the Study Area. Whilst some of these watercourses have gone through bank modification and channelization, partly or wholly, the majority of them retain natural features including stream bed and riparian vegetation. However, due to the small size of these natural and semi-natural watercourses, their riparian zones are narrow, with the riparian vegetation integrating immediately into the adjacent woodlands and grasslands. Stream-associated plants that grow on the stream beds include *Commelina diffusa*, *Cyclosorus interruptus*, *Cyperus involucratus*, and *Persicaria* spp., and the dominant species in their riparian zones include *Alocasia macrorrhizos*, *Blechnum orientale*, *Sterculia lanceolata*, *Desmos chinensis* and *Ligustrum sinense*. List of flora species recorded within this habitat is provided in **Appendix 9.2**.

A number of seasonal watercourses were found on the slopes of Sandy Ridge, on southern side of Kong Nga Po Road, and along the foothills of Cham Shan; these are primarily gullies which were formed by water erosion and, after formation, channel water running down the hills after heavy rains. They feed into larger, permanent watercourses or drainage channels. Given the ephemeral nature and variation in flow between years, their locations and extent cannot be exactly mapped. These seasonal and permanent watercourses are collectively labeled as watercourses on the habitat map. In addition, two entirely



channelized watercourses are located to the north of Lo Wu Station Road and at Cheung Po Tau. Their concrete bottoms and banks eliminate the colonisation of most plants.

### Pond

All the ponds in the Study Area are located outside of the Project site. Ponds with open water and of various sizes were identified to the south of Lo Wu Station Road, at Sandy Ridge and to the west of the Project site. They are usually associated with agricultural lands and/or orchards. No evidence of fish farming activities (e.g. air pumping or storage of fish food) was observed. List of plant species recorded within this habitat is provided in **Appendix 9.2**. Aquatic plants such as *Nelumbo nucifera*, *Eichhornia crassipes* and *Pistia stratiotes* are present at some of these ponds, sometimes in high abundance. On the pond bunds, dominant vegetation are grassy and herbaceous species such as *Alocasia macrorrhizos*, *Bothriochloa bladhii*, *Conyza sumatrensis*, *Kyllinga polyphylla* and *Imperata cylindrica* var. *major*, along with isolated clumps of fruit trees including *Musa x paradisiaca*, *Morus alba* and *Dimocarpus longan*.

Abandoned ponds are also present. These are overgrown with grasses such as *Microstegium ciliatum*, *Brachiaria mutica*, *Cyclosorus interruptus*, *Ludwigia octovalvis*, *Panicum maximum* and *Tithonia diversifolia*, which are tangled with climbers *Ipomoea cairica*, *Lygodium japonicum* and *Mikania micrantha*.

### Developed Area

Developed area found within the Study Area comprises roads, villages, car parks, open storage and government institutions.

The baseline surveys recorded 256 plant species in this habitat as provided in **Appendix 9.2** and most of the species are common in Hong Kong. The dominant plants include ornamental trees and shrubs (e.g. *Aleurites moluccana*, *Delonix regia*, *Elaeocarpus sylvestris*, *Juniperus chinensis*, *Lagerstroemia speciosa*, *Livistona chinensis*, *Osmanthus fragrans*, *Pterocarpus indicus*, and *Senna siamea*) and fruit trees (e.g. *Litchi chinensis*, *Dimocarpus longan*, *Artocarpus heterophyllus* and *Psidium guajava*). Other plants include weedy vegetation along roadside verges which are common to this habitat type (e.g. *Paederia scandens*, *Panicum maximum*, *Pueraria lobata* and *Wedelia trilobata*).

Several individuals of Japanese Tea *Camellia japonica* were observed cultivated in a garden of a single storey house north of the EPD Sha Ling Livestock Waste Control Centre. In the genus of *Camellia*, this species is locally protected by Cap.96A.

#### 9.4.3.3 Floral Species of Conservation Interest

##### Literature Review

Incense Tree *Aquilaria sinensis* was recorded within the Study Area. It is scheduled under Cap. 586. It is also listed under State protection (Category II) in Mainland China. Nevertheless, this species is common in Hong Kong.

*Aralia chinensis* is considered common in Hong Kong and recorded within the Study Area beside footpaths. Although not legally protected in Hong Kong, this species is listed as vulnerable under the IUCN Red List of Threatened Species.

Cycad-fern *Brainea insignis* was recorded within the Project site. Although not legally protected in Hong Kong, this species is listed in *Rare and Precious Plants of Hong Kong* (AFCD, 2003) and is considered vulnerable in China.

Night-blooming *Cereus Hylocereus undatus*, which belongs to the family Cactaceae, is also scheduled under Cap. 586. It is recorded in the village area within the Study Area. It is a non-native species often planted as ornamental or food plant. The observed individuals are probably intentionally planted by villagers.

A protected floral species Fortune's Keteleeria *Keteleeria fortunei* is found on both sides of Kong Nga Po Road within both the Project Area and Study Area. It is protected under the Forestry Regulations. The individuals observed are restricted to the roadside and are probably intentionally planted as roadside amenity trees.

Hong Kong Pavetta *Pavetta hongkongensis* is recorded in various locations within the Study Area but outside the Project site. Although this species is considered common in Hong Kong, it is protected under the Forestry Regulations.

Within the Study Area, several species of orchids were recorded. All orchids in Hong Kong are protected under the Forestry Regulations except "plants grown outside Hong Kong or on any land held from the Government under a lease, licence or permit or by virtue of an Ordinance". For the orchid species within the Study Area, two of them, namely *Cattleya* sp. and *Oncidium* sp., belong to genera non-native to Hong Kong. *Cattleya* sp. was recorded in a planting area within the Livestock Waste Composting Plant and *Oncidium* sp. was recorded growing in the front garden of a village house. These two species were very unlikely wild-grown but imported and planted intentionally as ornamental plants. Hence, these two species are not protected under the Forestry Regulations. Nevertheless, they are scheduled under Cap. 586.

The remaining orchid species Dense-flowered Geodorum *Geodorum densiflorum*, Common Pecteilis *Pecteilis susannae* and Buttercup Orchid *Spathoglottis pubescens* are native orchids. *Geodorum densiflorum* was recorded on hillside grassland beside a footpath within the Study Area; *Pecteilis susannae* and *Spathoglottis pubescens* were observed beside an access road leading to the Table Hill Service Reservoir. These species are likely wild orchids and hence species of conservation interest protected under both the Forestry Regulations and Cap. 586. *Geodorum densiflorum* is considered locally uncommon and vulnerable in Hong Kong; *Pecteilis susannae* is considered endangered in Hong Kong; *Spathoglottis pubescens* is widespread and considered least concern in Hong Kong.

## Field Survey Findings

Seedlings of Incense Tree *Aquilaria sinensis* were observed within and adjacent to the Project site during the tree group survey in early 2015. However, subsequent to the hill fire(s) within the Study Area in



March/April 2015, the observed seedlings of Incense Tree *Aquilaria sinensis* were no longer found at the same locations. They were likely to have been eliminated by the hill fire(s) in March/April 2015.

A native orchid species Ladies Tresses *Spiranthes sinensis* was observed within the Project site beside a U-channel. It is protected under both the Forestry Regulations and Cap. 586. It is considered common and widespread and of least concern in Hong Kong. Cycad-fern *Brainea insignis* was observed in grassland within the Project site close to the existing road.

It is noted during the field surveys that the extensive hillside grassland within the proposed Development Area and some plantation and grassy areas within the Study Area including Cheung Po Tau had been subject to a large-scaled hill fires by the first field survey on 12 March 2015. After the fires, bare ground was exposed as much of the ground vegetation had been burnt, and most trees are scorched black. Some of the site photos taken in March and April 2015 are shown in **Plates 13 to 17** in **Appendix 9.1**.

#### 9.4.4 Bird

The Study Area of this Project mainly covers terrestrial habitats except some watercourses and ponds. Similar to other inland areas in the northeast New Territories, the Study Area generally lacks a continuous wetland system to support waterbird community. The only wetland for waterbirds within the Study Area located at the western edge of the Study Area, i.e. the wet agricultural land and ponds located southwest to Sandy Ridge, next to Lo Wu Station Road. Therefore, the majority of avifauna record within the whole Study Area comprises mainly terrestrial bird species, with relatively low occurrence of wetland-dependent avifauna restricted by the limited wetland available.

##### 9.4.4.1 Literature Review

Relevant studies providing local avifauna information were reviewed. These studies included the Breeding Bird Survey conducted by the HKBWS in 1993-1996 (Carey *et al.*, 2001), and survey findings of the CA Study (Ove Arup, 2010), NENT NDAs Study (Ove Arup, 2013), OWTF2 EIA (MMHK, 2013) and the KNP PER (MMHK, 2014).

The breeding bird survey is a grid analysis for all the breeding and potentially breeding bird species in Hong Kong. The results were illustrated in grid format (1km<sup>2</sup> grid or 5km<sup>2</sup> grid for some raptor species. In area overlapping with the Study Area of the Project, around 24 species were recorded by the Breeding Bird Survey. The majority of these species are common and widespread in Hong Kong except Bonelli's Eagle *Aquila fasciata* and Black Baza *Aviceda leuphotes* which are uncommon and species of conservation interest. Amongst these species of conservation interest, Black Baza is an uncommon passage migrant and scarce summer visitor. There is only one confirmed local breeding record dated in year 1989 (Carey *et al.*, 2001) and this species has been recorded in only one of the grids overlapping the Study Area. Therefore, the results of the Breeding Bird Survey for Black Baza probably included migratory individuals. Details of the breeding bird survey records are presented in **Table 9.5**.

The field survey for the CA Study (Ove Arup, 2010) recorded two species of “conservation importance”, including Black Kite *Milvus migrans* and White-throated Kingfisher *Halcyon smyrnensis*, in Kong Nga Po area. These two species are quite common and widespread in Hong Kong.

The CA Study also conducted avifauna survey in the area of wet agricultural land and fishponds south to the Sandy Ridge cemetery where partially covered by the Study Area of this Project. The bird community of this area was found very similar to that of Long Valley in the vicinity. A total number of 21 bird species of conservation importance and/or wetland-dependent species were recorded at that area. These 21 bird species included Little Grebe *Tachybaptus ruficollis*, Grey Heron *Ardea cinerea*, Great Egret *Ardea alba*, Intermediate Egret *Egretta intermedia*, Eastern Cattle Egret *Bubulcus coromandus*, Chinese Pond Heron *Ardeola bacchus*, Black-crowned Night Heron *Nycticorax nycticorax*, Cinnamon Bittern *Ixobrychus cinnamomeus*, Eurasian Teal *Anas crecca*, White-breasted Waterhen *Amaurornis phoenicurus*, Greater Painted-snipe *Rostratula benghalensis*, Common Snipe *Gallinago gillinago*, Black-winged Stilt *Himantopus himantopus*, Little Ringed Plover *Charadrius dubius*, Wood Sandpiper *Tringa glareola*, Green Sandpiper *Tringa ochropus*, Common Sandpiper *Actitis hypoleucos*, Pied Kingfisher *Ceryle rudis*, White-throated Kingfisher, Chinese Grosbeak *Eophona migratoria* and Red-billed Starling *Spodiopsar sericeus*. The report indicated that the active and inactive wet agricultural areas and fishponds south to the Sandy Ridge cemetery support a range of wetland-dependent bird species and probably a breeding population of Greater Painted-snipe which is a flagship wetland-dependent species in Long Valley. Details of the species recorded were presented in **Table 9.5**.

The ecological study for NENT NDAs Study has covered the Cheung Po Tau area, where it overlapped with the fringe of Study Area of this Project, due to the construction of Fanling North Freshwater Service Reservoir. During the course of field survey of NENT NDAs Study (Ove Arup, 2013), calls of nocturnal bird species of conservation interest, Grey Nightjar *Caprimulgus jotaka*, was recorded in upland grassland near Cheung Po Tau where partially located within the Study Area of this Project. Grey Nightjar is considered to be of “Local Concern” (Fellowes *et al.*, 2002), and is a locally distributed summer visitor and passage migrant (Allcock *et al.*, 2012). There is only one breeding record of Grey Nightjar in Hong Kong (Carey *et al.*, 2001), however, it is considered to breed in upland grassland/shrubland areas in a number of locations in the New Territories (Ove Arup, 2013). Details of the species recorded were presented in **Table 9.5**.

The EIA report of OWTF2 showed that a total number of 46 bird species were recorded within its Study Area (MMHK, 2013), which is entirely covered by the Study Area of this Project. The majority of the recorded species was common and widespread in Hong Kong with no conservation interest, except a few including Little Grebe, Chinese Pond Heron, Black Kite, Greater Coucal, Lesser Coucal, Collared Scops Owl and White-throated Kingfisher. Details of the species recorded were presented in **Table 9.5**.

Ecological study in Kong Nga Po area was carried out under the KNP PER Study (MMHK, 2014). In the course of the field surveys, a total number of 50 bird species were recorded of which the majority is terrestrial and resident species in Hong Kong (MMHK, 2014). Eleven out of these 50 bird species were considered to be of conservation interest and recorded within the Study Area. These 11 species included Pacific Swift, Chinese Pond Heron, Lesser Coucal, Greater Coucal, Little Egret, Hwamei, Asian Barred Owl, White-throated Kingfisher, Black Kite, Black-crowned Night Heron and Collared Scops Owl. Details of the species recorded were presented in **Table 9.5**.

### Man Kam To Road Egret

Man Kam To Road Egret is located at Man Kam To Road roadside at the section between Hung Kiu San Tsuen and Ng Tung River, outside the Study Area. The egret was first identified in year 2009 with a maximum of 15 Chinese Pond Heron nests during the course of ecological field surveys of NENT NDAs Study (Ove Arup, 2013). During June and July 2012, the Man Kam To egret was cleared by the removal of some bamboos which forms the main part of the egret and pruning of some of the mature trees nearby, leading to a drastic drop of total number of nests from 23 in June to 5 in July 2012. The egret was observed re-occupied in 2013 (Ove Arup, 2013). In 2014, there were 32 nests in total at Man Kam To Road Egret, comprised of 5 nests of Little Egret and 27 nests of Chinese Pond Heron (Anon, 2014).

Besides egret count survey, flight line surveys have also been carried out at the Man Kam To Road Egret during June to July 2009 and May to July 2011 (Ove Arup, 2013). The result of the flight line surveys indicated that the majority of birds (67.4%) flew towards the southwest direction, either to the Ng Tung River (46.4% of birds) or directly over the developed land to the southwest (21.0% of birds). A moderate proportion of birds (13.5%) flew east along the Ng Tung River. Only a few birds (4.4%) flew towards the northeast where the Study Area of this Project locates.

#### 9.4.4.2 Field Survey Findings

Sixty-eight avifauna species were recorded during the ecological surveys, 35 species within the Project site and 64 species within the Study Area. Amongst these 68 species, nineteen species are of conservation importance. They are Little Grebe, Yellow Bittern, Black-crowned Night Heron, Chinese Pond Heron, Eastern Cattle Egret, Grey Heron, Little Egret, Great Cormorant, Crested Serpent Eagle, Crested Goshawk, Black Kite, Common Emerald Dove, Greater Coucal, Lesser Coucal, Collared Scops Owl, Eurasian Eagle Owl, White-throated Kingfisher, Common Kestrel and Collared Crow.

For the six bird species of conservation importance recorded within the Project site, Great Cormorant and Black Kite were observed flying over the uphill grassland, calls of Greater Coucal and Lesser Coucal were heard during day-time surveys in their recorded habitats, Collared Scops Owl was heard during a night-time survey from the plantation habitat and the recorded individual of Eurasian Eagle Owl was in flight after being flushed from short grasses near to the road during a night-time survey.

Birds species recorded during the surveys and their abundance are summarised in **Appendix 9.3**, and the locations of the bird species of conservation importance are shown in **Figures 9.2a to 9.2d**. It should be noted that bird is a highly mobile fauna group and these mapped indicative locations may not indicate the species use of the Study Area.

### Egret Survey

Man Kam To Road Egret and its satellite are situated at least 1,100m away from the southern boundary of the KNP Development Area. Man Kam To Road Egret is located at a small tree group of *Celtis sinensis*, *Callistemon viminalis*, *Acacia auriculiformis* and bamboo along Man Kam To Road, and thus receives intensive disturbance arising from the heavy vehicle traffic. With regard to the satellite of the Man

Kam To Road Egret, ardeids built their nests primarily on a large tree of *Ficus microcarpa* at an abandoned meander of Ng Tung River. Behind the meander there is an open storage, where container trucks movements are regular during the day time. The indicative extents of these two nesting locations are outlined on **Figure 9.3**.

During the egret surveys from April to July 2015, low numbers of adult ardeids were observed utilizing the two egret, with the maximum of 19 and 17 nests recorded at the Man Kam To Road Egret and its satellite respectively. Based on the survey findings, the Man Kam To Road Egret was used mainly by Chinese Pond Heron, while its satellite was used by both Chinese Pond Heron and Little Egret. The surveys confirm that both egrets were active in the ardeid breeding season of 2015; however, it is difficult to define the status of each nest based on four snapshot surveys. This is because an empty nest observed at a particular time of survey may be used at the other time of the breeding season. Therefore, those unoccupied nests at each time of survey are categorized as “unknown”, rather than “abandoned”.

Detailed nest data of the two egrets recorded monthly in the ardeid breeding season of 2015 are listed in **Table 9.6**.

**Table 9.5: Avifauna species of conservation interest recorded within Study Area**

Common Name	Scientific Name	Level of Concern / Protection Status <sup>(1)</sup>	Hong Kong Status <sup>(2)</sup>	Carey <i>et al.</i> (2001)	Ove Arup (2010) / (2013)	OWTF2 (MMHK 2013)	KNP PER (MMHK 2014)	Field Survey 2015
Eurasian Teal	<i>Anas crecca</i>	RC	abundant but declining winter visitor		✓			
Little Grebe	<i>Tachybaptus ruficollis</i>	LC	common all year		✓	✓		✓
Yellow Bittern	<i>Ixobrychus sinensis</i>	(LC)	common passage migrant in spring to summer with scarce winter record					✓
Cinnamon Bittern	<i>Ixobrychus cinnamomeus</i>	LC	uncommon passage migrant and scarce summer visitor		✓			
Black-crowned Night Heron	<i>Nycticorax nycticorax</i>	(LC)	common resident and migrant		✓		✓	✓
Chinese Pond Heron	<i>Ardeola bacchus</i>	PRC (RC)	winter, migrant and breeding population in widespread wetlands and damp areas		✓	✓	✓	✓
Eastern Cattle Egret	<i>Bubulcus coromandus</i>	LC	common and widespread in freshwater wetland and short grassland, with winter, migrant and breeding populations		✓			✓

Common Name	Scientific Name	Level of Concern / Protection Status <sup>(1)</sup>	Hong Kong Status <sup>(2)</sup>	Carey <i>et al.</i> (2001)	Ove Arup (2010) / (2013)	OWTF2 (MMHK 2013)	KNP PER (MMHK 2014)	Field Survey 2015
Grey Heron	<i>Ardea cinerea</i>	PRC	abundant winter visitor to Deep Bay; scarce in summer		✓			✓
Great Egret	<i>Ardea alba</i>	PRC (RC)	abundant all year		✓			
Intermediate Egret	<i>Egretta intermedia</i>	RC	uncommon but present all year		✓			
Little Egret	<i>Egretta garzetta</i>	PRC (RC)	abundant and present all year				✓	✓
Great Cormorant	<i>Phalacrocorax carbo</i>	PRC	abundant winter visitor					✓
Black Baza	<i>Aviceda leuphotes</i>	Cap. 586	scarce migrant and summer visitor	✓				
Crested Serpent Eagle	<i>Spilornis cheela</i>	Cap. 586, (LC), CRDB (V), CSMPS (II)	locally common, present all year and probably largely resident in woodland					✓
Crested Goshawk	<i>Accipiter trivirgatus</i>	Cap. 586, CRDB (R), CSMPS (II)	common resident in woodland throughout HK					✓
Black Kite	<i>Milvus migrans</i>	Cap. 586, CSMPS (II), (RC)	abundant, present all year and widespread		✓	✓	✓	✓
Bonelli's Eagle	<i>Aquila fasciata</i>	Cap. 586, CRDB (R), RC	uncommon and locally distributed resident	✓				
Black-winged Stilt	<i>Himantopus himantopus</i>	RC	common winter visitor and migrant		✓			
Little Ringed Plover	<i>Charadrius dubius</i>	(LC)	common and present all year		✓			
Greater Painted-snipe	<i>Rostratula benghalensis</i>	LC	locally common resident breeding species		✓			
Wood Sandpiper	<i>Tringa glareola</i>	LC	common migrant and winter visitor		✓			
Common Emerald Dove	<i>Chalcophaps indica</i>	CRDB (V)	uncommon but widespread resident					✓
Greater Coucal	<i>Centropus sinensis</i>	CRDB (V), CSMPS (II)	widespread and common resident	✓		✓	✓	✓
Lesser Coucal	<i>Centropus bengalensis</i>	CRDB (V), CSMPS (II)	widespread but uncommon resident			✓	✓	✓
Collared Scops Owl	<i>Otus lettia</i>	Cap. 586, CSMPS (II)	widespread and common resident			✓	✓	✓
Eurasian Eagle Owl	<i>Bubo bubo</i>	Cap. 586, RC, CRDB (R), CSMPS (II)	scarce and locally-distributed resident in remote areas of hill slope grassland					✓

Common Name	Scientific Name	Level of Concern / Protection Status <sup>(1)</sup>	Hong Kong Status <sup>(2)</sup>	Carey <i>et al.</i> (2001)	Ove Arup (2010) / (2013)	OWTF2 (MMHK 2013)	KNP PER (MMHK 2014)	Field Survey 2015
Asian Barred Owl	<i>Glaucidium cuculoides</i>	Cap. 586	common though locally-distributed resident			✓	✓	
Grey Nightjar	<i>Caprimulgus jotaka</i>	LC	scarce passage migrant with some summer records		✓*			
Pacific Swift	<i>Apus affinis</i>	(LC)	common spring passage migrant and summer visitor with some autumn and a few winter records				✓	
White-throated Kingfisher	<i>Halcyon smyrnensis</i>	LC	common and present all year	✓	✓	✓	✓	✓
Pied Kingfisher	<i>Ceryle rudis</i>	(LC)	common resident		✓			
Common Kestrel	<i>Falco tinnunculus</i>	Cap. 586, CSMPS (II)	common autumn migrant and winter visitor					✓
Collared Crow	<i>Corvus torquatus</i>	LC, IUCN (NT)	locally common resident					✓
Chinese Hwamei	<i>Garrulax canorus</i>	Cap. 586	common and widespread resident				✓	
Red-billed Starling	<i>Spodiopsar sericeus</i>	GC	Abundant winter visitor with summer records including breeding in recent years		✓			
Chinese Grosbeak	<i>Eophona migratoria</i>	LC	common winter visitor and scarce breeding species in recent year		✓			

Notes:

(1) All wild birds are protected under the Wild Animals Protection Ordinance (Cap.170).

Abbreviations for Level of Concern/ Protection Status:

Cap.586 – Listed in Protection of Endangered Species of Animals and Plants Ordinance;

CSMPS – Ministry of Environmental Protection of the People's Republic of China (2002) China State Major Protection Status:

CSMPS (II) = Class II Protected Species;

CRDB – China Red Data Book: E = Endangered, V = Vulnerable, R = Rare, I = Intermediate (Zheng & Weng 1998);

IUCN – IUCN Red List of Threatened Species: NT= Near Threatened;

Level of Concern – LC = Local Concern, RC = Regional Concern, PRC = Potential Regional Concern, PGC = Potential Global Concern, GC = Global Concern, Letter in parentheses indicate that the assessment is on the basis of restrictedness in breeding and/or roosting sites rather than in general occurrence. (Fellowes *et al.* 2002)

(2) Hong Kong Status follows Allcock *et al.* (2013).

\* - Grey Nightjar was recorded in NENT NDAs Study (Ove Arup, 2013) only.

Table 9.6: Nest numbers, species type and plant species used as nesting substrate at Man Kam To Road Egrettry (MKT Egrettry) and its satellite (MKT Satellite Egrettry) recorded between April and July 2015

Egrettry	Survey Month (2015)	Ardeid Species			Total No. of Nests	Plant Species of Nesting Substrate
		Chinese Pond Heron	Little Egret	Unknown		
MKT Egrettry	April	4	-	2	6	<i>Celtis sinensis</i> , <i>Callistemon viminalis</i> , <i>Acacia auriculiformis</i> , <i>Bambusa sp.</i>
	May	13	-	6	19	
	June	10	-	5	15	
	July	4	-	7	11	
MKT Satellite Egrettry	April	6	1	2	9	<i>Ficus microcarpa</i>
	May	9	4	2	15	
	June	6	5	6	17	
	July	6	3	8	17	

#### 9.4.5 Mammal

In Hong Kong, large terrestrial mammals inhabit in areas with low anthropogenic activities and good vegetation coverage. The Project site and Study Area is grassland dominated habitat with low coverage of woodland area. Although human disturbance is relative low in the Study Area, the traffic on Kong Nga Po Road and the human activities associated with adjacent residential villages pose a constraint to the large terrestrial mammals. Therefore, the Project site and Study Area are deemed not a favorable environment for large terrestrial mammals.

##### 9.4.5.1 Literature Review

##### Non-flying Mammals

During the literature review, the records of non-flying terrestrial mammals of Hong Kong included in Shek (2006) and Shek *et al.* (2007) have been reviewed. However, no specific record within the Study Area was found.

At the western edge of the Study Area (i.e. agricultural area southwest to the Sandy Ridge), there is record of a single Eurasian Otter *Lutra lutra* (Ove Arup, 2010). This single individual of Eurasian Otter was found in one of the inactive fish ponds. Eurasian Otter is a semi-aquatic mammal which nests on land but forages in waters. It inhabits terrestrial areas nearby water bodies. Eurasian Otter has a highly restricted distribution in Hong Kong that confines to the northwest New Territories particularly the Mai Po Inner Deep Bay Ramsar Site (Shek, 2006). This is the only record of the species in area east to Ng Tung River. Eurasian Otter is listed as Near Threatened under the IUCN Red List of Threatened Species (IUCN, 2015) and regarded as "Vulnerable" in China Red Data Book (Wang, 1998). It is also considered to be of "Regional Concern" by Fellowes *et al.* (2002). Details of the species recorded were presented in **Table 9.7**.

The EIA report of OWTF2 revealed AFCD's unpublished records of signs of Red Muntjac *Muntiacus muntjak* within its project area, i.e. area near the Livestock Waste Composting Plant where it is next to the



KNP Project Site (MMHK, 2013). Red Muntjac is considered to be of “Potential Regional Concern” by Fellowes *et al.* (2002). In the course of the field survey for OWTF2, carcass of a widely distributed House Mouse *Mus musculus* was recorded on Kong Nga Po Road, which is within the road works area of this Project. Details of the species recorded were presented in **Table 9.7**.

The field surveys for the KNP PER recorded common and widely distributed Wild Boar *Sus scrofa* and Chestnut Spiny Rat *Niviventer fulvescens* in woodland and plantation habitats.

#### Bats

For bats, no locally-specific record involved within the Study Area was found in the literature Shek (2006) and Shek & Chan (2005 and 2006). Potential bat roosting habitat such as water tunnel, abandoned mines or cave habitat is present within the Study Area.

In the course of the field surveys of the CA Study (Ove Arup, 2010), Batbox Duet bat detector was used to detect all calls from foraging insectivorous bats. However, most of the calls from detected individuals could not be determined to species level even after using the BatScan program to analyse the calls. In San Uk Ling where partially covered by the Study Area of this Project, four species of bats were found with moderate abundance. On the other hand, three species of foraging insectivorous bats were recorded within Kong Nga Po with moderate abundance. The overall finding of the survey of that project showed that other parts of the FCA such as Tsung Yuen Ha, Ta Kwu Ling and Chow Tin have higher species diversity and abundance of foraging insectivorous bats.

The field surveys of the OWTF2 recorded a total number of 5 individuals of Short-nosed Fruit Bat *Cynopterus sphinx* (MMHK, 2013). This species is very common in Hong Kong’s urban areas. The field survey also found carcasses of unidentified Pipistrelle and Short-nosed Fruit Bat on a mist net at the orchard near the ponds where it is west to the Project site. Details of the species recorded were presented in **Table 9.7**.

In the course of field surveys of the KNP PER, nesting activities of Short-nosed Fruit Bat were observed under a few palm trees in plantation habitat (MMHK, 2014). Details of the mammal species of conservation concern were presented in **Table 9.7**.

#### 9.4.5.2 Field Survey Findings

A total of three mammal species, one in the Project site and two in the Study Area, including two unidentified bat species (in flight) and Eurasian Wild Pig, were recorded during the mammal survey conducted in 12 March, 18 March, 22 March, 27 May, 19 June, July 29 and 12 August 2015. During the surveys, no particular roosting or foraging sites for bats were observed.

Eurasian Wild Pig is a widely distributed species in Hong Kong, whilst all bat species are protected under (Cap. 170) Wild Animal Protection Ordinance. Eurasian Wild Pig was recorded within the grassland habitat of the Project site while the two unidentified bat species were recorded within agricultural land and developed area within the Study Area outside the Project site. The recorded mammal species and their



abundance are summarised in **Appendix 9.3**, and the locations of the two unidentified bat species are shown on **Figures 9.2a to 9.2d**. It should be noted that bats are a highly mobile fauna group and these mapped indicative locations may not indicate the species use of the Study Area.

Details of the mammal species of conservation concern recorded within the Study Area were presented in **Table 9.7**.

**Table 9.7: Mammal species of conservation interest recorded within the Study Area**

Common Name	Scientific Name	Level of Concern / Protection Status <sup>(1)</sup>	Status in Kong Kong <sup>(2)</sup>	Ove Arup (2010)	MMHK (2013)	MMHK (2014)	Field Survey 2015
<b>Bats</b>							
Short-nosed Fruit Bat	<i>Cynopterus sphinx</i>	Cap. 170 <sup>(3)</sup>	very common		✓	✓	
Unidentified Pipistrelle	--	Cap. 170 <sup>(3)</sup>	--		✓		
Unidentified Bat Species (Wingspan: approx. 30cm)	--	Cap. 170 <sup>(3)</sup>	--				✓
Unidentified Bat Species (Wingspan: approx. 15cm)	--	Cap. 170 <sup>(3)</sup>	--				✓
<b>Non-flying Mammals</b>							
Eurasian Otter	<i>Lutra lutra</i>	Cap. 170; RC; IUCN (NT); CRDB (V)	rare	✓			
Red Muntjac	<i>Muntiacus muntjak</i>	Cap.170; PRC	very common		✓		

Notes:

(1) Abbreviations for Level of Concern/ Protection Status:

Cap.170 – Listed in Wild Animals Protection Ordinance;

CRDB – China Red Data Book of Endangered Animals: Mammalia (Wang, 1998); Letters in parentheses: E = Endangered, V = Vulnerable, R = Rare, I = Indeterminate;

IUCN – IUCN Red List of Threatened Species: NT= Near Threatened;

Level of Concern – LC = Local Concern, RC = Regional Concern, PRC = Potential Regional Concern, PGC = Potential Global Concern, GC = Global Concern, Letter in parentheses indicate that the assessment is on the basis of restrictedness in breeding and/or roosting sites rather than in general occurrence. (Fellowes *et al.*, 2002)

(2) Status in Hong Kong follows Shek *et al.* (2007).

(3) All bats found in Hong Kong are protected under the Wild Animals Protection Ordinance (Cap.170).

#### 9.4.6 Amphibian and Reptile

In the New Territories, grassland is the most extensive vegetation type and it is also the dominant habitat type within the Study Area of this Project. Grassland generally supports herpetofauna species which occur in a wide variety of habitats, such as *Microhyla* spp., Spotted Narrow-mouthed Frog *Kalophrynus interlineatus*, Asian Common Toad *Duttaphrynus melanostictus*, Brown Tree Frog *Polypedates megacephalus*, Long-tailed Skink *Eutropis longicaudata*, Chinese Skink *Plestiodon chinensis chinensis*, Reeve's Smooth Skink *Scincella reevesii*, Copperhead Racer *Coelognathus radiates*, White-spotted Slug

Snake *Pareas margaritophorus*, Indo-Chinese Rat Snake *Ptyas korros*, Chinese Cobra *Naja atra* and Bamboo Snake *Cryptelytrops albolabris*.

#### 9.4.6.1 Literature Review

The survey findings listed in the Appendix G of the Final Report of the CA Study (Ove Arup, 2010) has been reviewed. Data collected in Man Kam To Road, San Uk Ling and Kong Nga Po areas appeared to be the most relevant data to the Study Area of this Project. In total, 11 amphibian and four reptile species were recorded in the above-mentioned areas. Amongst these records, Chinese Bullfrog *Hoplobatrachus chinensis*, Two-striped Grass Frog *Hylarana taipehensis* and Many-banded Krait *Bungarus multicinctus* were considered to be of conservation interest. Chinese Bullfrog is considered to be of “Potential Regional Concern” (Fellowes *et al.*, 2002), however, it is widely distributed in the New Territories and Lantau. Chinese Bullfrog was recorded in several locations within the Study Area, including agricultural land located southwest to Sandy Ridge, locations near sampling point for aquatic survey P5, pond near San Uk Ling and area near pond at the west to the Project site. Another amphibian species of conservation interest, Two-striped Grass Frog, is considered to be of “Local Concern” (Fellowes *et al.*, 2002). It was recorded in a pond near San Uk Ling. The reptile species of conservation interest, Many-banded Krait, is a highly venomous snake which is considered by Fellowes *et al.* (2002) to be of “Potential Regional Concern” and it is also categorized as “Vulnerable” by China Red Data Book (Zhao, 1998). A dead body of Many-banded Krait was found on Sha Ling Road at western part of Sandy Ridge. Details of the herpetofauna species recorded were presented in **Table 9.8**.

During the course of field surveys of EIA study of OWTF2 (MMHK, 2013), a total number of six amphibian and four reptile species were recorded. All these 10 herpetofauna species are common in Hong Kong with no conservation interest. These species included Paddy Frog *Fejervarya limnocharis*, Asiatic Painted Frog *Kaloula pulchra pulchra*, Brown Tree Frog and Günther’s Frog *Hylarana guentheri*, Spotted Narrow-mouth Frog, Asian Common Toad, Changeable Lizard *Calotes versicolor*, Chinese Skink, Long-tailed Skink and White-spotted Slug Snake. No herpetofauna species of conservation interest were recorded.

The KNP PER (MMHK, 2014) recorded eight amphibian and four reptile species within the Study Area of this Project. All these species are common in Hong Kong except Red Mountain Racer *Elaphe porphyracea nigrofasciata* which is regarded as “Local Concern” (Fellowes *et al.*, 2002) and listed as “Vulnerable” under China Red Data Book (Zhao, 1998). Red Mountain Racer is known from several localities in central New Territories and distributed in woodlands in protected areas including Tai Lam Country Park, Tai Mo Shan Country Park, Ma On Shan Country Park and Tai Po Kau Nature Reserve. This species was recorded in the grassland habitat within the Project site. Details of the herpetofauna species of conservation concern were presented in **Table 9.8**.

#### 9.4.6.2 Field Survey Findings

A total of nine species of amphibian (including three species within the Project site and nine species within the Study Area) and seven species of reptiles (including three species within the Project site and six species within the Study Area) were recorded during the six-month survey. None of the recorded species are rare or of conservation importance (Karsen *et al.*, 1998, AFCD 2015a) except Chinese Bullfrog, which

is of Potential Regional Concern (Fellowes *et al.*, 2002) and listed as a Class II Protected Species in China. Amphibian and reptile species recorded and their abundance are summarised in **Appendix 9.3** and the locations of the Chinese Bullfrog are shown on **Figures 9.2a to 9.2d**.

Details of the herpetofauna species of conservation concern recorded during the ecological survey were presented in **Table 9.8**.

Table 9.8: Herpetofauna species of conservation interest recorded within the Study Area

Common Name	Scientific Name	Level of Concern / Protection Status <sup>(1)</sup>	Distribution in Kong Kong	Ove Arup (2010)	MMHK (2013)	MMHK (2014)	Field Survey 2015
<b>Amphibians</b>							
Chinese Bullfrog	<i>Hoplobatrachus chinensis</i>	PRC; CSMPS (II)	fairly common and widespread throughout the NT and Lantau Island <sup>(3)</sup>	✓			✓
Two-striped Grass Frog	<i>Hylarana taipehensis</i>	LC	uncommon <sup>(3)</sup>	✓			
<b>Reptiles</b>							
Many-banded Krait	<i>Bungarus multicinctus multicinctus</i>	PRC; CRDB (V)	common <sup>(2)</sup>	✓			
Red Mountain Racer	<i>Elaphe porphyracea nigrofasciata</i>	LC	Rare <sup>(2)</sup>			✓	

Notes:

(1) Abbreviations for Level of Concern/ Protection Status:

Cap.586 – Listed in Protection of Endangered Species of Animals and Plants Ordinance;

CSMPS – Ministry of Environmental Protection of the People's Republic of China (2002) China State Major Protection Status:

CSMPS (II) = Class II Protected Species;

CRDB – China Red Data Book: E = Endangered, V = Vulnerable, R = Rare, I = Intermediate (Zhao, 1998);

Level of Concern – LC = Local Concern, RC = Regional Concern, PRC = Potential Regional Concern, PGC = Potential Global Concern, GC = Global Concern, Letter in parentheses indicate that the assessment is on the basis of restrictedness in breeding and/or roosting sites rather than in general occurrence. (Fellowes *et al.*, 2002)

(2) Karsen *et al.*, 1998

(3) Chan *et al.*, 2005

(4) Hong Kong Biodiversity No. 17 (Chan *et al.*, 2009)

## 9.4.7 Butterfly

### 9.4.7.1 Literature Review

In general, the habitats within the Project site comprise grassland, grassland/shrubland mix and plantation. These habitats generally support low diversity of butterfly community in Hong Kong. In addition, no over-wintering hotspot has been identified in the Northeast New Territories (Wong *et al.*, 2004).

In the SBF project (MMHK, 2009), a butterfly species of conservation interest Baron *Euthalia aconthea* was recorded in Nam Hang within the Study Area.

In the data collected during field survey for the CA Study (Appendix G of the Final Report; Ove Arup, 2010), a butterfly species of conservation interest Danaid Eggfly *Hypolimnas misippus* was recorded in the west of Kong Nga Po within the Study Area.

In the course of field survey for the OWTF2 (MMHK, 2013), a total of 16 butterfly species were recorded. All of them are either common or very common in Hong Kong. No rare butterfly or species of conservation interest was recorded. A total of 28 butterfly species were recorded distributing in all identified habitats. They are all common or very common species in Hong Kong. No rare species or species of conservation interest was recorded.

In the ecological field survey for the KNP PER (MMHK, 2014), a total of 29 butterfly species were recorded. All recorded species were common in Hong Kong, except for Grass Demon *Udaspes folus* recorded in marsh habitat within the Study Area, which is considered a rare species in Hong Kong (AFCD, 2015a). Details of butterfly species of conservation interest are presented in **Table 9.9**.

#### 9.4.7.2 Field Survey Findings

A total number of 59 butterfly species were recorded during the field surveys, of which 18 species were recorded within the Project site and 57 species were recorded within Study Area. All recorded butterfly species and their abundance are summarised in **Appendix 9.3**.

Amongst the recorded species, five are considered as of Rare or Very Rare by Chan *et al.* (2011), namely Grass Demon, Grey Scrub Hopper *Aeromachus jhora*, Courtesan *Euripus nycteliusm*, Small Three-ring *Ypthima norma* and Swallowtail *Papilio xuthus*.

Small Three-ring was considered to be of Local Concern (Fellowes *et al.*, 2002) and very rare species of conservation concern (AFCD, 2015a). Nevertheless, it occurs in a variety of habitats including shrubland, hillside grassland, lowland and coastal grassland and wetland fringes. It has been recorded in various localities including Pak Tam Chung, Ngau Kwo Lo and Kai Shan (AFCD, 2015a), hillside grassland on Crest Hill close to Ho Sheung Heung, marsh, seasonally-wet grassland and hillside grassland in Ma Tso Lung area (Ove Arup, 2013) and also in Nga Yiu Ha hillside grassland and Ping Che area in northeast New Territories (MMHK, 2011). Six individuals of Small Three-ring were observed in grassland at the north of Project Site.

Three individuals of rare species Swallowtail were recorded in grassland within the Project site, plantation and seasonally wet grassland at the south of the Study Area. Swallowtail has been recorded in a variety of locations including Clear Water Bay Country Park (ERM, 2007), Kap Lung, Ma On Shan, Tai Tam, Sha Lo Wan, Kat O, Lung Kwu Tan, Wu Kau Tang and Lung Kwu Chau (AFCD, 2015a).

Within the Study Area, five individuals of very rare Courtesan were recorded in plantation habitat at the south of the Study Area. Two individuals of rare species Grey Scrub Hopper were recorded in grassland

habitat, and three individuals of rare Grass Demon were found in agricultural land and seasonally wet grassland. Indicative locations of these butterfly species of conservation interest recorded are presented in **Figures 9.2a to 9.2d** and the butterfly species of conservation interest recorded within the Study Area are presented in **Table 9.9**. Other recorded species were mostly common in Hong Kong.

Table 9.9: Butterfly species of conservation interest recorded within the Study Area

Common Name	Scientific Name	Level of Concern / Protection Status <sup>(1)</sup>	Commonness in Hong Kong <sup>(2)</sup>	MMHK (2009)	Ove Arup (2010)	MMHK (2014)	Field Survey 2015
<b>Butterflies</b>							
Baron	<i>Euthalia aconthea</i>	LC	Uncommon	✓			
Danaid Eggfly	<i>Hypolimnas misippus</i>	LC	Uncommon		✓		
Grey Scrub Hopper	<i>Aeromachus jhora</i>	-	Rare				✓
Grass Demon	<i>Udaspes folus</i>	-	Rare			✓	✓
Courtesan	<i>Euripus nycteliusm</i>	-	Very Rare				✓
Small Three-ring	<i>Ypthima norma</i>	LC	Very Rare				✓
Swallowtail	<i>Papilio xuthus</i>	-	Rare				✓

Notes:

(1) Abbreviations for Level of Concern/ Protection Status:

Level of Concern – LC = Local Concern, RC = Regional Concern, PRC = Potential Regional Concern, PGC = Potential Global Concern, GC = Global Concern, Letter in parentheses indicate that the assessment is on the basis of restrictedness in breeding and/or roosting sites rather than in general occurrence. (Fellowes *et al.*, 2002)

(2) AFCD Biodiversity Database

## 9.4.8 Dragonfly

### 9.4.8.1 Literature Review

According to the distribution of dragonfly diversity in Hong Kong (Tam *et al.*, 2008), 1 to 20 dragonfly species were found in the grids of the Study Area of the Project. In addition, no representative sites of Hong Kong's dragonflies were found in both the Project site and Study Area (Tam *et al.*, 2008).

The field survey for the CA Study (Appendix G of the Final Report; Ove Arup, 2010) had no record of rare dragonfly species or species of conservation interest within the Study Area.

The EIA report of OWTF2 (MMHK, 2013) showed that a total of seven dragonfly species were recorded within its Study Area. Many of them were present in grassland, pond and watercourse areas. No rare dragonfly species or species of conservation interest was recorded.

In the ecological field survey for the KNP PER (MMHK, 2014), a total of 16 dragonfly species were recorded during the survey. All recorded species were common in Hong Kong (Tam *et al.*, 2011).

#### 9.4.8.2 Field Survey Findings

A total number of 32 species were recorded during the field surveys, of which four species were recorded within the Project site and 31 species were recorded within Study Area. All recorded dragonfly species and their abundance are summarised in **Appendix 9.3**.

Four dragonfly species of conservation interest with Local Concern (Fellowes *et al.*, 2002) were recorded within Study Area. An individual of Blue Chaser *Potamarcha congener* and two individuals of Scarlet Basker *Urothemis signata* were recorded in pond at the north of Study Area. In addition, individuals of species Ruby Darter *Rhodothemis rufa* and Sapphire Flutterer *Rhyothemis triangularis* were recorded in watercourse habitat. Three individuals of Ruby Darter were also recorded in grassland within the Study Area. Indicative locations of these dragonfly species of conservation interest recorded are presented in **Figures 9.2a to 9.2d**.

### 9.4.9 Aquatic Fauna

#### 9.4.9.1 Literature Review

During the literature review, the distribution records of freshwater fish in Hong Kong provided in Lee *et al.* (2004) have been reviewed. No locally-specific record was found within the Study Area. In addition, the list of Ecologically Important Streams (AFCD, 2015b) has been reviewed, in which no watercourse within the Study Area was identified as Ecologically Important Stream.

In the data collected during field survey for the CA Study (Appendix G of the Final Report; Ove Arup, 2010), two fish species were recorded in Kong Nga Po. No rare fish or species of conservation interest was recorded within the Study Area.

The ecological field survey for the OWTF2 (MMHK, 2013) showed that a total of eight freshwater fish species were recorded within its study area. One species of conservation concern, Common Carp *Cyprinus carpio* which is listed as Vulnerable in the IUCN Red List of Threatened Species, was recorded within the study area. This native species is not common in streams but occurs in many reservoirs and cultivated in fishponds as food fish in Hong Kong.

In the ecological field survey for the KNP PER (MMHK, 2014), a total of six freshwater fish, five mollusca and two crustacean species were recorded in stream and pond habitats. Amongst the recorded species, Spotted snakehead *Channa maculata* and Mud carp *Cirrhinus molitorella* recorded in pond were not common in wild or streams, whilst they are normally cultivated in fishponds in Hong Kong. The other recorded species were common in Hong Kong.

#### 9.4.9.2 Field Survey Findings

Aquatic fauna surveys for freshwater fishes, freshwater macro-invertebrates and invertebrates were conducted. The aquatic habitats were all located outside of Project Site. The recorded aquatic fauna species and their relative abundance are summarised in **Appendix 9.3**.

##### Freshwater Fish

A total of ten species of freshwater fish were recorded in sampling points. The fish species sampled were common in Hong Kong, except Small Snakehead, which was uncommon in wild or stream and considered to be of “Local Concern” (Fellowes *et al.*, 2002).

##### Freshwater Macro-invertebrates and Invertebrates

A total of 14 taxa of aquatic macro-invertebrates and invertebrates were recorded in sampling points. Two species of “Global Concern” (Fellowes *et al.*, 2002), the freshwater crab *Somanniathelphusa zanklon* and a single larva of Club-tailed Cruiser *Macromia Urania* were found in sampling points. The freshwater crab is endemic to Hong Kong and it is listed as “Endangered species” in IUCN Red List (2015).

Indicative locations of these aquatic fauna species of conservation interest recorded are presented in **Figures 9.2a to 9.2d**.

### 9.5 Evaluation of Ecological Importance of Habitats and Species

Habitats identified within the Study Area were evaluated in accordance with the guidelines stipulated in Table (2) in Annex 8 of the EIAO-TM. Overall ecological values for each habitat type were ranked. Rankings starting with the highest ecological value range from:

- High
- Moderate-high
- Moderate
- Moderate-low
- Low
- Very Low

#### 9.5.1 Evaluation of Habitats

Ecological evaluation of each habitat within the Study Area (including Project Site) is presented in **Table 9.10 to Table 9.21**.



Table 9.10: Ecological Evaluation of Plantation

Criteria	Plantation within the Project Site	Other Plantation
Naturalness	Man-made habitat	Man-made habitat
Size	approx. 2.98 ha in the KNP Development Area; approx. 0.76 ha in Proposed Road Improvement Works	approx. 33.1 ha in Study Area
Diversity	Moderate-low in flora, avifauna and butterfly species diversity; Low in other fauna species diversity	Moderate-low in flora, butterfly species diversity; Low in other fauna species diversity
Rarity	Common Habitat; One large fern species of conservation interest Cycad-fern <i>Brainea insignis</i> was recorded; One species of conservation interest Fortune's Keteleeria <i>Keteleeria fortune</i> was recorded in Proposed Road Improvement; Two avifauna species of conservation interest Greater Coucal and Collared Scops Owl were recorded	Common habitat; Four species of conservation interest Incense Tree <i>Aquilaria sinensis</i> , Fortune's Keteleeria <i>Keteleeria fortunei</i> , Common Pecteilis <i>Pecteilis susannae</i> and Buttercup Orchid <i>Spathoglottis pubescens</i> were recorded; Three avifauna species of conservation interest Lesser Coucal, White-throated Kingfisher and Common Kestrel were recorded; Two butterfly species of conservation interest Courtesan and Swallowtail were record;
Re-creatability	Readily re-creatable	Readily re-creatable
Fragmentation	These habitats are patchily created / modified around hillside and urban land use	These habitats are patchily created / modified around hillside and urban land use
Ecological linkage	Ecologically linked with woodland and grassland/shrubland	Ecologically linked with grassland and secondary woodland
Potential value	Low potential value at lowland areas in the vicinity of developed area as the habitat is being maintained for crop production or urban landscaping; Moderate potential value by succession in the other areas in the vicinity of woodland	Low potential value at lowland areas in the vicinity of developed area as the habitat is being maintained for crop production or urban landscaping; Moderate potential value by succession in the other areas in the vicinity of woodland
Nursery/ breeding ground	Not significant nursery / breeding ground	Not significant nursery / breeding ground
Age	10 to 20 years	10 to 20 years
Abundance/ Richness of wildlife	Moderate-low in bird and butterfly abundance; low in other terrestrial wildlife	Moderate-low in bird and butterfly abundance; low in other terrestrial wildlife
Ecological value	Moderate-low	Moderate-low



Table 9.11: Ecological Evaluation of Orchard

Criteria	Orchard within the Project Site (Portion at the southern edge of Project Site)	Other Orchard
Naturalness	Wholly man-made habitat	Wholly man-made habitat
Size	Approx. 0.43 ha in total	Approx. 8.21 ha in total
Diversity	Low in both fauna and flora species diversity	Low in both fauna and flora species diversity
Rarity	Common habitat; No species of conservation interest present	Common habitat; Two avifauna species of conservation concern Black-crowned Night Heron and Greater Coucal were recorded
Re-creatability	Readily re-creatable	Readily re-creatable
Fragmentation	These habitats are patchily created/modified	These habitats are patchily created/modified
Ecological linkage	Low ecological linkage with other habitats	Low ecological linkage with other habitats
Potential value	Low potential value as the habitat is being maintained for fruit production	Low potential value as the habitat is being maintained for fruit production
Nursery/ breeding ground	Potential foraging ground for birds and fruit bats, but similar grounds are readily available in the northern part of NT	Potential foraging ground for birds and fruit bats, but similar grounds are readily available in the northern part of NT
Age	N/A	N/A
Abundance/ Richness of wildlife	Low	Low
Ecological value	Low	Low

Table 9.12: Ecological Evaluation of Shrubland

Criteria	Shrubland
Naturalness	Man-made habitat after abandonment
Size	approx. 16.31 ha in total
Diversity	Low in fauna species diversity; Low in flora species diversity
Rarity	Habitat not rare; All species recorded are common; Two avifauna species of conservation interest Greater Coucal and Lesser Coucal were recorded
Re-creatability	Re-creatable through re-planting and natural regeneration
Fragmentation	Scattered within the Study Area
Ecological linkage	Ecologically linked to adjacent vegetated habitat and streams
Potential value	Potential value can be improved if human disturbance cease for long period
Nursery/ breeding ground	Not significant nursery / breeding ground
Age	10 to 20 years
Abundance/ Richness of wildlife	Low
Ecological value	Moderate-low

Table 9.13: Ecological Evaluation of Secondary Woodland

Criteria	Secondary Woodland
Naturalness	Secondary habitat derives from modified habitat
Size	approx. 39.83 ha in total
Diversity	High in flora species diversity; Moderate-low in fauna species diversity
Rarity	A few saplings of floral species of conservation interest Incense Tree <i>Aquilaria sinensis</i> were recorded; Five avifauna species of conservation interest recorded including Chinese Pond Heron, Eastern Cattle Egret, Common Emerald Dove, Greater Coucal and Lesser Coucal were recorded.
Re-creatability	Re-creatable through re-planting but requires longer duration
Fragmentation	Fragmented due to previous ground modifications and developments
Ecological linkage	Ecologically linked with adjacent agricultural land, grassland and plantations
Potential value	The habitat value could be enhanced with increase in maturity but not much, as being split into patches
Nursery/ breeding ground	Potential breeding records for mammals, birds, herpetofauna and insects, but no significant record
Age	More than 20 years
Abundance/ Richness of wildlife	Moderate-low in bird and butterfly abundance; low in other terrestrial wildlife
Ecological value	Moderate

Table 9.14: Ecological Evaluation of Grassland/Shrubland

Criteria	Grassland/Shrubland within Project Site	Other Grassland/Shrubland
Naturalness	Modified habitat after abandonment	Modified habitat after abandonment
Size	approx. 2.94 ha in total	approx. 5.94 ha in total
Diversity	Low in both fauna and flora species diversity	Low in both fauna and flora species diversity
Rarity	Habitat not rare; No rare species recorded; Avifauna species of conservation interest Greater Coucal was recorded	Habitat not rare; No rare species recorded; Common resident of avifauna species Lesser Coucal was noted
Re-creatability	Re-creatable through re-planting and natural regeneration	Re-creatable through re-planting and natural regeneration
Fragmentation	These habitats are patchily created / modified	These habitats are patchily created / modified
Ecological linkage	Ecologically linked to adjacent grassland and plantation habitat	Ecologically linked to adjacent grassland and shrubland habitat
Potential value	Potential value can be improved if human disturbance cease for long period	Potential value can be improved if human disturbance cease for long period
Nursery/ breeding ground	Not significant nursery / breeding ground	Not significant nursery / breeding ground
Age	N/A	N/A
Abundance/ Richness of wildlife	Low	Low
Ecological value	Low	Low

Table 9.15: Ecological Evaluation of Grassland

Criteria	Grassland within Project Site	Other Grassland
Naturalness	Modified habitat disturbed by hill fires	Modified habitat disturbed by hill fires
Size	Majority of the Project site, approx. 11.03 ha in total; Approx.0.07 ha in Proposed Road Improvement Works	Large, approx. 109.50 ha in total
Diversity	Moderate-low in flora species diversity Low in fauna species diversity	Moderate-low in flora species diversity Moderate-low in avifauna species diversity Low in other fauna species diversity
Rarity	Common habitat; One orchid species of conservation interest Ladies' Tresses <i>Spiranthes sinensis</i> was recorded, however, it is common and widespread and of least concern in Hong Kong. One large fern species of conservation interest Cycad-fern <i>Brainea insignis</i> was recorded Bird species of conservation interest Greater Coucal and Lesser Coucal were recorded but they are both common in grassland of Hong Kong; Black Kite and Great Cormorant were recorded in-flight only. Eurasian Eagle Owl was recorded but it is actually widely distributed in Hong Kong. Two rare butterfly species of conservation interest Small Three-ring and Swallowtail are recorded.	Common habitat; One large fern species of conservation interest Cycad-fern <i>Brainea insignis</i> was recorded. Bird species of conservation interest Lesser Coucal and White-throated Kingfisher were recorded but it is common in grassland of Hong Kong; Eurasian Eagle Owl was recorded in-flight only. One rare butterfly species of conservation interest Grey Scrub Hopper was recorded. One dragonfly species of conservation interest Ruby Darter was recorded.
Re-creatability	Maintained by hill fires	Maintained by hill fires
Fragmentation	Mostly contiguous on hillside areas	Mostly contiguous on hillside areas
Ecological linkage	Generally connected to adjacent plantations, shrubland and secondary woodlands	Connected to adjacent plantations and secondary woodlands
Potential value	Potential value can be enhanced through habitat enhancement but most of the hillside falls within permitted burial ground which limits the potential	Potential value can be enhanced if human disturbance cease for long period
Nursery/ breeding ground	Not significant nursery / breeding ground	Not significant nursery / breeding ground
Age	N/A	N/A
Abundance/ Richness of wildlife	Low abundance	Moderate-low in avifauna abundance; Low in flora and other fauna abundance
Ecological value	Moderate-low	Moderate-low

Table 9.16: Ecological Evaluation of Seasonally Wet Grassland

Criteria	Seasonally Wet Grassland
Naturalness	Derived from some abandoned agricultural fields
Size	approx. 4.64 ha in total
Diversity	Low in both fauna and flora species diversity
Rarity	Common habitat; One avifauna species of conservation interest Greater Coucal was heard calling; Two butterfly species of conservation interest Grass Demon and Swallowtail were recorded. Both of them are rare species.
Re-creatability	Readily re-creatable
Fragmentation	These habitats are patchily created / modified
Ecological linkage	Ecologically linked with adjacent agricultural land and orchard
Potential value	Potential value can be improved if human disturbance cease for long period
Nursery/ breeding ground	Not significant nursery / breeding ground
Age	N/A
Abundance/ Richness of wildlife	Low abundance
Ecological value	Moderate-low

Table 9.17: Ecological Evaluation of Agricultural Land

Criteria	Agricultural Land
Naturalness	Wholly man-made habitat
Size	approx. 14.49 ha in total
Diversity	Moderate-low in both fauna and flora species diversity
Rarity	Habitat not rare; Flora species of conservation interest Tea <i>Camellia sinensis</i> was recorded; Eight avifauna species of conservation interest including Chinese Pond Heron, Eastern Cattle Egret, Grey Heron, Little Egret, Crested Goshawk, Black Kite, Greater Coucal and Collared Crow were recorded; Amphibian species of conservation interest Chinese Bullfrog was recorded; One rare butterfly species Grass Demon was recorded.
Re-creatability	Readily re-creatable
Fragmentation	These habitats are patchily created / modified
Ecological linkage	Low ecological linkage with other habitats
Potential value	Low potential value as the habitat is being maintained for crop production
Nursery/ breeding ground	Breeding habitat for various common amphibian species; Potential foraging habitat for common avifauna species; but similar grounds are readily available in the northern part of NT
Age	N/A
Abundance/ Richness of wildlife	Moderate-low in bird abundance; low in other terrestrial wildlife
Ecological value	Moderate-low for areas at south to Sandy Ridge; Low for other areas

Table 9.18: Ecological Evaluation of Watercourse

Criteria	Watercourse
Naturalness	Semi-natural, modified for agricultural drainage
Size	Approx. 2.60 ha in total
Diversity	Moderate-low in avifauna and butterfly species diversity; Low in flora and other fauna species diversity
Rarity	Habitat not rare; No rare species recorded; One avifauna species of conservation interest Chinese Pond Heron was recorded; One amphibian species of conservation interest Chinese Bullfrog was recorded; Two dragonfly species of conservation interest Ruby Darer and Sapphire Flutterer were recorded; A single larva of a dragonfly species of conservation interest was recorded Club-tailed Cruiser was recorded; One fish species of conservation interest Small Snakehead was recorded; An endemic freshwater crab species with conservation interest <i>Somanniathelphusa zanklon</i> was recorded.
Re-creatability	Re-creatable through restoration and natural regeneration
Fragmentation	Generally not fragmented
Ecological linkage	Ecologically linked with pond, grassland and bankside plantations
Potential value	Potential value can be improved if human disturbance cease for long period
Nursery/ breeding ground	Potential breeding and nursery ground for fish, amphibian and dragonfly species, but no significant record
Age	N/A
Abundance/ Richness of wildlife	Moderate-low
Ecological value	Moderate-low

Table 9.19: Ecological Evaluation of Channelised Watercourse

Criteria	Channelised Watercourse
Naturalness	Artificial, maybe modified from natural or semi-natural watercourse
Size	Approx. 1.13 ha in total
Diversity	Low in both flora and fauna species diversity
Rarity	Common habitat; No rare species recorded; An endemic freshwater crab species with conservation interest <i>Somanniathelphusa zanklon</i> was recorded.
Re-creatability	Readily re-creatable
Fragmentation	Generally not fragmented
Ecological linkage	Low ecological linkage with other habitats
Potential value	The habitat value could be enhanced through implementation of green channel enhancement measures
Nursery/ breeding ground	Not significant nursery / breeding ground
Age	N/A
Abundance/ Richness of wildlife	Low in wildlife
Ecological value	Low

Table 9.20: Ecological Evaluation of Pond

Criteria	Pond
Naturalness	Man-made habitat
Size	approx. 7.88 ha in total
Diversity	Moderate-low in avifauna species diversity; Low in flora and other fauna species diversity
Rarity	Habitat not rare; No rare species recorded; Seven avifauna species of conservation interest Little Grebe, Yellow Bittern, Chinese Pond Heron, Eastern Cattle Egret, Little Egret, Crested Serpent Eagle and White-throated Kingfisher were recorded; Two dragonfly species of conservation interest Blue Chaser and Scarlet Basker were recorded.
Re-creatability	Readily re-creatable
Fragmentation	These isolated habitats are not contiguous
Ecological linkage	Ecologically linked with agricultural land, watercourse and plantation
Potential value	Low potential value due to their isolated location and small size
Nursery/ breeding ground	Potential nursery ground for fish and dragonfly species, but no significant record
Age	Around 10 years
Abundance/ Richness of wildlife	Moderate abundance of foraging insectivorous bats reported; Low in other terrestrial fauna; Moderate-low abundance of aquatic fauna
Ecological value	Moderate-low for ponds at south to Sandy Ridge; Low for other ponds

Table 9.21: Ecological Evaluation of Developed Area

Criteria	Developed area within Project Site	Other Developed area
Naturalness	Wholly man-made habitat	Wholly man-made habitat
Size	Approx. 1.1 ha; approx. 1.35 ha in Proposed Road Improvement Works	Approx. 90.58 ha in total
Diversity	Low in both fauna and flora species diversity	High in flora species diversity due to planting; Low in fauna species diversity
Rarity	Common habitat;	Common habitat; Flora species of conservation interest Japanese Tea <i>Camellia sinensis</i> was recorded
Re-creatability	Readily re-creatable	Readily re-creatable
Fragmentation	N/A	N/A
Ecological linkage	N/A	N/A
Potential value	Very low potential value due to heavy disturbance by human activities	Very low potential value due to heavy disturbance by human activities
Nursery/ breeding ground	Not nursery / breeding ground	Not nursery / breeding ground
Age	N/A	N/A
Abundance/ Richness of wildlife	Very Low	Low
Ecological value	Very Low	Low

## 9.5.2 Evaluation of Species of Conservation Interest

The species of conservation interest recorded were listed and tabulated in accordance with the criteria stated in Table (3) in Annex 8 in EIAO-TM. Evaluation of flora species of conservation interest recorded from the vegetation survey conducted for the current project and from literature review is presented in **Table 9.22**. Evaluations of fauna species of conservation interest recorded within Project Site, Study Area and those recorded from literature review are presented in **Table 9.23**, **Table 9.24** and **Table 9.25** respectively.

Table 9.22: Ecological Evaluation of Flora Species of Conservation Interest

Species	Location	Conservation and Protection Status	Distribution	Rarity
Incense Tree <i>Aquilaria sinensis</i>	Plantation on the southern periphery of the Livestock Waste Composting Plant and secondary woodland on the northern Man Kam To Road	Listed under Protection of Endangered Species of Animals and Plants Ordinance (Cap.586) in Hong Kong; listed as near threatened in mainland China <sup>(1)</sup> ; Category II protected species in Mainland China	Widely distributed in Hong Kong <sup>(1)</sup>	The species is common in Hong Kong <sup>(2)</sup> ; Listed as “vulnerable” under IUCN Red List of Threatened Species <sup>(3)</sup>
<i>Aralia chinensis</i>	Beside footpaths within Study Area	Not legally protected in Hong Kong	Common in Hong Kong <sup>(4)</sup>	Listed as “vulnerable” under IUCN Red List of Threatened Species <sup>(3)</sup>
Cycad-fern <i>Brainea insignis</i>	Plantation area and northwestern periphery of the Project site	Listed as Category II protected species in Mainland China	Guangdong, Guangxi, Yunnan, Guizhou, Fujian, Taiwan; N India to Indonesia <sup>(1)</sup>	Considered Common in Hong Kong <sup>(1)</sup> ; Listed in Rare and Precious Plants of Hong Kong <sup>(1)</sup>
Japanese Camellia <i>Camellia japonica</i>	Agricultural land on the northern side of Livestock Waste Composting Plant within Study Area	Listed under Forestry Regulations (Cap. 96 sub. leg.)	Shandong, Zhejiang; S Japan, S Korea <sup>(9)</sup>	Widely cultivated in Hong Kong <sup>(9)</sup>
<i>Cattleya sp.</i>	In planter within the Livestock Waste Composting Plant	Listed under Protection of Endangered Species of Animals and Plants Ordinance (Cap.586) in Hong Kong	Species of this genus are native to America <sup>(7)</sup> ; many cultivars introduced to Hong Kong for ornamental purposes <sup>(5)</sup>	Species of this genus commonly cultivated in Hong Kong
Dense-flowered Geodorum <i>Geodorum densiflorum</i>	On hillside grassland along a footpath at the north periphery of the Study Area	Listed under Forestry Regulations (Cap. 96 sub. leg.) and Protection of Endangered Species of Animals and Plants Ordinance (Cap.586) in Hong Kong	Wong Nai Chung, Aberdeen, Sai Kung <sup>(6)</sup> ; known from more than ten scattered locations in Hong Kong <sup>(7)</sup>	Total population size is estimated to be fewer than 1,000 plants in Hong Kong <sup>(7)</sup> ; This species is considered uncommon <sup>(8)</sup> and vulnerable <sup>(8)</sup> in Hong Kong

Species	Location	Conservation and Protection Status	Distribution	Rarity
Night-blooming Cereus <i>Hylocereus undatus</i>	In front of village house and in active agricultural area within the Study Area	Listed under Protection of Endangered Species of Animals and Plants Ordinance (Cap.586) in Hong Kong	Commonly cultivated <sup>(9)</sup>	The species is commonly cultivated in Hong Kong <sup>(9)</sup> ; Listed as “data deficient” under IUCN Red List of Threatened Species <sup>(3)</sup>
Fortune's Keteleeria <i>Keteleeria fortunei</i>	On both sides along Kong Nga Po Road near Police Search Training School within the Study Area	Listed under Forestry Regulations (Cap. 96 sub. leg.)	Natural populations in Cape D'Aguilar and Stanley <sup>(9)</sup>	This species has been propagated in the natural environment with promising results <sup>(10)</sup> ; Listed as Near Threatened under IUCN Red List of Threatened Species <sup>(3)</sup>
<i>Oncidium sp.</i>	In front garden of village houses	Listed under Protection of Endangered Species of Animals and Plants Ordinance (Cap.586) in Hong Kong	Species of this genus native to tropical America and cultivated in Hong Kong <sup>(5)</sup>	Species of this genus commonly cultivated in Hong Kong
Hong Kong Pavetta <i>Pavetta hongkongensis</i>	Various locations within Study Area	Listed under Forestry Regulations (Cap. 96 sub. leg.)	Hong Kong; Hainan, Guangdong, Guangxi, Yunnan; Vietnam <sup>(11)</sup>	This species is considered common in Hong Kong <sup>(11)</sup>
Common Pecteilis <i>Pecteilis susannae</i>	Beside the access road leading to the Table Hill Service Reservoir	Listed under Forestry Regulations (Cap. 96 sub. leg.) and Protection of Endangered Species of Animals and Plants Ordinance (Cap.586) in Hong Kong	India (Khasia Hills), Nepal, S China, Myanmar, Thailand, Indochina, Malaysia and the Malay Archipelago <sup>(7)</sup>	This species is considered endangered in Hong Kong <sup>(7)</sup> despite being known from several scattered localities
Buttercup Orchid <i>Spathoglottis pubescens</i>	Beside the access road leading to the Table Hill Service Reservoir	Listed under Forestry Regulations (Cap. 96 sub. leg.) and Protection of Endangered Species of Animals and Plants Ordinance (Cap.586) in Hong Kong	NE India, China (Fujian, Guangdong, Guangxi, Guizhou, Hong Kong, Hunan, Jiangxi, Sichuan, Yunnan, Zhejiang), Myanmar, Thailand and Indochina <sup>(7)</sup>	The total population in Hong Kong comprises well over 1000 plants <sup>(7)</sup> ; this species is considered least concern in Hong Kong <sup>(7)</sup>
Ladies Tresses <i>Spiranthes sinensis</i>	Beside a U-channel within the Project site	Listed under Forestry Regulations (Cap. 96 sub. leg.) and Protection of Endangered Species of Animals and Plants Ordinance (Cap.586) in Hong Kong	Widely distributed in China; E Asia, S to SE Asia, Australia <sup>(6)</sup>	This species is considered common and widespread in Hong Kong <sup>(6,7)</sup> ; Listed as “least concern” under IUCN Red List of Threatened Species <sup>(3)</sup>

Reference sources:

- (1) *Rare and Precious Plants of Hong Kong* (AFCD, 2003)
- (2) *Hong Kong Vascular Plants: Distribution and Status* (Corlett et al., 2000)
- (3) *IUCN Red List of Threatened Species* (IUCN, 2015)
- (4) *Flora of Hong Kong Volume 2* (Hong Kong Herbarium and South China Botanical Garden, 2008)
- (5) *The Genera of Orchidaceae in Hong Kong* (Hu, 1977)



- (6) *Flora of Hong Kong Volume 4* (Hong Kong Herbarium and South China Botanical Garden, 2011)  
 (7) *The Wild Orchids of Hong Kong* (Baretto *et al.*, 2011)  
 (8) *Hong Kong Orchids* (Baretto and Young, 1980)  
 (9) *Flora of Hong Kong Volume 1* (Hong Kong Herbarium and South China Botanical Garden, 2007)  
 (10) *Hong Kong Biodiversity Issue No. 20* (Pang *et al.*, 2011)  
 (11) *Flora of Hong Kong Volume 3* (Hong Kong Herbarium and South China Botanical Garden, 2009)

Table 9.23: Ecological Evaluation of Fauna Species of Conservation Interest recorded during Field Survey within the Project Site

Scientific Name	Common Name	Location	Conservation and Protection Status <sup>(1)</sup>	Distribution <sup>(2)</sup>	Rarity <sup>(2)</sup>
<b>Avifauna</b>					
<i>Phalacrocorax carbo</i>	Great Cormorant	In-flight over grassland habitat	• PRC	Ponds and inshore waters mainly in the Deep Bay area	Abundant winter visitor
<i>Milvus migrans</i>	Black Kite	In-flight over grassland habitat	• Cap. 586 • (RC) • CSMPS (II)	Widespread	Abundant and present all year
<i>Centropus bengalensis</i>	Lesser Coucal	Grassland	• CRDB (V) • CSMPS (II)	Widespread	Fairly common resident
<i>Centropus sinensis</i>	Greater Coucal	Grassland, grassland/shrubland and plantation habitats	• CRDB (V) • CSMPS (II)	Widespread	Common resident
<i>Otus lettia</i>	Collared Scops Owl	Plantation	• Cap. 586 • CSMPS (II)	Widespread	Common resident
<i>Bubo bubo</i>	Eurasian Eagle Owl	Grassland	• Cap. 586 • CRDB (R) • RC	Widespread	Scarce resident
<b>Butterflies</b>					
<i>Ypthima norma</i>	Small Three-ring	Grassland	• LC	Pak Tam Chung, Ngau Kwo Lo, Kai Shan	Very Rare
<i>Papilio xuthus</i>	Swallowtail	Grassland	-	Kap Lung, Ma On Shan, Tai Tam, Sha Lo Wan, Kat O, Lung Kwu Tan, Wu Kau Tang, Lung Kwu Chau	Rare

Table 9.24: Ecological Evaluation of Fauna Species of Conservation Interest recorded during Field Survey within the Study Area (excluding the Project Site)

Scientific Name	Common Name	Location	Conservation and Protection Status <sup>(1)</sup>	Distribution <sup>(2)</sup>	Rarity <sup>(2)</sup>
<b>Avifauna</b>					
<i>Tachybaptus ruficollis</i>	Little Grebe	Pond habitat south to Sandy Ridge	• LC	Widespread in ponds and pools	Present all year
<i>Ixobrychus sinensis</i>	Yellow Bittern	Pond habitat south to Sandy Ridge	• (LC)	Mainly in Deep Bay reedmarsh and mangrove	Common passage migrant in spring to summer with scarce winter record
<i>Nycticorax nycticorax</i>	Black-crowned Night Heron	Orchard habitat at west of Kong Nga Po	• (LC)	Widespread	Common resident and migrant
<i>Ardeola bacchus</i>	Chinese Pond Heron	Agricultural land, pond, watercourse and secondary woodland habitats	• PRC(RC)	Widespread	Common resident, winter visitor and migrant
<i>Bubulcus coromandus</i>	Eastern Cattle Egret	Secondary Woodland, pond and agricultural land habitats	• LC	Widespread in freshwater wetland and short grassland	Common with winter, migrant and breeding populations
<i>Ardea cinerea</i>	Grey Heron	Agricultural land south to Sandy Ridge	• PRC	Widespread	Abundant winter visitor and scarce in summer
<i>Egretta garzetta</i>	Little Egret	Agricultural land and pond south to Sandy Ridge	• PRC (RC)	Widespread	Abundant and present all year
<i>Spilornis cheela</i>	Crested Serpent Eagle	In-flight over pond near Nam Hang	• Cap. 586 • (LC) • CRDB (V) • CSMPS (II)	Widespread	Locally common, present all year and probably largely resident in woodland
<i>Accipiter trivirgatus</i>	Crested Goshawk	Agricultural land south to Sandy Ridge	• Cap. 586 • CRDB (R) • CSMPS (II)	Widespread	Common resident in woodland throughout HK
<i>Milvus migrans</i>	Black Kite	In-flight over agricultural land south to Sandy Ridge	• Cap. 586 • (RC) • CSMPS (II)	Widespread	Abundant and present all year
<i>Chalcophaps indica</i>	Common Emerald Dove	Secondary woodland near Nam Hang	• CRDB (V)	Locally common in closed-canopy shrubland and forest habitats	Uncommon but widespread resident

Scientific Name	Common Name	Location	Conservation and Protection Status <sup>(1)</sup>	Distribution <sup>(2)</sup>	Rarity <sup>(2)</sup>
<i>Centropus sinensis</i>	Greater Coucal	Various habitats	<ul style="list-style-type: none"> <li>• CRDB (V)</li> <li>• CSMPS (II)</li> </ul>	Widespread	Common resident
<i>Centropus bengalensis</i>	Lesser Coucal	Various habitats	<ul style="list-style-type: none"> <li>• CRDB (V)</li> <li>• CSMPS (II)</li> </ul>	Widespread	Fairly common resident
<i>Bubo bubo</i>	Eurasian Eagle Owl	In-flight over grassland	<ul style="list-style-type: none"> <li>• Cap. 586</li> <li>• CRDB (R)</li> <li>• RC</li> </ul>	Widespread	Scarce resident
<i>Halcyon smyrnensis</i>	White-throated Kingfisher	Grassland, pond and plantation habitats	<ul style="list-style-type: none"> <li>• (LC)</li> </ul>	Widely distributed in coastal areas throughout Hong Kong	Common and present all year
<i>Falco tinnunculus</i>	Common Kestrel	Plantation habitat at Cheung Po Tau	<ul style="list-style-type: none"> <li>• Cap. 586</li> <li>• CSMPS (II)</li> </ul>	Mostly in open country area	Common autumn migrant and winter visitor
<i>Corvus torquatus</i>	Collared Crow	Agricultural land south to Sandy Ridge	<ul style="list-style-type: none"> <li>• Cap. 170</li> <li>• LC</li> <li>• IUCN (NT)</li> </ul>	Mainly in coastal area	Locally common resident
<b>Herpetofauna</b>					
<i>Hoplobatrachus chinensis</i>	Chinese Bullfrog	Watercourse and agricultural land	<ul style="list-style-type: none"> <li>• PRC</li> <li>• CSMPS (II)</li> </ul>	Widespread throughout the NT and Lantau Island	Fairly common
<b>Butterflies</b>					
<i>Aeromachus jhora</i>	Grey Scrub Hopper	Grassland south to the Kong Nga Po	-	Yung Shue O, Kuk Po, Tai Lam, Sha Lo Tung	Rare
<i>Udaspes folus</i>	Grass Demon	Agricultural land and seasonally wet grassland south to Sandy Ridge	-	Widely distributed in agricultural field throughout Hong Kong	Rare
<i>Euripus nycteliusm,</i>	Courtesan	Plantation near Cheung Po Tau	-	Tai Po, Kai Shan	Very Rare
<i>Papilio xuthus</i>	Swallowtail	Seasonally wet grassland south to Sandy Ridge and plantation near Cheung Po Tau	-	Kap Lung, Ma On Shan, Tai Tam, Sha Lo Wan, Kat O, Lung Kwu Tan, Wu Kau Tang, Lung Kwu Chau	Rare
<b>Dragonfly</b>					
<i>Potamarcha congener</i>	Blue Chaser	Pond near Nam Hang	<ul style="list-style-type: none"> <li>• LC</li> </ul>	Widely distribute in marsh throughout Hong Kong	Common

Scientific Name	Common Name	Location	Conservation and Protection Status <sup>(1)</sup>	Distribution <sup>(2)</sup>	Rarity <sup>(2)</sup>
<i>Rhodothermis rufa</i>	Ruby Darter	Watercourse and grassland near San Uk Ling	• LC	Widely distribute in ponds and marshes throughout Hong Kong	Common
<i>Rhyothemis triangularis</i>	Sapphire Flutterer	Watercourse near San Uk Ling	• LC	Widely distribute in weedy ponds, sluggish rivers and marshes	Common
<i>Urothemis signata</i>	Scarlet Basker	Pond south to Sandy Ridge	• LC	Common in areas containing abandoned fish ponds throughout Hong Kong	Common
<b>Aquatic Fauna</b>					
<i>Channa asiatica</i>	Small Snakehead	Watercourse near San Uk Ling	• LC	Uncommon in the wild. Records from a few streams in North district and on Lantau Island. The fish is also cultivated in some fish farms and are available from fish market.	Uncommon
<i>Somanniathelphusa zanklon</i>	Freshwater Crab	Watercourse and channelised watercourse near San Uk Ling	• IUCN: EN • GC	Widespread in Hong Kong	Endemic to Hong Kong
<i>Macromia urania</i>	Club-tailed Cruiser	Watercourse near San Uk Ling	• GC	Lion Rock Country Park, Pat Sin Leng, Ping Yeung, Sha Lo Tung, She Shan Tsuen, Tai Lam Country Park, Tai Tong, Wu Kau Tang and Yeung Ka Tsuen	Common

Table 9.25: Ecological Evaluation of Fauna Species of Conservation Interest recorded within the Study Area from Literature Review

Scientific Name	Common Name	Location	Source of information*	Conservation and Protection Status <sup>(1)</sup>	Distribution <sup>(2)</sup>	Rarity <sup>(2)</sup>
<b>Avifauna</b>						
<i>Anas crecca</i>	Eurasian Teal	Ponds south to Sandy Ridge	CA Study	• RC	Primarily in Deep Bay area	Abundant but declining winter visitor
<i>Tachybaptus ruficollis</i>	Little Grebe	Pond (i.e. P6) within the Study Area; Ponds south to Sandy Ridge	CA Study, OWTF2	• LC	Widespread in ponds and pools	Present all year

Scientific Name	Common Name	Location	Source of information*	Conservation and Protection Status <sup>(1)</sup>	Distribution <sup>(2)</sup>	Rarity <sup>(2)</sup>
<i>Ixobrychus cinnamomeus</i>	Cinnamon Bittern	Ponds south to Sandy Ridge	CA Study	• LC	Freshwater wetland areas	Uncommon passage migrant and scarce summer visitor
<i>Nycticorax nycticorax</i>	Black-crowned Night Heron	Area of seasonal wet grassland, pond and agricultural land south to Sandy Ridge	CA Study, KNP PER	• (LC)	Widespread	Common resident and migrant
<i>Ardeola bacchus</i>	Chinese Pond Heron	A pond (i.e. Sampling Point P6); Area of seasonal wet grassland, pond and agricultural land south to Sandy Ridge; Plantation habitat within the Study Area	CA Study, OWTF2, KNP PER	• PRC(RC)	Widespread	Common resident, winter visitor and migrant
<i>Bubulcus coromandus</i>	Eastern Cattle Egret	Area of seasonal wet grassland, pond and agricultural land south to Sandy Ridge; Plantation habitat within the Study Area	CA Study	• LC	Widespread in freshwater wetland and short grassland	Common with winter, migrant and breeding populations
<i>Ardea cinerea</i>	Grey Heron	Area of seasonal wet grassland, pond and agricultural land south to Sandy Ridge	CA Study	• PRC	Widespread	Abundant winter visitor and scarce in summer
<i>Ardea alba</i>	Great Egret	Area of seasonal wet grassland, pond and agricultural land south to Sandy Ridge	CA Study	• PRC (RC)	Widespread	Abundant all year
<i>Egretta intermedia</i>	Intermediate Egret	Area of seasonal wet grassland, pond and agricultural land south to Sandy Ridge	CA Study	• Cap. 170 • RC	Mainly in freshwater wetland in the Deep Bay area	Uncommon but present all year
<i>Egretta garzetta</i>	Little Egret	Area of seasonal wet grassland, pond and agricultural land south to Sandy Ridge	KNP PER	• PRC (RC)	Widespread	Abundant and present all year
<i>Aviceda leuphotes</i>	Black Baza	Study Area (presented in grid format)	BBS	• Cap. 586	Widespread in the NT	Scarce migrant and summer visitor
<i>Milvus migrans</i>	Black Kite	Flying over the Study Area	CA Study, OWTF2, KNP PER	• Cap. 586 • (RC) • CSMPs (II)	Widespread	Abundant and present all year
<i>Aquila fasciata</i>	Bonelli's Eagle	Study Area (presented in grid format)	BBS	• Cap. 586 • RC • CRDB (R)	Open country and upland areas of the NT and Lantau	Uncommon and locally distributed resident

Scientific Name	Common Name	Location	Source of information*	Conservation and Protection Status <sup>(1)</sup>	Distribution <sup>(2)</sup>	Rarity <sup>(2)</sup>
<i>Rostratula benghalensis</i>	Greater Painted-snipe	Wet agricultural land and pond south to Sandy Ridge	CA Study	• LC	Found in Long Valley, Mai Po, Ha Tsuen, Lok Ma Chau, San Tin, Kam Tin, Hong Kong Wetland Park.	Locally common resident breeding species
<i>Himantopus himantopus</i>	Black-winged Stilt	Area of seasonal wet grassland, pond and agricultural land south to Sandy Ridge	CA Study	• RC	Mainly in wetland area	Common winter visitor and migrant
<i>Charadrius dubius</i>	Little Ringed Plover	Area of seasonal wet grassland, pond and agricultural land south to Sandy Ridge	CA Study	• (LC)	Mainly in lowland area near waters	Common and present all year
<i>Tringa glareola</i>	Wood Sandpiper	Area of seasonal wet grassland, pond and agricultural land south to Sandy Ridge	CA Study	• LC	Mainly in freshwater marshy areas	Common migrant and winter visitor
<i>Centropus sinensis</i>	Greater Coucal	Various habitats within the Study Area	BBS, OWTF2, KNP PER	• Cap. 170 • CRDB (V) • CSMPS (II)	Widespread	Common resident
<i>Centropus bengalensis</i>	Lesser Coucal	Plantation habitat just south to the Livestock Waste Control Centre	OWTF2, KNP PER	• CRDB (V) • CSMPS (II)	Widespread	Fairly common resident
<i>Otus lettia</i>	Collared Scops Owl	Plantation and shrubland habitat within the Study Area	OWTF2, KNP PER	• Cap. 586 • CSMPS (II)	Widespread	Common resident
<i>Caprimulgus jotaka</i>	Grey Nightjar	Hillside grassland at Cheung Po Tau (southern fringe of the Study Area)	NENT NDAs	• (LC)	Locally distributed to areas of closed-canopy shrubland	Scarce passage migrant with some summer records
<i>Apus affinis</i>	Pacific Swift	Flying over grassland habitat	KNP PER	• (LC)	Mostly in the Deep Bay area and islands	Common spring passage migrant and summer visitor with some autumn and a few winter records
<i>Halcyon smymensis</i>	White-throated Kingfisher	A pond (i.e. Sampling Point P6); Area of seasonal wet grassland, pond and agricultural land south to Sandy Ridge	BBS, CA Study, OWTF2, KNP PER	• (LC)	Widely distributed in coastal areas throughout Hong Kong	Common and present all year
<i>Ceryle rudis</i>	Pied Kingfisher	Area of seasonal wet grassland, pond and agricultural land south to Sandy Ridge	CA Study	• (LC)	Distributed in fishpond and other wetland areas especially in Deep Bay	Common resident

Scientific Name	Common Name	Location	Source of information*	Conservation and Protection Status <sup>(1)</sup>	Distribution <sup>(2)</sup>	Rarity <sup>(2)</sup>
<i>Garrulax canorus</i>	Chinese Hwamei	Developed area west to sampling point P7	KNP PER	• Cap. 586	Widespread	Common resident
<i>Spodiopsar sericeus</i>	Red-billed Starling	Area of seasonal wet grassland, pond and agricultural land south to Sandy Ridge	CA Study	• GC	Distributed in open-country areas, mainly in the northwest NT	Abundant winter visitor with summer records including breeding in recent year
<i>Eophona migratoria</i>	Chinese Grosbeak	Area of seasonal wet grassland, pond and agricultural land south to Sandy Ridge	CA Study	• LC	Distributed in wooded, open-country habitats	Common winter visitor and scarce breeding species in recent years
<b>Mammals</b>						
<i>Cynopterus sphinx</i>	Short-nosed Fruit Bat	In various habitats including developed area, orchard and plantation within the Study Area	KNP PER	• CRDB (I)	Widely distributed in urban and forested areas throughout Hong Kong	Very common
<i>Lutra lutra</i>	Eurasian Otter	Area of seasonal wet grassland, pond and agricultural land south to Sandy Ridge (i.e. at the western edge of the Study Area)	CA Study	• RC • IUCN (NT) • CRDB (V)	Highly restricted to Mai Po Inner Deep Bay Ramsar Site and nearby region	Rare
<i>Muntiacus muntjak</i>	Red Muntjac	Its sign noted in area close to the Livestock Waste Control Centre which located west to the Project site	OWTF2	• PRC	Widely distributed	Very common
<b>Herpetofauna</b>						
<i>Hoplobatrachus chinensis</i>	Chinese Bullfrog	In various locations within the Study Area	CA Study	• PRC • CSMPs (II)	Widespread throughout the NT and Lantau Island	Fairly common
<i>Hylarana taipehensis</i>	Two-striped Grass Frog	A pond near San Uk Ling (i.e. Sampling Point P1)	CA Study	• LC	Restricted to a few localities in Sai Kung Peninsula and the northern and central NT, such as Ho Pui, Lau Shui Heung and Cheung Sheung.	Uncommon
<i>Bungarus multicinctus multicinctus</i>	Many-banded Krait	Sha Ling Road at the western part of Sandy Ridge	CA Study	• PRC • CRDB (V)	Widely distributed over the NT and many islands.	Common



Scientific Name	Common Name	Location	Source of information*	Conservation and Protection Status <sup>(1)</sup>	Distribution <sup>(2)</sup>	Rarity <sup>(2)</sup>
<i>Elaphe porphyracea nigrofasciata</i>	Red Mountain Racer	Grassland within the Proposed Development Area	KNP PER	• LC	Records in several localities at lower altitude in the central NT, and also found on Lantau Island	Rare
<b>Butterflies</b>						
<i>Euthalia aconthea</i>	Baron	Nam Hang within the Study Area	SBF	LC	Widely distributed in woodland throughout Hong Kong	Uncommon
<i>Hypolimnasia misippus</i>	Danaid Eggfly	West of Kong Nga Po within the Study Area	CA Study	LC	Ngau Ngak Shan, Lung Kwu Tan, Hong Kong Wetland Park, Mount Parker, Cloudy Hill, Lin Ma Hang	Uncommon
<i>Udaspes folus</i>	Grass Demon	Marsh within the Study Area (south to Sandy Ridge)	KNP PER	-	Widely distributed in agricultural field throughout Hong Kong	Rare
<b>Aquatic Fauna</b>						
<i>Cyprinus carpio</i>	Common Carp	Pond and watercourse within the Study Area	OWTF2	• IUCN: VU	Not common in streams but occurs in many reservoirs and cultivated in fishponds	Native to China and Southeast Asia; Not rare, introduced throughout Hong Kong

Notes for Table 9.23, Table 9.24 and Table 9.25:

(1) Abbreviations for Protection and Conservation Status:

Cap. 170 – Listed in Wild Animals Protection Ordinance;

Cap. 586 – Listed in Protection of Endangered Species of Animals and Plants Ordinance;

Level of Concern – LC = Local Concern, RC = Regional Concern, PRC = Potential Regional Concern, PGC = Potential Global Concern, GC = Global Concern. Letters in parentheses indicate that the assessment is on the basis of restrictedness in breeding and/or roosting sites rather than in general occurrence. (Fellowes *et al.*, 2002);

IUCN – IUCN Red List of Threatened Species (Version 2012.1); EN = Endangered, VU = Vulnerable, NT = Near Threatened;

CRDB – China Red Data Book of Endangered Animals (Zheng & Wang 1998, Zhao 1998); E = Endangered, V = Vulnerable, R = Rare, I = Indeterminate;

CSMPS – Ministry of Environmental Protection of the People's Republic of China (2002) China State Major Protection Status:

CSMPS (II) = Class II Protected Species

(2) References for Distribution and Rarity:

Avifauna: Allcock *et al.* (2013);

Mammal: Bats – Shek and Chan (2006); Non-flying mammals – Shek *et al.* (2007).

Amphibian: Chan *et al.* (2005).

Butterfly: Hong Kong Biodiversity Database (AFCD, 2015a).  
 Aquatic Fauna: Lee *et al.* (2004).

\*Source of information:

'BBS': HKBWS Breeding Bird Survey (Carey *et al.* 2001)  
 'CA Study': Land Use Planning for the Closed Area – Feasibility Study (Ove Arup, 2010)  
 'NENT NDAs': North East New Territories New Development Areas – Final EIA Report (Ove Arup, 2013)  
 'OWTF2': Organic Waste Treatment Facilities Phase 2 – Feasibility Study: EIA Report (MMHK, 2013)  
 'KNP PER': Engineering Feasibility Study for Kong Nga Po – Preliminary Environmental Review (MMHK, 2014)

## 9.6 Identification and Evaluation of Ecological Impacts

This section identifies and evaluates the potential ecological impacts on habitats and species, caused by the proposed works during the construction and operation phase. The potential impacts described below have been assessed and evaluated in accordance with the criteria stipulated in the EIAO-TM and follows the detailed technical requirements given in Appendix G of the EIA Study Brief No. ESB-276/2014.

### 9.6.1 Construction Phase

#### 9.6.1.1 Loss of Habitat

The proposed Development Area is about 18.48 ha in area and comprises of developed area, plantation, grassland/shrubland, grassland and orchard habitats. The alignment of the proposed road improvement works covers a total area of about 2.17 ha which comprises of mainly developed area, with some roadside plantation and fringe of grassland habitats. Loss of different types of habitat within the Project site in the worst case scenario is presented in the following **Table 9.26**.

Table 9.26: Summary of Habitat Loss within the Project Site in the worst case scenario

Habitat	Area of Loss (ha)		Total
	Proposed Development Area	Road Improvement Works	
Grassland	11.03	0.07	11.1
Grassland/Shrubland	2.94	--	2.94
Orchard	0.43	--	0.43
Plantation	2.98	0.76	3.74
Developed Area	1.1	1.35	2.45
<b>Total</b>	<b>18.48</b>	<b>2.17</b>	<b>20.66</b>

#### Woodlands and Plantations

Woodlands and plantations are considered as habitats with conservation interest referring to Section 2(v)(b) of Appendix G of the EIA Study Brief. Secondary woodland habitat is not present within the Project site. Plantation habitat within the Project site is considered as of moderate-low ecological value owing to the dominance by common exotic tree species and moderate-low to low abundance and diversity of flora

and fauna species. Flora species of conservation interest Cycad-fern *Brainea insignis* and fauna species of conservation interest Collared Scops Owl and Greater Coucal were recorded in plantation habitat within the Project site. Collared Scops Owl and Greater Coucal are common and widespread in the local context.

Plantation is not the dominant habitat of the Project site. It distributes in the southern part of the Project Site. The plantation comprises of mainly 49 species in the KNP Development Area and 15 species in proposed road improvement works. This habitat type is common in the area and supports relative low abundance of fauna species. Therefore the significance of loss of plantation habitat is considered as minor.

#### Grasslands and Grassland/shrubland

Grassland and grassland/shrubland are the major habitats within the Project site. Grassland habitat is considered as of moderate-low ecological value due to the findings of flora and fauna species of conservation interest, which include Cycad-fern *Brainea insignis*, Ladies Tresses *Spiranthes sinensis*, bird species Greater Coucal, Lesser Coucal and Eurasian Eagle Owl, butterfly species Small Three-ring and Swallowtail. This habitat has a relatively short history and is often disturbed by hill fires, that prohibit the growth of vegetation and limit the ecological potential. As mentioned in **Section 9.4.3**, in the first field survey traits of extensive hill fire within the proposed Development Area have been observed, with large extent of bare ground exposed and vegetation were burnt. Nevertheless, grassland habitat is common within the Study Area and the grassland areas adjoining the Project site are readily available for these aforementioned fauna species of conservation interest, so that impact on loss of grassland would be considered as of moderate-minor significance.

The remaining habitats including orchard and developed area are considered as of low ecological value due to their man-made nature supporting low species diversity only, therefore the impact of loss on orchard and developed area would be considered as of minor significance. The ecological significance due to the loss of habitat is summarised in **Table 9.27**.

**Table 9.27: Evaluation of Habitat Loss**

Criteria	Habitat Loss
Habitat Quality	Moderate-low to Very Low
Species	Flora species of conservation interest Cycad-fern <i>Brainea insignis</i> , Fortune's Keteleeria <i>Keteleeria fortunei</i> and Ladies Tresses <i>Spiranthes sinensis</i> and fauna species of conservation interest Collared Scops Owl and Greater Coucal
Size / Abundance	Total area of 20.66 ha, including: 11.1 ha of grassland; 2.94 ha of grassland/shrubland; 0.43 ha of orchard; 3.74 ha of plantation; and 2.45 ha of developed area.
Duration	Construction and operation phases
Reversibility	Irreversible
Magnitude	Moderate for grassland and grassland/shrubland; minor for other habitats
Overall Impact Severity	Moderate-minor to minor

#### 9.6.1.2 Direct Impact on Flora Species of Conservation Interest

Thirteen flora species of conservation interest, namely Incense Tree *Aquilaria sinensis*, *Aralia chinensis*, Cycad-fern *Brainea insignis*, Japanese Camellia *Camellia japonica*, *Cattleya* sp., Dense-flowered *Geodorum densiflorum*, Night-blooming *Cereus Hylocereus undatus*, Fortune's Keteleeria *Keteleeria fortunei*, *Oncidium* sp., Hong Kong Pavetta *Pavetta hongkongensis*, Common Pecteilis *Pecteilis susannae*, Buttercup Orchid *Spathoglottis pubescens* and Ladies Tresses *Spiranthes sinensis*, were recorded within the Study Area. Among these flora species, only three of them, namely Cycad-fern *Brainea insignis*, Fortune's Keteleeria *Keteleeria fortunei* and Ladies Tresses *Spiranthes sinensis* were found within the Project site.

A small population of Ladies' Tresses *Spiranthes sinensis* was found in the grassland habitat in the eastern portion of the Proposed Development Area. This population will likely be directly affected by the Project. Given that Ladies' Tresses *Spiranthes sinensis* is locally common and widespread, the significance of ecological impact on this flora species within the Project site is considered as minor.

Several small populations of Cycad-fern *Brainea insignis* were found in the grassland habitat adjacent to the access road at the upland, flat area as well as on the plantation habitat on a slope at the southeastern side of the Proposed Development Area. Direct impact on the population within the plantation habitat and part of the populations within the grassland habitat is anticipated. Since this species is locally common and direct impact is not expected on all populations within the Project site, the significance of ecological impact on concerned plant species within the Project site is therefore considered as minor.

More than 80 individuals of Fortune's Keteleeria *Keteleeria fortunei* of various sizes were recorded along both sides of Kong Nga Po Road, east of Boarder District Police Headquarters within a plantation from the combination of both ecological field survey and LVIA broad-brush tree survey. They are estimated to be less than 25 years of age. Some of these Fortune's Keteleeria *Keteleeria fortunei* individuals will likely be directly affected by the proposed road improvement works. Given that the observed individuals are likely purposively planted in the plantation area, the significance on loss of this flora species within the Project site is considered as minor.

Table 9.28: Direct Impact on Flora Species of Conservation Interest

Criteria	Direct Impact on Flora Species of Conservation Interest
Species	Three flora species of conservation interest were recorded within the Project site, namely Cycad-fern <i>Brainea insignis</i> , Fortune's Keteleeria <i>Keteleeria fortunei</i> and Ladies Tresses <i>Spiranthes sinensis</i> .
Abundance	Low abundance of the flora species to be directly affected
Duration	Both construction and operation phases
Reversibility	Irreversible if not able to be transplanted or retained
Magnitude	Minor as relatively small number of individuals; most of them are herb species which could be readily transplanted
Overall Impact Severity	Minor impact because these three flora species are either locally common or purposively planted.

#### 9.6.1.3 Disturbance to Fauna Species of Conservation Interest

##### Project Site

Six bird species and two butterfly species of conservation interest were recorded within the Project site as summarised in **Table 9.23** and indicated in **Figure 9.2b** and **Figure 9.2d**. It is also noted from literature review as summarised in **Table 9.25** that one more reptile species of conservation interest Red Mountain Racer was recorded within the Project site.

Two of the bird species of conservation interest, Great Cormorant and Black Kite, were observed in flight only, thus they are not anticipated to be affected by any disturbance impact. Collared Scops Owl, Lesser Coucal and Greater Coucal recorded are common and widely distributed species in grassy habitat in the local context. Given their wide distribution, potential impact on these species is considered as minor.

The Eurasian Eagle Owl recorded at the grassland habitat within the proposed Development Area is a scarce resident in remote areas of hill slope. Nevertheless, it should be noted that this bird species is highly mobile and the mapped locations may not be indicative of the species use of the Project site. As large area of remote grassland habitat is readily available at the north of Project Site to facilitate the use by this scarce bird species of conservation interest, potential disturbance impact is considered as minor.

Rare butterfly species Small Three-ring and Swallowtail were recorded in the grassland habitat at the northern part of the proposed Development Area. Nevertheless, these two rare species have been recorded in various localities as mentioned in **Section 9.4.7**. The larval food plants of Small Three-ring and Swallowtail, *Ischaemum barbatum* and *Zanthoxylum nitidum*, are common plant species (AFCD, 2015a; Ove Arup, 2013). *Ischaemum barbatum* is often present in wetlands and also grows on dry hillslopes, whilst it is recorded in grassland habitat in the Project site and Study Area. *Zanthoxylum nitidum* is recorded in grassland of Project Site as well as in secondary woodland, shrubland and developed area within the Study Area. In view of large availability of hillside grassland habitat as well as larval food plants in close vicinity, the hillside grassland within the proposed Development Area is not considered as an essential habitat for the Small Three-ring and Swallowtail. Therefore potential impact on these butterfly species of conservation interest is considered to be moderate-minor.

Red Mountain Racer is known from several localities in central New Territories and distributed in woodlands in protected areas. The individual present at grassland in the proposed Development Area is deemed as an occasional recorded whilst direct impact on grassland would not constitute significant impact on the population of this reptile species in Hong Kong, therefore the potential impact on this species is considered as minor.

##### Study Area

Within the Study Area, a total of 17 bird species, one herpetofauna species, four dragonfly species, four butterfly species and three freshwater species of conservation interest were recorded during field surveys, as summarised in **Table 9.24** and indicated in **Figures 9.2a** to **9.2d**. A number of the fauna species of conservation interest were recorded at agricultural land and pond habitats south to Sandy Ridge. Potential

disturbance impact from construction activities may arise on these fauna species in case of uncontrolled site runoff and air/noise emission and neglect of good site practice. However, precautionary and mitigation measures for various environmental aspects, such as dust control, selection of quieter plant, use of movable noise barrier, good site practices for waste handling and minimisation of water quality impact, have been stated in previous sections. Given the relatively low abundance of fauna species of conservation interest and the high availability of their optimal habitats in the local context, potential disturbance impact on the individuals would not constitute significant impact on their population in Hong Kong and therefore the potential disturbance impact on these species is considered as minor.

Table 9.29: Evaluation of Disturbance Impact on Fauna Species of Conservation Interest

Criteria	Disturbance Impact on Fauna Species of Conservation Interest
Species	Seven bird species, one herpetofauna species and two butterfly species of conservation interest within the Project site; Seventeen bird species, one amphibian species, four dragonfly species, four butterfly species and three freshwater fauna species of conservation interest recorded outside the Project site within the Study Area.
Abundance	Low for all except Greater Coucal
Duration	Both construction and operation phases
Reversibility	Potential disturbance impact is reversible
Magnitude	Moderate-minor for the two butterfly species of conservation interest Minor for other species of conservation interest within the Project site and minor magnitude of off-site disturbance impact on fauna species within the Study Area
Overall Impact Severity	Moderate-minor impact on the two butterfly species of conservation interest within the Project site Minor impact on other fauna species of conservation interest

#### 9.6.1.4 Disturbance to Offsite Habitat and Flora Species of Conservation Interest

##### Wetlands within the Study Area

Wetlands are considered as habitats with conservation interest referring to Section 2(v)(a) of Appendix G of the EIA Study Brief. Within the Project site, there is not any presence of wetlands such as wet agricultural land, seasonally wet grassland, marsh, fishpond, watercourses or associated riparian habitats. Therefore, no direct loss of wetlands due to the Project is expected. These wetlands are only found within the Study Area but not on the fringe of the Project site; and a watercourse is found intersect with Kong Nga Po Road. Small pieces of abandoned pond habitat and watercourses are scattered from 50m outside the Project site, whilst large areas of seasonal wet grassland, agricultural land and pond habitats are available at the west of Man Kam To Road. The watercourse intersect with Kong Nga Po Road will be temporarily diverted but reinstated after construction. With adequate separations from the Project site as well as implementation of good site practices outlined in ProPECC Note PN1/94 to minimise site surface runoff from construction works areas and to control the dispersion of sediments and contaminants to inland waters (as mentioned in **Section 5.6**), disturbance to offsite wetland habitats is considered as negligible.

### Flora Species of Conservation Interest within the Study Area

For the flora species of conservation interest within the Study Area but outside the Project site, indirect disturbance might affect the plants, which include construction dust deposition on plants and storage / disposal of construction waste / materials in retained vegetated areas, particular in areas close to the Project site. Dust composition on plants could adversely interfere with the photosynthesis of plants while storage / disposal of construction waste / materials could cause physical or chemical damage to the plants. These construction disturbances are not uncommon in construction sites in Hong Kong, but could be effectively prevented through clear definition of site limit, good workmanship and regular site inspections. The significance of ecological impact on flora species of conservation interest within the Study Area is therefore considered as minor.

#### 9.6.1.5 Disturbance to Man Kam To Egretty

In the 2015 breeding season there were up to 36 nests of ardeids including 5 Little Egret nests, 19 Chinese Pond Heron nests and 12 nests of unidentified ardeid species from two colonies at Man Kam To Road Egretty, approximately 1km to the southwest of the Project site. Although the egretty colonies are not located within the Study Area, 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 major foraging habitats for Chinese Pond Heron are inland pond and marsh. A flight line study for locally breeding Chinese Pond Heron revealed that 72% landed around fish ponds (Young, 1998). It is noted that fish ponds or similar wetland habitat are absent in the Project site and uncommon at the Study Area. It was also observed in the field that fairly low number of Chinese Pond Heron was found in the Study Area, probably due to lack of suitable wetland habitat for ardeids.

From the flight line survey conducted at the Man Kam To Road Egretty for NENT NDAs Study (Ove Arup, 2013), it can be revealed that the Project site and the surrounding environment (i.e. the Study Area) are not optimal foraging sites for the breeding Chinese Pond Herons and Little Egrets at Man Kam To Road Egretty as only 4.4% of them flew towards the northeast where the Study Area of this Project located. Wetland is available in proximity to the egretty, noticeably Ng Tung River, Long Valley and fish ponds in Ho Sheung Heung, which are considered to be the major foraging habitats for the egretty. All these wetlands are located in the western to southern side of the egretty; therefore the most frequent flight movement is considered being the western and southern side of the egretty. This was confirmed by the flight line survey conducted for NENT NDAs Study which showed that the majority (67.4%) of ardeid at the egretty flew towards the southwest. Since the Project site is located to the north-eastern side of the egretty, the construction and operation of this Project will unlikely constitute disturbance impact on the flight line or foraging opportunity for the breeding ardeids.



Table 9.30: Evaluation of Disturbance Impact on Man Kam To Egret

Criteria	Disturbance Impact on Man Kam To Egret
Species	Ardeids (Little Egret and Chinese Pond Heron)
Abundance	Breeding population of 5 Little Egret nests and 19 Chinese Pond Heron nests in 2015 – small population (3.3% and ranked #11) in the local context
Duration	Both construction and operation phases
Reversibility	Potential off-site disturbance impact is reversible
Magnitude	Magnitude of any off-site disturbance impact will be negligible; Egret is relatively small in the local context.
Overall Impact Severity	Negligible

#### 9.6.1.6 Reduction of Ecological Carrying Capacity

Ecological carrying capacity refers to the ecological resource that a habitat or an area can sustain. The general area of the Project is a mixture of different natural, semi-natural and man-made habitats. The habitats within the Project site is not identified of sustaining significant population of flora and fauna species, thus the ecological carrying capacity of the Project site is deemed not significant in the context of the ecosystem in the northeast New Territories. As the habitats to be lost is mainly grassland, grassland/shrubland, orchard, plantation and developed area in which species diversity and abundance are low whilst similar habitats are available in the vicinity of the Project site, the reduction of ecological carrying capacity due to this project is considered as minor.

Table 9.31: Evaluation of Reduction of Ecological Carrying Capacity

Criteria	Reduction of Ecological Carrying Capacity
Species	All flora and fauna species
Abundance	Relatively low species diversity and abundance of fauna
Duration	Both construction and operation phases
Reversibility	Irreversible
Magnitude	Minor
Overall Impact Severity	Minor

#### 9.6.1.7 Indirect Ecological Impacts of Potential Changes in Water Quality as a result of Surface Runoff

Referring to Section 2(vi)(c) of Appendix G of the EIA Study Brief, potential changes in water quality as a result of surface runoff are taken into account for identification of any potential indirect ecological impacts. According to **Section 5.6.1.2** of this EIA Report, good site practices outlined in ProPECC Note PN1/94 should be practised to minimise surface runoff from construction works area which may contain suspended solids, sediments and contaminants, thus potential changes of inland water quality and dispersion of sediment to inland waters can be controlled effectively. As no adverse water quality impacts are anticipated with the adoption of good site practices, any potential indirect ecological impacts as a result of during construction phase is considered as negligible.

Table 9.32: Evaluation of Indirect Ecological Impacts of Potential Changes in Water Quality as a result of Surface Runoff

Criteria	Indirect Ecological Impacts of Surface Runoff
Species	Mainly riparian vegetation, aquatic flora and fauna species, wetland-dependent birds, dragonfly and amphibian species
Abundance	Relatively low
Duration	Construction phase
Reversibility	Reversible
Magnitude	Negligible as no adverse water quality impact anticipated
Overall Impact Severity	Negligible

### 9.6.2 Operation Phase

The operation of the Project may impose potential indirect impact of air quality or noise due to the training activities in the police facilities particularly in the firing range and due to increased traffic on off-site habitat in operation phase. These potential impacts of air quality or noise will be insignificant as those firing training activities and induced traffic from proposed development are not intensive. Potential areas of concern on water quality impacts during operation phase include sewage and wastewater generation. As the sewage and wastewater generated will be properly handled, discharged and closely monitored under respective regulations and ordinances on water, any potential disturbance to the offsite pond or watercourse habitat will be controlled within acceptable level (see **Section 5** of this report). In addition, since the adjacent habitats are relatively low in ecological value, the offsite disturbance impact is anticipated to be minor in operation phase.

Table 9.33: Evaluation of Disturbance Impact during Operation Phase

Criteria	Disturbance Impact during Operation Phase
Species	Flora and fauna species utilizing the habitats in the vicinity of the Project site
Abundance	Relatively low
Duration	Throughout operation phase
Reversibility	Reversible
Magnitude	Minor, owing to low abundance of fauna, and the environmental impact of sewage and wastewater will be controlled No unacceptable emission of air or noise
Overall Impact Severity	Minor

### 9.6.3 Cumulative Impact

A total of three projects located within the Study Area of this Project are identified clearly as concurrent projects which may constitute cumulative impacts, as discussed in **Section 2.9**. These projects include:

- Organic Waste Treatment Facilities, Phase 2 (OWTF2);
- Fanling North Freshwater Service Reservoir under NENT NDAs; and
- Columbarium Crematorium and Related Facilities at Sandy Ridge.

#### 9.6.3.1 Organic Waste Treatment Facilities, Phase 2

The OWTF2 project site of 2.5ha comprises developed area and plantation habitat where the area is not ecologically significant owing to the relatively low ecological value of the habitats. The majority of the recorded flora and fauna species within the project site and study area were common and widespread in Hong Kong with no conservation interest, except two floral species of conservation interest (*Aquilaria sinensis* and orchid species *Cattleya spp.*) which would be preserved on-site, signs of Red Muntjac and some bird species of conservation interest including Little Grebe, Chinese Pond Heron, Black Kite, Greater Coucal, Lesser Coucal, Collared Scops Owl and White-throated Kingfisher, which are all common species in the local context. As no significant ecological impacts have been identified for the OWTF2 project, cumulative ecological impact is not expected.

#### 9.6.3.2 Fanling North Freshwater Service Reservoir under NENT NDAs

Potential ecological impact of the construction of Fanling North Freshwater Service Reservoir has been considered in the NENT NDAs EIA report. The semi-natural Cheung Po Tau Watercourse, which is also within the Study Area of this Project, was evaluated. This watercourse was found seasonal and supporting no stream fauna of conservation significance. The upstream section could be impacted by runoff during construction of the proposed Fanling North Freshwater Service Reservoir. Direct habitat loss, disturbance, hydrological and runoff impact severity were all considered as low. Therefore, no cumulative impact is anticipated on the watercourse at Cheung Po Tau.

#### 9.6.3.3 Development of Columbarium, Crematorium and related facilities at Sandy Ridge Cemetery

With reference to the Project Profile (PP-503/2014) this proposed development is located at around 580 m to the west of the project site. The site formation works will be carried out by phases with the handover of the formed land in 2019 and the construction of building works of the columbarium, crematorium and related facilities expected to complete in 2022.

Findings from the ecological impact assessment of this proposed development are currently not published. Offsite disturbance impact of this Project is considered as minor, with proper control of wastewater and without unacceptable emission of air or noise. Therefore, no cumulative impact on habitat or ecological resource is anticipated at this stage.

### 9.7 Precautionary and Mitigation Measures

#### 9.7.1 Minimization of Direct Impact on Flora Species of Conservation Interest

To minimize any direct impact on flora species of conservation interest, mitigation measures are recommended. Some individuals of the three flora species of conservation interest within the Project site, namely Cycad-fern *Brainea insignis*, Fortune's Keteleeria *Keteleeria fortunei* and Ladies Tresses *Spiranthes sinensis*, are in direct conflict with the proposed works and in-situ preservation may not be practicable. To ensure that no flora species of conservation interest will be affected, it is recommended to

conduct a detailed vegetation survey as baseline monitoring to update the exact locations, number and condition of individuals of any flora species of conservation interest within the proposed works area prior to the commencement of site clearance. A qualified botanist / ecologist with at least 5 years of experience in flora study or survey should be appointed to carry out the detailed vegetation survey. The scope of the detailed vegetation survey should include the following:

- checking and updating the number, locations and condition of Cycad-fern *Brainea insignis*, Fortune's Keteleeria *Keteleeria fortunei* and Ladies Tresses *Spiranthes sinensis* identified and any other flora species of conservation interest by actively searching within the works boundary;
- preparing an updated location plan showing the locations of individuals of Cycad-fern *Brainea insignis*, Fortune's Keteleeria *Keteleeria fortunei* and Ladies Tresses *Spiranthes sinensis* and any other flora species of conservation interest identified within the works boundary during the detailed vegetation survey;
- confirming whether any of the individuals of Cycad-fern *Brainea insignis*, Fortune's Keteleeria *Keteleeria fortunei* and Ladies Tresses *Spiranthes sinensis* and any other flora species of conservation interest identified within the works boundary during the detailed vegetation survey will likely be directly affected by the proposed works of the Project;
- for individuals of Cycad-fern *Brainea insignis*, Fortune's Keteleeria *Keteleeria fortunei* and Ladies Tresses *Spiranthes sinensis* and any other flora species of conservation interest not anticipated to be directly affected, recommending protective measures of identified individuals for each species where in situ preservation is feasible; and
- for individuals of Cycad-fern *Brainea insignis*, Fortune's Keteleeria *Keteleeria fortunei* and Ladies Tresses *Spiranthes sinensis* and any other flora species of conservation interest likely to be directly affected, preparing a transplantation proposal which includes detailed methodology of transplantation for each species, plans with proposed recipient locations, post-transplantation maintenance schedule for each species and detailed implementation programme.

A Detailed Vegetation Survey Report summarising the findings and recommendations of the detailed vegetation survey should be prepared and submitted to AFCD for approval no later than one month prior to the commencement of site clearance.

During construction phase, erection and maintenance of a temporary protective fence enclosing the flora species of conservation interest identified under the detailed vegetation survey is recommended to avoid potential impact from construction activities such as materials storage. Monthly monitoring of any other flora species of conservation interest identified in the detailed vegetation survey should be conducted during the construction phase to make sure that the flora species of conservation interest are not affected by the construction activities of the Project.

### **9.7.2 Precautionary Measures for Butterfly Species of Conservation Interest**

Rare butterfly species of conservation interest, Small Three-ring and Swallowtail, have been recorded in grassland habitat in the Project site. It is recommended to propose common grass species *Ischaemum barbatum* and *Zanthoxylum nitidum*, which are the larval food plants of Small Three-ring and Swallowtail, in the Landscape Master Plan. .

### **9.7.3 Precautionary Measures for Minimization of Indirect Disturbance on Ecology**

Mitigation measures for air, noise, water, waste and landscape aspects proposed in respective sections of this EIA Report could act as precautionary measures to prevent and minimize any indirect disturbance impact or pollution arisen from the construction activities on the local ecology and offsite habitats. These measures include dust control measures, selection of quieter plants, use of movable noise barriers, good site practices for waste and wastewater handling, measures outlined in ProPECC Note PN1/94 to minimise surface runoff from construction site, landscape buffer planting, etc., according to relevant sections of this EIA Report.

### **9.8 Evaluation of Residual Ecological Impact**

Given that no significant ecological impacts are identified for construction and operation phases, no residual ecological impacts are identified.

### **9.9 Ecological Monitoring and Audit Requirements**

The implementation, monitoring and audit of the precautionary and mitigation measures as mentioned in **Section 9.7** should be conducted as presented in the standalone Environmental Monitoring and Audit (EM&A) Manual. In addition, the mitigation measures for air, noise, water, waste and landscape aspects proposed in respective sections which are indirectly beneficial to the local ecology shall be checked as part of the environmental monitoring and audit procedures during construction period as presented in the standalone EM&A Manual.

### **9.10 Summary**

The Project site comprises of five habitat types including plantation, grassland, grassland/shrubland, developed area and orchard. Amongst these habitat types, grassland is dominant in the Project site. Although several flora and fauna species of conservation interest were recorded within the Project site, the area is generally not ecologically significant owing to the relatively low ecological value of the habitats. Grassland habitat is common in the Study Area and this habitat is also the dominant habitat at the periphery of the Project site. Therefore, the potential direct impact on habitat loss is considered as of moderate-minor to minor significance. Indirect impact on off-site habitat is also not considered to be significant due to lack of important ecological resources. No significant ecological impact will be resulted from the operation of the Project as all potential air quality, noise and water quality impacts will be controlled to environmentally acceptable levels, thus no specific ecological mitigation measure is considered necessary.

To minimise impact on the flora species of conservation interest within the Project site, it is recommended to conduct a detailed vegetation survey as baseline monitoring to update the exact locations, number and condition of individuals of any flora species of conservation interest within the proposed works area prior to the commencement of site clearance. Erection and maintenance of a temporary protective fence enclosing the flora species of conservation interest to be preserved is recommended to avoid potential impact from

construction activities. A proper transplantation proposal should be prepared and implemented if individuals of flora species of conservation interest are identified not preserved on site. Monthly monitoring of any other flora species of conservation interest identified in the detailed vegetation survey should be conducted during the construction phase to preserve those flora species of conservation interest recorded within the Project site.

With consideration of minimizing impact on rare butterfly species of conservation interest recorded at the grassland in the Project site, it is recommended to propose common grass species which are the larval food plants of Small Three-ring and Swallowtail in the Landscape Master Plan.

## 9.11 References

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