

## 8. TERRESTRIAL ECOLOGY

### 8.1 Introduction

8.1.1 The following section presents the results of an ecological assessment of potential impacts resulting from the Project. Reference was made to previous assessments of the area. Field surveys were undertaken to supplement and assess the validity of data from previous assessments. As stated in the EIAO-TM, the aim of ecological impact assessment is to provide sufficient and accurate ecological data to allow a complete and objective identification, prediction and evaluation of the potential ecological impacts.

### 8.2 Environmental Legislation, Plans, Standards and Guidelines

8.2.1 Guidelines, standards, documents and HKSAR Government ordinances and regulations listed below were referred to during the course of the ecological impact assessment.

- The *Country Parks Ordinance* (Cap. 208) provides for the designation and management of country parks and special areas. Country parks are designated for the purpose of nature conservation, countryside recreation and outdoor education. Special Areas are created mainly for the purpose of nature conservation.
- The *Forests and Countryside Ordinance* (Cap. 96) prohibits felling, cutting, burning or destroying of trees and growing plants in forests and plantations on Government land. Related subsidiary Regulations prohibit the selling or possession of listed restricted and protected plant species. The list of protected species in Hong Kong, under the Forestry Regulations, was last amended on 11 June 1993 under the Forestry (Amendment) Regulation 1993 made under Section 3 of the Forests and Countryside Ordinance.
- Under the *Wild Animals Protection Ordinance* (Cap. 170), designated wild animals are protected from being hunted, whilst their nests and eggs are protected from injury, destruction and removal. All birds and most mammals, including marine cetaceans, are protected under this Ordinance.
- The amended *Town Planning Ordinance* (Cap. 131) provides for the designation of coastal protection areas, Sites of Special Scientific Interest (SSSIs), Conservation Area, Country Park, Green Belt or other specified uses that promote conservation or protection of the environment. The authority responsible for administering the Town Planning Ordinance is the Town Planning Board.
- The *Protection of Endangered Species of Animals and Plants Ordinance* (Cap. 586) provides protection for certain plant and animal species through controlling or prohibiting trade in the species.
- Chapter 10 of the Hong Kong Planning Standards and Guidelines (HKPSG) covers planning considerations relevant to conservation. This chapter details the principles of conservation, the conservation of natural landscape and habitats, historic buildings, archaeological sites and other antiquities. It also describes enforcement issues. The appendices list the legislation and administrative controls for conservation, other conservation related measures in Hong Kong and government departments involved in conservation.
- Annex 16 of the EIAO-TM 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. Annex 8 recommends the criteria that can be used for evaluating habitat and ecological impact.
- Environmental Impact Assessment Ordinance (EIAO) Guidance Note No. 3/2010 provides general guidelines for assessing the recommended environmental mitigation measures in Environmental Impact Assessment reports.

- EIAO Guidance Note No. 6/2010 clarifies the requirements of ecological assessments under the EIAO.
- EIAO Guidance Note No. 7/2010 provides general guidelines for conducting ecological baseline surveys in order to fulfil requirements stipulated in the EIAO-TM.
- EIAO Guidance Note No. 10/2010 introduces general methodologies for conducting terrestrial and freshwater ecological baseline surveys.
- ETWB TCW No. 3/2006 Tree Preservation sets out the policy on tree preservation, and the procedures for control of tree felling, transplanting and pruning in Government projects.
- The IUCN Red List of Threatened Species provides taxonomic, conservation status and distribution information on taxa that have been evaluated using the IUCN Red List Categories and Criteria. This system is designed to determine the relative risk of extinction, and the main purpose of the IUCN Red List is to catalogue and highlight those taxa that are facing a higher risk of global extinction. The IUCN Red List also includes information on taxa that are either close to meeting the threatened thresholds or that would be threatened were it not for an ongoing taxon-specific conservation programme.
- The Key Protected Wildlife Species List details Category I and Category II protected animal species under the PRC's Wild Animal Protection Law.

### 8.3 Assessment Methodology

#### *Study Area*

- 8.3.1 In accordance with Clause 3.4.9.2 of the EIA Study Brief, the study area for the purpose of terrestrial ecological impact assessment, including freshwater habitats, included areas within 500 m distance from the site boundary of the Project.

#### *Literature Review*

- 8.3.2 In accordance with Clause 3.4.9.4(i) of the EIA Study Brief, relevant studies/surveys and information regarding the ecological character of the study area were collated and reviewed. The information collected was evaluated to identify any information gaps relating to the assessment of potential ecological impacts.
- 8.3.3 A literature review of ecological conditions and relevant data on flora and fauna that lies within a 500 m distance from the site boundary was taken from the following resources:
- Agreement No. CE 42/96 Route 16 Investigation Assignment from West Kowloon to Sha Tin – Alternative Alignment – EIA Study (HyD, 1999); and
  - Shatin to Central Link – Tai Wai to Hung Hom Section – Environmental Impact Assessment Study (MTRC, 2011).
- 8.3.4 Other relevant reports from private sector or Government included:
- Avifauna of Hong Kong (Carey *et al.*, 2001);
  - Rare and Precious Plants of Hong Kong (Hu *et al.*, 2003);
  - Flora of Hong Kong (Volumes 1 to 4) published by AFCD;
  - A Field Guide to the Terrestrial Mammals of Hong Kong (Shek, 2006);
  - Hong Kong Biodiversity – newsletter of AFCD;

- *Porcupine!* – newsletter of Department of Ecology & Biodiversity of University of Hong Kong.
- AFCD Hong Kong Biodiversity Survey Database (2002-2011) (unpublished);
- Annual Report and other Publications of The Hong Kong Bird Watching Society; and
- Memoirs of Hong Kong Natural History Society.

*Ecological Surveys*

8.3.5 Based on the findings of literature review, field surveys were carried out to fill information gaps identified and verify the information collected, to fulfill the objectives of this EIA according to Clause 3.4.9.4 (iii) of the EIA Study Brief. The methodologies for ecological surveys and impact assessment presented below were prepared in accordance with the criteria and guidelines in Annexes 8 and 16 of the EIAO-TM, EIAO Guidance Note No. 7/2010 and 10/2010.

Ecological Survey Programme

8.3.6 An eleven-month ecological survey was conducted from October 2010 to August 2011 covering both dry and wet seasons. The details of the survey programme are summarized in **Table 8.1**.

**Table 8.1 Ecological Survey Programme**

Ecological Survey	2010			2011							
	Wet Season	Dry Season			Wet Season						
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
Habitat Mapping and Vegetation	√	√	√				√		√		
Avifauna (Day)	√		√	√	√	√	√	√	√	√	√
Avifauna (Night)	√		√		√		√		√		√
Terrestrial Mammal (Day) <sup>1</sup>	√		√	√	√	√	√	√	√	√	√
Terrestrial Mammal (Night) <sup>1</sup>	√		√		√		√		√		√
Herpetofauna (Day)	√		√				√	√	√	√	√
Herpetofauna (Night)	√		√				√		√		√
Butterfly, Dragonfly and Damselfly	√		√				√	√	√	√	√
Freshwater Communities	√		√				√		√		

Note:

1. Infrared camera was deployed for terrestrial mammal survey from June 2011 to August 2011.

8.3.7 A verification field visit was conducted in September 2014 to check the condition of the habitats within the study area. Findings of the ecological survey and verification field visit were incorporated in the description of the environment presented in **Section 8.4**.

Habitat Mapping and Vegetation Surveys

8.3.8 Habitats within the study area were identified, sized and mapped. Ecological characteristics of each habitat type including size, vegetation type, species present, dominant species found, species diversity and abundance, community structure, seasonal patterns and inter-dependence of the habitats and species, and presence of any features of ecological importance were defined and

characterized. Representative photographs of the habitat types and of important ecological features identified were taken. A desktop review of aerial photographs developed habitat maps of a suitable scale (1:1000 to 1:5000) showing the types and locations of habitats in the study area. The habitat maps were then verified during ground truthing.

- 8.3.9 Vegetation surveys were conducted throughout dry and wet seasons, by direct observation, to record diversity and dominance of plant species present in different habitat types. Areas with similar vegetation composition were categorized under the same habitat type. The locations of any plant species of conservation importance were recorded. Identification of flora species and status in Hong Kong was made with reference to Flora of Hong Kong (Volume 1 – 4) (2007, 2008, 2009, 2011 respectively), Hong Kong Herbarium (AFCD, 2014a), and Corlett *et al.* (2000).

#### Avifauna Surveys

- 8.3.10 Avifauna species present and relative abundance of species in different habitats were surveyed visually and aurally by transect counts (**Figure 8.1** and **Figure 8.2** refer). The location of any avifauna species of conservation importance encountered was recorded, along with notable behaviour (e.g. breeding behaviour such as nesting and presence of recently fledged juveniles, roosting, and feeding activities). Night surveys were also conducted to record nocturnal avifauna. Ornithological nomenclature in this report follows Carey *et al.* (2001).

#### Mammal Survey

- 8.3.11 Mammal surveys were conducted in areas which may potentially be utilized by terrestrial mammals during day and night time. The surveys focused on searching for field signs such as droppings, footprints, diggings or burrows left by larger terrestrial mammals. Mammal identification was made to the lowest possible taxon from the field signs. In addition, any mammal directly observed was also identified. Locations of mammal species of conservation importance were recorded. Nomenclature of mammal follows Shek (2006).
- 8.3.12 Flying mammals were detected with the use of a bat detector. Whilst a formal bat survey was not undertaken, the survey aimed to identify the bat species utilizing the site for commuting and foraging. A surveyor walked a continuous pre-determined transect route around the site covering linear and other features likely to be used by bats such as lines of trees, tracks, woodland edge and waterbodies. The surveyor was equipped with an ultrasonic bat detector. This enabled identification of most bat species in the field, using the heterodyne output. However, a digital MP3 recorder was also employed to record all bat calls for later analysis using BatScan computer software.
- 8.3.13 Infrared camera trap was used from June to August 2011 to record the presence of mammals with minimal disturbance to wildlife. Motion of wildlife was detected through the infrared outputs which then triggered the camera. The camera was set in locations where evidences of mammals such as burrows, animal tracks and possible corridors were present. In an attempt to maximize opportunities of observing different species, the camera was set at various locations within the secondary woodland habitat. The camera was strapped securely to a tree or a post about 30cm above ground and a test-run was conducted by the surveyor to ensure the camera was working properly. The camera was then left overnight to capture images of diurnal and nocturnal species. After retrieving the camera the following day, the memory card of the camera was analyzed and any images of wildlife were identified.

#### Dragonfly, Damselfly and Butterfly Survey

- 8.3.14 Dragonflies, damselflies and butterflies within the study area were surveyed along the transect adopted for the avifauna survey (**Figure 8.1** and **Figure 8.2** refer). Relative abundance of dragonfly, damselfly and butterfly encountered was recorded. Nomenclature of dragonfly and damselfly follows Tam *et al.* (2011), and nomenclature of butterfly follows Lo (2005).

#### Herpetofauna Survey

- 8.3.15 Herpetofauna (amphibian and reptile) within the study area were surveyed qualitatively during both daytime and night-time. Potential microhabitats (e.g., leaf litter, underneath of rotten logs) were actively searched. All reptiles and amphibians sighted or heard were recorded, supplemented by

observation of eggs and tadpoles of frogs and toads. Nomenclature of amphibian follows Chan *et al.* (2005), and reptile follows Karsen *et al.* (1998).

#### Freshwater Communities Survey

- 8.3.16 Freshwater fish and invertebrate communities were surveyed via active searching and direct observation at watercourse sections within the study area during dry and wet seasons. The sampling locations of the freshwater communities surveys are shown in **Figure 8.1** and **Figure 8.2**. Boulders within the watercourse were carefully turned over to locate any aquatic animals beneath. A hand net was used to collect organisms along the watercourse. Organisms encountered were recorded and identified to the lowest possible taxon level.

#### Verification Field Visit

- 8.3.17 A verification field visit was conducted with an aim to check and verify the condition of the habitats within the study area. The habitat map was updated based on desktop review of updated aerial photographs and ground truthing along the transects as shown in **Figure 8.1** and **Figure 8.2**.

### **8.4 Description of the Environment**

#### *Areas of Conservation Importance*

- 8.4.1 The only known area of conservation importance identified within the study area is Lion Rock Country Park situated about 300 m south of the Project site (**Figure 8.3** and **Figure 8.4** refer). The park is known to support high avifauna diversity (AFCD, 2013). Fauna of conservation importance such as Black Kite (*Milvus migrans*), Longtailed Macaque (*Macaca fascicularis*) and Tokay Gecko (*Gekko gecko*), can be found (AFCD, 2013; Chan *et al.*, 2006). Flora species such as Chinese Red Pine (*Pinus massoniana*), Chinese Hackberry (*Celtis sinensis*), Incense Tree (*Aquilaria sinensis*), and Chinese New Year Flower (*Enkianthus quinqueflorus*) are also common in the park (AFCD, 2013).

#### *Habitat and Vegetation*

#### Literature Review

- 8.4.2 The Route 16 Investigation Assignment from West Kowloon to Sha Tin Alternative Alignment EIA and Shatin to Central Link (SCL) – Tai Wai to Hung Hom Section EIA studies recorded four habitats within the study area, namely: secondary woodland, natural watercourse/stream, plantation and developed area (HyD, 1999; MTRC, 2011).
- 8.4.3 The SCL – Tai Wai to Hung Hom Section EIA Study located three flora species of conservation importance within the study area namely, Incense Tree (*Aquilaria sinensis*), Lamb of Tartary (*Cibotium barometz*) and Hong Kong Pavetta (*Pavetta hongkongensis*) (MTRC, 2011). Saplings of Incense Trees were recorded in plantation habitat southwest of Hin Keng Estate. Lamb of Tartary and anecdotal evidence of Hong Kong Pavetta were reported from the secondary woodland near Hin Keng Estate and the secondary woodland of Tei Lung Hau, respectively.

#### Recent Survey Results

- 8.4.4 Four terrestrial habitat types were identified, namely secondary woodland, plantation, watercourse and developed area during the recent ecological surveys under this Project. **Table 8.2** summarizes the size of each habitat type within the study area.
- 8.4.5 A habitat map of the study area is illustrated in **Figure 8.3** and **Figure 8.4**. Representative photographs of habitats are given in **Appendix 8.1**. Photographs of plant species of conservation importance are presented in **Appendix 8.2**. Vegetation recorded within the study area is listed in **Appendix 8.3**.
- 8.4.6 The findings of the verification field visit showed that the habitat condition remained largely unchanged. A patch of plantation of about 0.44ha and secondary woodland of about 0.13ha was

transformed into developed area. The changes were mainly attributed to the construction of Hin Keng Portal under the Shatin to Central Link (SCL) project.

**Table 8.2 Habitats Recorded within the Study Area**

Habitat Type	Area (ha)	Percentage of Total Area (%)
Secondary Woodland	97.58	54%
Plantation	23.41	13%
Watercourse	1.85	1%
Developed Area	56.77	32%
<b>Total:</b>	<b>179.61</b>	<b>100%</b>

#### Secondary Woodland

- 8.4.7 Secondary woodlands are confined to the hillsides surrounding the Sha Tin WTW apart from the developed residential areas of Hin Keng Estate and road network located on the east. The southern end of the secondary woodland is continuous with Lion Rock Country Park. Secondary woodland on the north and west side of the Sha Tin WTW extends to the plantations on the edge of Tai Po Road. This habitat is largely undisturbed, but the periphery is subjected to disturbance from Sha Tin WTW operation, road traffic and recreation uses. Evidences of hunting activities were also noted at the proposed Water Treatment Works Logistics Centre.
- 8.4.8 The woodland near Keng Hau Road, inside the Lion Rock Country Park and Tei Lung Hau was covered by the transect. Attempts made to survey the woodland surrounding Shatin Water Treatment Works through Keng Hau Road, Tai Po Road, and the walking trail within Lion Rock Country Park, were unsuccessful as the accessibility was blocked by wire mesh or steep slopes.
- 8.4.9 Moderate floral diversity (197 flora species) was recorded in this habitat (**Appendix 8.3** refers). The overstorey vegetation species consisted of a closed canopy with a height between 4 to 15 meters. The proposed site for the Water Treatment Works Logistics Centre would be located at the margin of the woodland where was found more shrubby in nature. Dominant native species included *Alangium chinensis*, *Caesalpinia crista*, *Litsea rotundifolia*, *Psychotria asiatica*, *Schefflera heptaphylla*, and *Sterculia lanceolata*. Six flora species of conservation importance were recorded in the woodland habitat within the study area including Incense Tree (*Aquilaria sinensis*), Ailanthus (*Ailanthus fordii*), Hong Kong Pavetta (*Pavetta hongkongensis*), Hairy-fruit Ormosia (*Ormosia pachycarpa*), Lamb of Tartary (*Cibotium barometz*), and Hong Kong Eagle's Claw (*Artabotrys hongkongensis*). Photographic records of flora species of conservation importance are provided in **Appendix 8.2**.
- 8.4.10 Incense Tree was recorded at the proposed site for the Water Treatment Works Logistics Centre, which is located in the secondary woodland, west of the developed area of the Sha Tin WTW. Several individuals of Incense Trees at the proposed works site were logged. In addition, some individuals were recorded in scattered parts of the secondary woodland areas outside of the site boundary but within the study area (**Figure 8.3** and **Figure 8.4** refer). This species is common in Hong Kong and is usually found in lowland forest and fung shui woods (Xing *et al.*, 2000). However, it is threatened due to destruction of habitat, over-exploitation and damage to the tree during the harvesting of its medicinal balm for ornamental and medicinal purposes (IUCN, 2014). It is classified as vulnerable in the *IUCN Red List* (2014). In China, Incense Tree is also categorized as vulnerable (AFCD, 2014a) and Class II protected plant (Near Threatened) in the List of Wild Plants under State Protection (Hu *et al.*, 2003). In Hong Kong, it is protected under the *Protection of Endangered Species of Animals and Plants Ordinance* (Cap. 586).
- 8.4.11 One individual of Ailanthus was found located in the proposed Water Treatment Works Logistics Centre adjacent to the developed area of the Sha Tin WTW (**Figure 8.3** and **Figure 8.4** refer). This native species has a rare distribution in Hong Kong and is listed under the *Forests and Countryside Ordinance* (Cap.96) (AFCD, 2014a). Ailanthus occurs exclusively and discontinuously in Hong Kong and southern Yunnan, and it is recognized as near threatened in China (Hu *et al.*, 2003).
- 8.4.12 Several small populations of Lamb of Tartary were recorded on the secondary woodland slopes of the proposed site for the Water Treatment Works Logistics Centre within the site boundary. In addition, a small population was recorded near the vicinity of the site boundary in the upstream of Watercourse 1. Further away, another population was recorded in the Lion Rock Country Park approximately 400 m

from the site boundary (**Figure 8.4** refers). Although this is a common species in Hong Kong, the Chinese medicinal use of the plant has led to over-exploitation (Hu *et al.*, 2004). Therefore, it is protected under the *Protection of Endangered Species of Animals and Plants Ordinance* (Cap.586) (AFCD, 2014a).

- 8.4.13 Hong Kong Eagle's Claw was recorded in secondary woodland on the west side of the site boundary (**Figure 8.3** and **Figure 8.4** refer). Although this native species is not protected under legislation (AFCD, 2014a), due to the potential economic value of its flowers it is considered to be a rare plant of Hong Kong (Hu *et al.*, 2003).
- 8.4.14 Hong Kong Pavetta has been recorded in the southern portion of the study area, approximately 350 m away from the site boundary, just north of Watercourse 4 (**Figure 8.4** refers). This common and native species is listed under the *Forests and Countryside Ordinance* (Cap.96) (AFCD, 2014a).
- 8.4.15 Hairy-fruit Ormosia is listed as a rare or precious plant in Hong Kong due to the durability of its wood (Hu *et al.*, 2003). One individual was recorded in the secondary woodland near Lion Rock Country Park, north of Watercourse 4 approximately 320m from the site boundary (**Figure 8.4** refers). It has a restricted distribution in Hong Kong (Corlett *et al.*, 2000) and it is recognized as endangered in China (Hu *et al.*, 2003).

#### Plantation

- 8.4.16 Most plantation habitats within the study area create a buffer zone between the developed areas and the secondary woodlands. A strip of plantation lies within the site boundary between the developed area of the Sha Tin WTW and Watercourse 1. Plantation habitat is also found running along both sides of Tai Po Road and the south side of Hin Keng Estate. North-east of Lion Rock Country Park, a patch of plantation exists between secondary woodland and developed area. Plantation habitat is also present between the MTR (East Rail Line) and Keng Hau Road and Hin Tin playground (**Figure 8.3** and **Figure 8.4** refer). There is a high level of disturbance in this habitat due to human activities such as leisure farming and recreational uses.
- 8.4.17 Exotic planted species including *Acacia confusa*, *Casuarina equisetifolia*, *Albizia lebbek*, *Eucalyptus citriodora* and *Leucaena leucocephala* were recorded in the linear plantation strip within the site boundary and the larger plantation patch north-east of Lion Rock Country Park. Dominant understorey species included commonly found species such as *Lantana camara*, *Microstegium ciliatum*, *Oxalis corymbosa*, *Pueraria* spp. and *Wedelia trilobata*.

#### Watercourse

- 8.4.18 Three modified watercourses and one catchwater are present within the study area (**Figure 8.3** and **Figure 8.4** refer). One watercourse (Watercourse 1), located north-west of the Sha Tin WTW, flows from west to east. Two watercourses flowing from south to north, are located south-east of the Sha Tin WTW. One of which lies along the southern and eastern boundaries of the Sha Tin WTW (Watercourse 2), while the other (Watercourse 3) passes through secondary woodland habitat adjacent to Tei Lung Hau. Finally, a catchwater (Watercourse 4) lies along the boundary of Lion Rock Country Park and secondary woodland. Dominant native vegetation species established on the banks of the watercourses included *Blechnum orientale*, *Cyclosorus parasiticus*, *Dicranopteris pedata*, *Psychotria asiatica* and *Rhodomyrtus tomentosa*. Dominant exotic species included *Bidens alba*, *Lantana camara* and *Syngonium podophyllum*.
- 8.4.19 The upper and mid-reaches of Watercourse 1 have natural banks and base with sand and small cobbles as substrate, and is highly shaded by adjacent vegetation. The upstream reach is shallow, 0.3 m in depth, and flows rapidly; however, at the mid-stream reach it becomes slightly deeper at about 0.5 m and the flow rate decreases. The lower reach of this watercourse narrows and becomes channelized with a concrete base. The concrete base creates a variation in depth between approximately 0.3 to 0.6 m.
- 8.4.20 Watercourse 2 is a channelized watercourse with moderate flow rate. Its substrate is composed of sand and pebbles. Towards the lower-reach of the watercourse polluted discharge flows into the watercourse. As a result of this, the ecological conditions upstream are much more viable for fauna

species than that of downstream. Flora species of the surrounding habitat include *Microstegium ciliatum*, *Acacia confusa*, *Cyclosorus parasiticus*, *Alocasia odora*, *Macaranga tanarius*, *Schefflera heptaphylla*, *Litsea rotundifolia*, *Lophosteman confertus*, *Eucalyptus citriodora* and *Neyraudia reynaudiana*.

- 8.4.21 Watercourse 3 is located south-east of the Sha Tin WTW, next to Tei Lung Hau. The upper reach is a channelized section with a concrete base and edges; the downstream reach is a natural section, of which substrate is comprised of large boulders. Downstream is highly disturbed by anthropogenic activities (e.g. washing of laundry in watercourse).
- 8.4.22 Watercourse 4 is a catchwater which runs along the edge of the Lion Rock Country Park. It is slow-flowing and supports minimal vegetation due to its modified nature. Dragonfly species and tadpoles have been observed utilizing this catchwater.
- 8.4.23 Considering that Watercourse 3 and Watercourse 4 are far from the Project site and direct impact is not anticipated, no detailed freshwater survey at these two watercourses is deemed necessary.

#### Developed Area

- 8.4.24 The majority of developed areas are occupied by the water treatment works facilities, residential developments (Hin Keng Estate), roads (Tai Po Road and the Route 8 Toll Plaza), construction sites, and railway (MTR East Rail Line) and associated facilities. The majority of the developed area aside from the Sha Tin WTW is Hin Keng Estate just east of the site boundary. The developed areas within the study area are subject to high disturbance from regular human and vehicular activities. This habitat is mostly void of vegetation. But common horticultural or landscape species such as *Bauhinia* spp. and *Acacia* spp. are planted on the roadsides.

#### Avifauna

##### Literature Review

- 8.4.25 Survey results from the Route 16 from West Kowloon to Sha Tin – EIA Study in 1999, recorded a total of 22 species of avifauna in the secondary woodland habitats in the vicinity of the study area, of which two are species of conservation importance, these species included Black Kite (*Milvus migrans*) and Crested Serpent Eagle (*Spilornis cheela*) (HyD, 1999).
- 8.4.26 In a more recent study conducted for the Tai Wai to Hung Hom section (MTRC, 2011), survey results identified a total of 36 species of birds in the area surrounding the study site. Black Kite and Crested Serpent Eagle were also observed from the secondary woodland habitat. No breeding activities were recorded. Refer to **Table 8.3** for the protection status of these avifauna species.

**Table 8.3 Avifauna of Conservation Importance Previously Recorded within the Study Area.**

Common Name <sup>1</sup>	Distribution in Hong Kong <sup>3</sup>	Level of Concern <sup>4</sup>	Protection Status in China	IUCN Red List <sup>7</sup>	Habitat Recorded
Black Kite <sup>2</sup>	Common	(RC)	Class II <sup>5</sup>	Least Concern	In Flight
Crested Serpent Eagle <sup>2</sup>	Uncommon	(LC)	Class II <sup>5</sup> Vulnerable <sup>6</sup>	Least Concern	In Flight

Note:

- All wild birds are protected under Wild Animal Protection Ordinance (Cap. 170).
- Protected under Protection of Endangered Species of Animals and Plants Ordinance (Cap. 586).
- AFCD (2014b).
- Fellowes *et al.* (2002): LC=Local Concern; RC=Regional 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.
- List of Wild Animals under State Protection (promulgated by State Forestry Administration and Ministry of Agriculture on 14 January, 1989).
- China Red Data Book (Zheng & Wang 1998).
- IUCN (2014).

Recent Survey Results

- 8.4.27 In 2010 - 2011, 74 species of avifauna were recorded in total within the study area, thirteen of which are species of conservation importance (**Table 8.4** and **Appendix 8.4** refer). The avifauna community was dominated by resident species such as Red-whiskered Bulbul (*Pycnonotus jocosus*), Japanese White-eye (*Zosterops japonica*) and Eurasian Tree Sparrow (*Passer montanus*), which are considered to be abundant in Hong Kong. All avifauna species are listed *Wild Animals Protection Ordinance* (Cap.170) (AFCD, 2014b). Species of conservation importance comprised of mostly woodland species, followed by raptors and two species of ardeids. Species diversity was highest in the secondary woodland habitat. Photographic records of avifauna species of conservation importance are provided in **Appendix 8.2**.
- 8.4.28 Within the developed area of the Sha Tin WTW, one individual of Chinese Pond Heron (*Ardeola bacchus*) has been recorded (**Figure 8.3** and **Figure 8.4** refer). A common and widely distributed resident in Hong Kong, this species is mainly colonized around the wetlands in the northwest New Territories (AFCD, 2014b; Carey *et al.*, 2001). Chinese Pond Heron is considered to be of potential regional concern (Fellowes *et al.*, 2002). No evidence of breeding/nesting behaviour was recorded during survey.
- 8.4.29 Most of the Black Kites recorded were seen flying alone, in some cases pairs of Black Kite were seen soaring in the sky in circles. Additionally, there were several observations of individuals perched on man-made structures such as, electric wires and pylons in secondary woodland and plantation habitats. None were recorded within the site boundary (**Figure 8.3** and **Figure 8.4** refer). Due to its restrictedness in breeding and roosting sites, Black Kites are listed as being of regional concern (Fellowes *et al.*, 2002). However, no evidence of nesting/breeding was recorded during the surveys. Black Kite is a widely distributed common resident and winter visitor of Hong Kong (AFCD, 2014b). It is protected under the *Protection of Endangered Species of Animals and Plants Ordinance* (Cap.586) (AFCD, 2014b), Class II Protected Animals of PRC and listed in Appendix II of CITES (Zheng and Wang, 1998).
- 8.4.30 Eastern Buzzard (*Buteo japonicus*) is widespread in the New Territories and has been reported from a wide variety of habitats at all altitudes (Carey *et al.*, 2001). A perched individual was seen in the developed area (75 m from the Project area) west of Hin Keng Estate (**Figure 8.3** and **Figure 8.4** refer), another was spotted in flight within the study area. This species is listed under the *Protection of Endangered Species of Animals and Plants Ordinance* (Cap.586) and in China is under Class II protection (AFCD, 2014b).
- 8.4.31 Common Emerald Dove (*Chalcophaps indica*) is a scarce but widespread resident in Hong Kong (AFCD, 2014b). The China Red Data Book recognizes this species as vulnerable. Individuals were reported from the secondary woodland areas just east of the Sha Tin WTW and near the vicinity of Watercourse 3 (**Figure 8.3** and **Figure 8.4** refer). It is probable that the multiple records within the study area were of the same individual as occasionally the same individuals are regularly recorded over a long period at one site (Carey *et al.*, 2001).
- 8.4.32 Collared Scops Owl (*Otus bakkamoena*) is a nocturnal resident species which inhabits a variety of wooded habitats including forests, Fung Shui woods, shrubland with scattered trees, gardens and city parks (Carey *et al.*, 2001). Collared Scops Owl is listed under the *Protection of Endangered Species of Animals and Plants Ordinance* (Cap.586) (AFCD, 2014b). Individuals were heard in the developed area within the Sha Tin WTW and in the secondary woodland just outside of the western site boundary (**Figure 8.3** and **Figure 8.4** refer). No evidence of breeding/nesting was recorded during survey.
- 8.4.33 Common in the winter and scarce in the summer of Hong Kong, Grey-chinned Minivet (*Pericrocotus solaris*) occurs almost exclusively in forested areas of central New Territories (AFCD, 2014b; Carey *et al.*, 2001). It is listed as of local concern (Fellowes *et al.*, 2002). All records of Grey-chinned Minivet were from the secondary woodland and plantation areas outside the site boundary (**Figure 8.3** and **Figure 8.4** refer).
- 8.4.34 Rufous-capped Babbler (*Stachyridopsis ruficeps*) is an uncommon resident recognized to be of local concern (AFCD, 2014b; Fellowes *et al.*, 2002). Within the site boundary, individuals were recorded in the secondary woodland area of the proposed Water Treatment Works Logistics Centre and in

developed area within the Sha Tin WTW. Other individuals were recorded in secondary woodland habitats near the vicinity of Lion Rock Country Park (**Figure 8.3** and **Figure 8.4** refers).

- 8.4.35 A flock of Chestnut-collared Yuhina (*Yuhina castaniceps*) was recorded in the secondary woodland area just north of Lion Rock Country Park approximately 450 m from the site boundary (**Figure 8.4** refers). Chestnut-collared Yuhina occur in flocks of two to around 40 individuals with the largest flock being of 55 birds (Carey *et al.*, 2001). This species is a rare winter visitor with a wide distribution in Hong Kong (AFCD, 2014b). Due to its restrictedness in breeding and roosting sites, this species is regarded as of local concern (Fellowes *et al.*, 2002). However no evidence of breeding/nesting behaviour was observed during survey.
- 8.4.36 Ashy Drongo (*Dicrurus leucophaeus*) was recorded in the secondary woodland west of Keng Hau Road approximately 200 m north of the site boundary (**Figure 8.3** refers). This scarce winter visitor is listed as local concern (AFCD, 2014b; Fellowes *et al.*, 2002).
- 8.4.37 The call of an individual Pygmy Wren-babbler (*Pnoepyga pusilla*) was heard in the secondary woodland adjacent to the south-west site boundary (**Figure 8.3** and **Figure 8.4** refer). Pygmy Wren-babbler is regarded as rare in Hong Kong and of local concern (Fellowes *et al.*, 2002).
- 8.4.38 One individual of Little Egret (*Egretta garzetta*) was recorded soaring over the study area. The nearest egretty in Penfold Park is located more than 4 km away. Little Egrets appear in low lying wet or coastal areas throughout Hong Kong and have adapted well to the increased impact of anthropogenic areas such as Sha Tin and Victoria Harbour (Carey *et al.*, 2001). This species is a common resident in Hong Kong and is widely distributed in coastal areas (AFCD, 2014b). Most birds are probably resident but there is evidence of seasonal migration (Viney *et al.*, 2005). Little Egret is recognized to be of potential regional concern (Fellowes *et al.*, 2002). No evidence of breeding/nesting behaviour was observed during survey.
- 8.4.39 Individuals of Crested Serpent Eagles have been observed soaring over the study area sporadically throughout wet and dry season. This uncommon resident species is widely distributed in shrubland on hillsides throughout Hong Kong (AFCD, 2014b). Crested Serpent Eagle is listed under the *Protection of Endangered Species of Animals and Plants Ordinance* (Cap.586). China Red Data Book recognizes this species to be vulnerable (AFCD, 2014b). Due to its restrictedness in breeding and roosting sites, this species is regarded as of local concern (Fellowes *et al.*, 2002). However, no evidence of breeding/nesting behaviour was observed during survey.
- 8.4.40 Crested Goshawks (*Accipiter trivirgatus*) are generally observed in forest and mature woodland (Carey *et al.*, 2001). A few individuals were sighted flying over the study area throughout the survey period. Crested Goshawk is an uncommon resident with a wide distribution in the woodlands and shrublands throughout Hong Kong (AFCD, 2014b). Listed under the *Protection of Endangered Species of Animals and Plants Ordinance* (Cap.586), it is also recognized as rare in the China Red Data Book (AFCD, 2014b).
- 8.4.41 No evidence of breeding or nesting birds was recorded within the study area.

**Table 8.4 Avifauna of Conservation Importance Recorded within the Study Area**

Common Name <sup>1</sup>	Distribution in Hong Kong <sup>3</sup>	Level of Concern <sup>4</sup>	Protection Status in China	IUCN Red List <sup>7</sup>	Habitat Recorded
Little Egret	Common	PRC (RC)	-	Least Concern	In flight
Chinese Pond Heron	Common	PRC (RC)	-	Least Concern	Developed area
Black Kite <sup>2</sup>	Common	(RC)	Class II <sup>5</sup>	Least Concern	Secondary woodland and plantation
Crested Serpent Eagle	Uncommon	(LC)	Class II <sup>5</sup> Vulnerable <sup>6</sup>	Least Concern	In flight
Crested Goshawk	Uncommon	-	Class II <sup>5</sup> Rare <sup>6</sup>	Least Concern	In flight

Common Name <sup>1</sup>	Distribution in Hong Kong <sup>3</sup>	Level of Concern <sup>4</sup>	Protection Status in China	IUCN Red List <sup>7</sup>	Habitat Recorded
Eastern Buzzard	Common	-	Class II <sup>5</sup>	Least Concern	Developed Area
Common Emerald Dove	Scarce	-	Vulnerable <sup>6</sup>	Least Concern	Secondary woodland and watercourse
Collared Scops Owl	Common	-	Class II <sup>5</sup>	Least Concern	Secondary woodland and developed area
Grey-chinned Minivet	Common	LC	-	Least Concern	Secondary woodland and plantation
Rufous-capped Babbler	Uncommon	LC	-	Least Concern	Secondary woodland and developed area
Chestnut-collared Yuhina	Rare	(LC)	-	Least Concern	Secondary woodland
Ashy Drongo	Scarce	LC	-	Least Concern	Secondary woodland
Pygmy Wren-babbler	Rare	LC	-	Least Concern	Secondary woodland

Note:

- All wild birds are protected under Wild Animal Protection Ordinance (Cap. 170).
- Protected under Protection of Endangered Species of Animals and Plants Ordinance (Cap. 586).
- AFCD (2014b)
- Fellowes *et al.* (2002): LC=Local Concern; RC=Regional Concern; PRC=Potential Regional 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.
- List of Wild Animals under State Protection (promulgated by State Forestry Administration and Ministry of Agriculture on 14 January, 1989).
- China Red Data Book (Zheng & Wang 1998).
- IUCN (2014)

#### Terrestrial Mammal

#### Literature Review

- 8.4.42 Evidence of rooting (turned earth as part of foraging) by Eurasian Wild Pig (*Sus scrofa*) and a burrow believed to be that of Chinese Pangolin (*Manis pentadactyla*) were observed near the Route 8 Toll Plaza, west of the site boundary during the Route 16 from West Kowloon to Sha Tin – EIA Study (HyD, 1999). Of these two species, only Chinese Pangolin is of conservation importance.
- 8.4.43 In a more recent survey carried out under the SCL – Tai Wai to Hung Hom Section EIA Study, five mammal species were recorded and all of which are species of conservation importance (MTRC, 2011). These include Rhesus Macaque (*Macaca mulatta*), Pallas's Squirrel (*Callosciurus erythraeus*), East Asian Porcupine (*Hystrix brachyura*), Japanese Pipistrelle (*Pipistrellus abramus*) and one unidentified bat species. Refer to **Table 8.5** for its protection status.

**Table 8.5 Terrestrial Mammals Previously Recorded within the Study Area**

Common Name	Distribution in Hong Kong <sup>3</sup>	Level of Concern <sup>4</sup>	Protection Status	IUCN Red List <sup>7</sup>	Habitat Recorded
Chinese Pangolin <sup>1,2</sup>	Rare	RC	Class II <sup>5</sup> Vulnerable <sup>6</sup>	Critically Endangered	Burrows recorded in woody vegetation
Rhesus Macaque <sup>1</sup>	Common	-	Class II <sup>5</sup> Vulnerable <sup>6</sup>	Least Concern	Secondary Woodland
Pallas's Squirrel <sup>1</sup>	Fairly widely distributed,	-	-	Least Concern	Secondary Woodland
East Asian Porcupine <sup>1</sup>	Abundant	PGC	-	Least Concern	Discarded quills and dung heaps

Common Name	Distribution in Hong Kong <sup>3</sup>	Level of Concern <sup>4</sup>	Protection Status	IUCN Red List <sup>7</sup>	Habitat Recorded
					found in secondary woodland
Japanese Pipistrelle <sup>1</sup>	Abundant	LC	-	Least Concern	In flight
Unidentified Bat <sup>1</sup>	N/A	N/A	N/A	N/A	Roosting in a disused tunnel

Note:

1. Protected under Wild Animal Protection Ordinance (Cap. 170).
2. Protected under Protection of Endangered Species of Animals and Plants Ordinance (Cap. 586).
3. AFCD (2014b)
4. Fellowes *et al.* (2002): RC=Regional Concern; LC=Local Concern; PGC=Potential Global Concern.
5. List of Wild Animals under State Protection (promulgated by State Forestry Administration and Ministry of Agriculture on 14 January, 1989).
6. China Red Data Book (Zheng & Wang 1998).
7. IUCN (2014)

### Recent Survey Results

- 8.4.44 A total of six species of mammals were recorded within the study area, five of which are species of conservation importance (**Table 8.6** and **Appendix 8.4** refer). The mammal species of conservation importance recorded, Rhesus Macaque, Pallas's Squirrel, Short-nosed Fruit Bat (*Cynopterus sphinx*), Chinese Horseshoe Bat (*Rhinolophus sinicus*) and Japanese Pipistrelle, are protected under the *Wild Animals Protection Ordinance* (Cap.170).
- 8.4.45 Rhesus Macaque was recorded in three habitats namely, secondary woodland, plantation and developed area. The majority of the records occurred in secondary woodland in or around Lion Rock Country Park. Individuals were usually sighted foraging in groups along the sloped areas. Some individuals were recorded in the developed area within the site boundary. They have adapted to different types of habitats, such as woodlands, grasslands, and near urban areas (Shek, 2006). Rhesus Macaque is listed in the China Red Data Book as vulnerable (AFCD, 2014b) and is under Class II protection in China (AFCD, 2014b). Photographic record of Rhesus Macaque is provided in **Appendix 8.2**.
- 8.4.46 Pallas's Squirrels were recorded in various habitats within the study area, including secondary woodland, plantation and developed area. This arboreal species was seen climbing in trees. One individual was recorded in developed area within the site boundary and another in secondary woodland within the study area. Pallas's Squirrel has a fairly wide distribution in Hong Kong and has been recorded in New Territories as well as Hong Kong Island (AFCD, 2014b). This is an introduced species presumably from released or escaped pets (Shek, 2006).
- 8.4.47 Three species of flying mammals were recorded, two of which are microbats (mainly insect-eating bats), Chinese Horseshoe Bat and Japanese Pipistrelle. Microbats were recorded with the use of a bat detector. Most observations of microbats occurred near watercourses/bodies. One species of megabat (fruit-eating bats), Short-nosed Fruit Bat, was also observed.
- 8.4.48 Short-nosed Fruit Bat is very common in Hong Kong (Shek, 2006) and roost under the palm fronds of Chinese Fan-palm (Chan & Shek, 2006). One individual was observed commuting within the Sha Tin WTW near the front entrance. One active roost was recorded within the developed area of the Sha Tin WTW south of the sludge pumping station near the entrance and an inactive roost was recorded south of the filter beds (**Figure 8.3** and **Figure 8.4** refer). The active and inactive roosts (i.e. no bats present) were both made on the fronds of Chinese Fan-palms (*Livistona chinensis*). The inactive roost identified is likely to be failed attempts by inexperienced males to build and recruit females to their roosts. Photograph of the active and inactive roosts are provided in **Appendix 8.2**. The concerned Chinese Fan-palms were re-visited in the verification survey, but no active/inactive bat roosts were found.

- 8.4.49 Chinese Horseshoe Bat is very common in Hong Kong (Shek, 2006) and was recorded foraging within the vegetation along Keng Hau Road. Whilst, individuals of this species were not observed due to the vegetation cover, they were heard through the heterodyne output and later confirmed during analysis using BatScan (Shek and Lau, 2006).
- 8.4.50 Japanese Pipistrelle is very common in Hong Kong (Shek, 2006) and was the most abundant bat species recorded during the survey. High numbers of individuals were recorded foraging and commuting along Watercourse 4 (outside of the site boundary). A small number of individuals were recorded foraging over the treatment pools within the Sha Tin WTW.
- 8.4.51 Whilst all three bat species recorded are common in Hong Kong (Shek, 2006; AFCD, 2014b), they are protected under law, therefore disturbance or harm to these species would be in breach of the Wild Animals Protection Ordinance (Cap. 170).
- 8.4.52 No mammal species was recorded by the infrared camera.

**Table 8.6 Terrestrial Mammals of Conservation Importance Recorded within the Study Area**

Common Name	Distribution in Hong Kong <sup>2</sup>	Level of Concern <sup>3</sup>	Protection Status in China	IUCN Red List <sup>6</sup>	Habitat Recorded
Short-nosed Fruit Bat <sup>1</sup>	Abundant	LC	Indeterminate <sup>5</sup>	Least Concern	Developed area
Chinese Horseshoe Bat <sup>1</sup>	Abundant	-	-	Least Concern	Secondary woodland
Japanese Pipistrelle <sup>1</sup>	Abundant	LC	-	Least Concern	Secondary woodland, watercourse and developed area
Rhesus Macaque <sup>1</sup>	Common	-	Class II <sup>4</sup> Vulnerable <sup>5</sup>	Least Concern	Secondary woodland, plantation and developed Area
Pallas's Squirrel <sup>1</sup>	Fairly widely distributed, common	-	-	Least Concern	Secondary woodland, plantation and developed Area

Note:

1. Protected under Wild Animal Protection Ordinance (Cap. 170).
2. AFCD (2014b)
3. Fellowes *et al.* (2002): LC=Local Concern.
4. List of Wild Animals under State Protection (promulgated by State Forestry Administration and Ministry of Agriculture on 14 January, 1989).
5. China Red Data Book (Zheng & Wang 1998).
6. IUCN (2014)

### *Butterfly*

#### Literature Review

- 8.4.53 Twenty-eight species of butterflies were recorded within the study area between 2002 and 2011 in the AFCD Hong Kong Biodiversity Survey, none of which were species of conservation importance (AFCD, unpublished). A total of 37 species of butterfly were recorded during the SCL – Tai Wai to Hung Hom Section EIA Study, no species of conservation interest were recorded. (MTRC, 2011)

#### Recent Survey Results

- 8.4.54 Sixty-seven species of butterflies were recorded within the study area during the current study. Amongst these, six are of conservation importance; White-banded Flat (*Gerosia phisara*), Lesser

Band Dart (*Potanthus trachala trachala*), Golden Birdwing (*Troides aeacus aeacus*), Common Rose (*Pachliopta aristolochiae goniopeltis*), Cornelian (*Deudorix epijarbas menesicles*) and Orange Punch (*Dodona egeon egeon*). All six species of conservation importance were recorded in secondary woodland habitat. The highest abundance and diversity was recorded in secondary woodland. The majority of species are very common or commonly distributed within Hong Kong. Nine species have an uncommon distribution (**Appendix 8.4** refers). Photographic records of butterfly species of conservation importance are provided in **Appendix 8.2**.

- 8.4.55 White-banded Flat, Lesser Band Dart, Common Rose and Cornelian are all rare species of Hong Kong (AFCD, 2014b). All of these species are widely distributed in Hong Kong, with the exception of Cornelian which is distributed in Lam Tsuen, Shan Liu, Wu Kau Tang, Pak Sha O and Fung Yuen (AFCD, 2014b). Records of these species from the recent surveys were all obtained along Watercourse 4, just outside of the Lion Rock Country Park with the minimum distance of 325 m away from the nearest boundary of the works area (**Figure 8.4** refers).
- 8.4.56 Most records of Golden Birdwings were made in secondary woodlands and plantations approximately 125 m to 300 m south-east of the site boundary (**Figure 8.3** and **Figure 8.4** refer). Additionally, individuals have also been recorded in the secondary woodland adjacent to Watercourse 2 within the site boundary. Although it is distributed widely throughout Hong Kong, it is rare (AFCD, 2014b) and considered to be of local concern (Fellowes *et al.*, 2002).
- 8.4.57 A single individual of Orange Punch was recorded in the secondary woodland approximately 350 m south of the site boundary. This species is rare in Hong Kong (AFCD, 2014b) and is considered to be of regional concern (Fellowes *et al.*, 2002).

**Table 8.7 Butterfly Species of Conservation Importance Recorded within the Study Area**

Common Name	Distribution in Hong Kong <sup>1</sup>	Level of Concern <sup>2</sup>	IUCN Red List Status <sup>3</sup>	Habitat Recorded
White-banded Flat	Rare	-	-	Secondary woodland
Lesser Band Dart	Rare	-	-	Secondary woodland
Golden Birdwing	Rare	LC	-	Secondary woodland and plantation
Common Rose	Rare	-	-	Secondary woodland
Cornelian	Rare	-	-	Secondary woodland
Orange Punch	Rare	RC	-	Secondary woodland

Note:

1. AFCD (2014b)
2. Fellowes *et al.* (2002): LC=Local Concern; RC=Regional Concern.
3. IUCN (2014).

### Odonata

#### Literature Review

- 8.4.58 Survey results from the AFCD Biodiversity Survey between 2002 and 2011 recorded five species of dragonflies in the study area, none of which were species of conservation importance (AFCD, unpublished).
- 8.4.59 In the SCL – Tai Wai to Hung Hom Section EIA Study, a total of 15 species of dragonfly were recorded during the surveys. Three of them are of conservation importance were recorded in the vicinity of the Tei Lung Hau stream (MTRC, 2011), including Indochinese Copperwing (*Mnais mneme*), White-banded Shadowdamsel (*Protosticta taipokauensis*), and Emerald Cascader (*Zygonyx iris insignis*). Refer to **Table 8.8** for their protection status.

**Table 8.8 Odonates Previously Recorded within the Study Area**

Common Name	Distribution in Hong Kong <sup>1</sup>	Level of Concern <sup>2</sup>	IUCN Red List Status <sup>3</sup>	Habitat Recorded
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Common Name	Distribution in Hong Kong <sup>1</sup>	Level of Concern <sup>2</sup>	IUCN Red List Status <sup>3</sup>	Habitat Recorded
Indochinese Copperwing	Common	LC	Least Concern	Natural Watercourse
White-banded Shadowdamsel	Common	GC	Least Concern	Natural Watercourse
Emerald Cascader	Abundant	PGC	Least Concern	Natural Watercourse

Note:

1. AFCD (2014b)

2. Fellowes *et al.* (2002): LC=Local Concern; GC=Global Concern; PGC=Potential Global Concern

3. IUCN (2014)

### Recent Survey Results

- 8.4.60 Five species of damselfly and fourteen species of dragonflies were recorded under the current study. Two species of dragonflies of conservation importance were recorded namely, Scarlet Basker (*Urothemis signata signata*) and Emerald Cascader (*Zygonyx iris insignis*). All other species recorded have an abundant or common distribution in Hong Kong.
- 8.4.61 Watercourse habitat supported the highest diversity (number of species and abundance) of odonata relative to other habitats of the study area. Abundant species found in the watercourse habitat included Common Blue Jewel (*Rhinocypha perforata perforata*), Black-banded Gossamerwing (*Euphaea decorata*), Common Blue Skimmer (*Orthetrum glaucum*), Common Red Skimmer (*Orthetrum prunosum neglectum*), Lesser Blue Skimmer (*Orthetrum triangulare triangulare*) and Indigo Dropwing (*Trithemis festiva*); whereas Wandering Glider (*Pantala flavescens*) was abundant in other habitats.
- 8.4.62 One individual of Scarlet Basker was seen near the sedimentation tank in the developed area of the Sha Tin WTW. Although this species is regarded as of local concern (Fellowes *et al.*, 2002), it is locally common in Hong Kong (AFCD, 2014b). Scarlet Baskers are found mainly in the New Territories, especially in area near abandoned fishponds (Tam *et al.*, 2011).
- 8.4.63 Records of Emerald Cascader are scattered throughout the study area. A number of individuals were recorded in the developed area within the site boundary and in Watercourse 1 and Watercourse 2 just outside of the site boundary. Individuals were also recorded in Watercourse 4 and the small plantation patch north of Watercourse 4, approximately 450 m and 300 m from the site boundary, respectively (**Figure 8.4** Refers). This species is widespread in moderately clean and fast-flowing woodland streams (Tam *et al.*, 2011). Emerald Cascader is seen in early spring with its numbers reducing rapidly by autumn (Wilson, 1995). Although it is abundant throughout Hong Kong, they are considered as of potential global concern (Fellowes *et al.*, 2002).

**Table 8.9 Odonate Species of Conservation Importance Recorded within the Study Area**

Common Name	Distribution in Hong Kong <sup>1</sup>	Level of Concern <sup>2</sup>	IUCN Red List Status <sup>3</sup>	Habitat Recorded
Scarlet Basker	Common	LC	Least Concern	Developed area
Emerald Cascader	Abundant	PGC	Least Concern	Plantation, Developed area; Watercourse

Note:

1. AFCD (2014b)

2. Fellowes *et al.* (2002): LC=Local Concern; PGC=Potential Global Concern.

3. IUCN (2014)

### Herpetofauna

### Literature Review

- 8.4.64 Between 2002 and 2011, the AFCD Hong Kong Biodiversity Survey recorded eight species of amphibians and ten species of reptiles from the study area (AFCD, unpublished). Of which, two species of amphibians and one species of reptile of conservation importance were recorded namely, Lesser Spiny Frog (*Quasipaa exilispinosa*), Brown Wood Frog (*Hylarana latouchii*) and Chinese Mountain Snake (*Sibynophis chinensis chinensis*).
- 8.4.65 In addition, eggs and adults of Hong Kong Cascade Frog (*Amolops hongkongensis*) were recorded in the survey undertaken in the SCL – Tai Wai to Hung Hom Section EIA Study (MTRC, 2011). Refer to **Table 8.10** for their protection status.

**Table 8.10 Herpetofauna Species of Conservation Importance Previously Recorded within the Study Area**

Common Name	Distribution in Hong Kong <sup>2</sup>	Level of Concern <sup>3</sup>	IUCN Red list Status <sup>4</sup>	Habitat Recorded
Lesser Spiny Frog	Widely distributed in mountain streams	PGC	Vulnerable	Not available <sup>5</sup> Natural Watercourse <sup>6</sup>
Brown Wood Frog	Recorded in several localities in the New Territories including Tai Shing Stream, Pak Sha O and Tai Po Kau Nature Reserve	LC	Least Concern	Not available
Hong Kong Cascade Frog <sup>1</sup>	Widely distributed in mountain streams in Hong Kong	PGC	Endangered	Natural Watercourse
Chinese Mountain Snake	Distributed in eastern and central New Territories, on Hong Kong Island and Lantau Island	LC	-	Not available

Note:

1. Protected under Wild Animal Protection Ordinance (Cap, 170)
2. AFCD (2014b)
3. Fellowes *et al.* (2002): PGC=Potential Global Concern; LC=Local Concern
4. IUCN (2014)
5. Results from AFCD Hong Kong Biodiversity Survey
6. Results from MTRC (2011)

#### Recent Survey Results

- 8.4.66 The current study recorded 16 species of herpetofauna within the study area, ten of which were reptiles and six were amphibians. Three reptiles species of conservation importance recorded included Common Water Monitor (*Varanus salvator*), Indo-Chinese Rat Snake (*Ptyas korros*), and Chinese Mountain Snake (*Sibynophis chinensis chinensis*). Only one amphibian species of conservation importance, Lesser Spiny Frog was recorded, the remaining amphibian species area regarded as abundant or widely distributed in Hong Kong (AFCD, 2014b).
- 8.4.67 Bowring's Gecko (*Hermidactylus bowringii*) was relatively abundant compared to other reptile species. All Bowring's geckos were recorded in developed area,
- 8.4.68 Dominant species of amphibians included Asian Common Toad (*Bufo malanostictus*) and Gunther's Frog (*Hylarana guentheri*). Asian Common Toad was recorded in all habitats; with most records in the developed area. The majority of observations of Gunther's Frog were recorded in watercourses.
- 8.4.69 One individual of Common Water Monitor was seen in Watercourse 1, near the vicinity of the western site boundary (**Figure 8.3** and **Figure 8.4** refer). Not much is known about the habits of native specimens (Karsen *et. al.*, 1998). Most records of individuals are believed to be released or escaped

individuals (AFCD, 2014b). This species is protected under the *Wild Animals Protection Ordinance* (Cap.170) and *Endangered Species of Animals and Plants Ordinance* (Cap.586) (AFCD, 2014b). It is listed as regional concern (Fellowes *et al.*, 2002) and critically endangered/extinct in wild by China Red Data Book (AFCD, 2014b). Photographic record of Common Water Monitor is provided in **Appendix 8.2**.

8.4.70 An Indo-Chinese Rat Snake was recorded just outside of the site boundary on the banks of Watercourse 2 (**Figure 8.3** and **Figure 8.4** refer). It is a diurnal species and known to hunt Gunther's Frogs in tall grass around reservoirs (Karen *et al.*, 1998). This species is found in many open habitats such as grassy banks of streams and reservoirs, edges of cultivated fields and ponds, dry shrubland and woodland (Karsen *et al.*, 1998). This species is widely distributed throughout Hong Kong (AFCD, 2014b). It is an endangered species according to the China Red Data Book (AFCD, 2014b) and is of potential regional concern (Fellowes *et al.*, 2002).

8.4.71 Chinese Mountain Snake occurs in moist vegetated area at high elevations (Karsen *et al.*, 1998), and is distributed in the eastern and central New Territories, on Hong Kong Island and Lantau Island (AFCD, 2014b). An individual was recorded in the developed area within the Sha Tin WTW during the current survey. Chinese Mountain Snake is listed as local concern (Fellowes *et al.*, 2002).

8.4.72 Lesser Spiny Frog was the only amphibian species of conservation importance recorded. This species was recorded in various watercourses within the study area (Watercourse 2, Watercourse 3 and Watercourse 4). It is widely distributed in mountain streams throughout Hong Kong (AFCD, 2014b).

**Table 8.11 Herpetofauna of Conservation Importance Recorded within the Study Area**

Common Name	Distribution in Hong Kong <sup>1</sup>	Level of Concern <sup>2</sup>	Protection Status in China	IUCN Red List <sup>3</sup>	Habitat Recorded
Common Water Monitor	Records from Sha Tau Kok, Fanling and Kowloon Reservoir but probably released or escaped individuals	RC	Class I <sup>4</sup>	Least Concern	Watercourse
Indo-Chinese Rat Snake	Widely distributed	PRC		-	Watercourse
Chinese Mountain Snake	Distributed in eastern and central New Territories, on Hong Kong Island and Lantau Island	LC		-	Developed area
Lesser Spiny Frog	Widely distributed in mountain streams	PGC		Vulnerable	Watercourse

Note:

1. AFCD (2014b)
2. Fellowes *et al.* (2002): LC=Local Concern; RC=Regional Concern; PRC=Potential Regional Concern; PGC=Potential Global Concern.
3. IUCN (2014)
4. List of Wild Animals under State Protection (promulgated by State Forestry Administration and Ministry of Agriculture on 14 January, 1989).

### *Freshwater Communities*

#### Literature Review

8.4.73 Previous survey results from SCL – Tai Wai to Hung Hom Section – EIA Study identified two freshwater fish species of conservation importance in the natural watercourses near Tei Lung Hau and Lion Rock Toll Plaza. These fish species include Predaceous Chub (*Parazacco spilurus*) and Vietnam Catfish (*Pterocryptis anomala*) (MTRC, 2011). Refer to **Table 8.12** for their status.

**Table 8.12 Freshwater Species of Conservation Importance Previously Recorded within the Study Area**

Common Name	Distribution in Hong Kong <sup>1</sup>	Level of Concern <sup>2</sup>	Protection Status in China <sup>3</sup>	IUCN Red List <sup>3</sup>	Habitat Recorded
Predaceous Chub	Common	LC	Vulnerable	-	Natural Watercourse
Vietnam Catfish	Common	GC	-	-	Natural Watercourse

Note:

1. AFCD (2014b)
2. Fellowes *et al.* (2002): LC=Local Concern; GC= Global Concern.
3. China Red Data Book (Zheng & Wang 1998)

Recent Survey Results

- 8.4.74 Freshwater community surveys conducted for this Project covered two watercourses adjacent to the Sha Tin WTW, Watercourse 1 and Watercourse 2 (**Figure 8.3** and **Figure 8.4** refer). Watercourse 1 is located adjacent to the north-western boundary of the Sha Tin WTW. Watercourse 2 follows the eastern and southern boundaries of the Sha Tin WTW where the southern section is included within the site boundary and the upstream reach lies adjacent to the eastern site boundary.
- 8.4.75 An active search of Watercourse 1 recorded a total of 27 taxa (**Appendix 8.4** refers), which was dominated by caddisflies and mayflies; no fish were recorded. The absence of fish species may possibly be due to the shallow water and lack of pools in the watercourse. Aside from the increase of snails recorded during wet season, there did not appear to be a significant difference between the diversity of species between wet and dry season.
- 8.4.76 Survey records indicated a total of 28 taxa recorded in Watercourse 2. Shrimp (*Caridina cantonensis*) was the most abundant. Caddisflies and mayflies were common during both seasons in up and mid-stream. The diversity of freshwater species was significantly lower downstream. Aside from the presence of Mosquito Fish during dry season and its absence during wet season, there is no significant difference between the dry and wet season species composition.

**8.5 Ecological Value**

- 8.5.1 The ecological importance of recorded habitats has been evaluated in accordance with the EIAO-TM Annex 8 criteria, and is shown in **Table 8.13 - Table 8.16** below.

*Secondary Woodland*

- 8.5.2 Secondary woodland occupies about half of the study area. This habitat comprised of mostly native vegetation and experiences little disturbance; apart from the margin where it is more shrubby in nature and subject to disturbance from road traffic, Sha Tin WTW operation, recreation uses and hunting. This habitat provides complete linkage to Lion Rock Country Park (area of ecological importance). The majority of species of conservation importance was recorded in the woodland. Based on the above observations and the criteria set in Annex 8 of EIAO-TM, ecological value of these woodland areas are detailed in **Table 8.13**.

**Table 8.13 Ecological Evaluation of the Secondary Woodland Habitat within the Study Area**

Criteria	Secondary Woodland
Naturalness	Largely undisturbed and dominated with native species; the woodland margin including the proposed site for the Water Treatment Works Logistics Centre is subjected to moderate levels of human disturbance.
Size	Large – 97.58 ha

Criteria	Secondary Woodland
Diversity	Flora diversity: Moderate (197 species recorded).  Fauna diversity: Moderate (52 avifaunal species, 5 mammal species, 9 dragonfly species, 50 butterfly species and 4 herpetofaunal species recorded)
Rarity	A common habitat in Hong Kong.  Six flora species of conservation importance recorded (Ailanthus, Incense Tree, Lamb of Tartary, Hairy-fruited Ormosia, Hong Kong Pavetta and Hong Kong's Eagle Claw).  Eight species of avifauna (Black Kite, Common Emerald Dove, Collared Scops Owl, Grey-chinned Minivet, Rufous-capped Babbler, Chestnut-collared Yuhina, Ashy Drongo and Pygmy Wren-babbler), 4 species of mammals (Chinese Horseshoe Bat, Japanese Pipistrelle, Rhesus Macaque and Pallas's Squirrel) and 6 species of butterflies (White-banded Flat, Lesser Band Dart, Golden Birdwing, Common Rose, Cornelian and Orange Punch) of conservation importance recorded.
Re-creatability	Reforestation would take several decades.
Fragmentation	Almost the entire habitat is continuous.
Ecological linkage	Directly linked to Lion Rock Country Park.
Potential value	The habitat is mature.
Nursery ground	No breeding/nesting were recorded during survey
Age	Unknown, but trees are relatively mature.
Abundance/ Richness of Wildlife	High
<b>Ecological Value</b>	<b>Generally high, but the directly affected area at the peripheral of the habitat, which was more shrubby and disturbed, has reduced value</b>

*Plantation*

- 8.5.3 The plantation habitat comprised of a small portion of the study area with exotic, planted species. There is a high level of disturbance in these habitats due to human activities such as leisure farming and recreational uses. Small, scattered patches of plantation habitat are scattered throughout the study area and occur on the modified slopes between developed areas and secondary woodland. Based on the above observations and the criteria set in Annex 8 of EIAO-TM, ecological value of these plantation areas are detailed in **Table 8.14**.

**Table 8.14 Ecological Evaluation of the Plantation Habitat within the Study Area**

Criteria	Plantation
Naturalness	Planted man-made habitat with exotic species; subjected to high level of human disturbance.

Criteria	Plantation
Size	Moderate – 23.41 ha
Diversity	Flora diversity: Low (87 species recorded)  Fauna diversity: Low (24 avifaunal species, 2 mammal species, 5 dragonfly species, 36 butterfly species and 1 herpetofaunal species recorded)
Rarity	A common habitat in Hong Kong.  No flora species of conservation importance recorded.  Two species of avifauna (Black Kite and Grey-chinned Minivet), 2 species of mammals (Rhesus Macaque and Pallas's Squirrel), 1 species of dragonfly (Emerald Cascader) and 1 species of butterfly (Golden Birdwing) of conservation importance recorded.
Re-creatability	Easily re-created as this habitat is man-made.
Fragmentation	Patches are spread throughout the Study Area.
Ecological linkage	This habitat is not structurally linked to any high ecological value resources, however one patch of plantation is located approximately 50 m away from Lion Rock Country Park.
Potential value	Low – Potential is limited due to high levels of human disturbance and high number of exotic species.
Nursery ground	No significant record.
Age	Variable.
Abundance/ Richness of Wildlife	Low
<b>Ecological value</b>	<b>Low</b>

*Watercourse*

- 8.5.4 Four main watercourses occur within the study area; however, only two (Watercourse 1 and Watercourse 2) are subject to potential impacts. Almost all of the watercourses have been channelized with the exception of the upstream reach of Watercourse 1. Based on the above observations and the criteria set in Annex 8 of TM-EIAO, ecological values of these watercourses areas are detailed in **Table 8.15**.

**Table 8.15 Ecological Evaluation of the Watercourse Habitat within the Study Area**

Criteria	Watercourse 1	Watercourse 2
Naturalness	Upstream is natural, downstream is man-made and channelized.	Man-made, channelized
Size	Small.	Moderate.

Criteria	Watercourse 1	Watercourse 2
Diversity	Twenty-seven taxa of freshwater species recorded.	Twenty-eight taxa of freshwater species recorded.
Rarity	A common habitat in Hong Kong.  One dragonfly species (Emerald Cascader) and one herpetofauna species (Common Water Monitor) of conservation importance recorded.  No flora or freshwater species of conservation importance recorded.	A common habitat in Hong Kong.  One dragonfly species (Emerald Cascader) and two herpetofauna species (Indo-Chinese Rat Snake and Lesser Spiny Frog) of conservation importance recorded.  No flora or freshwater species of conservation importance recorded.
Re-creatability	Channelized portion is easily re-creatable, natural parts of upstream is not easily re-creatable	Easily re-creatable
Fragmentation	Not fragmented.	Not fragmented.
Ecological linkage	Ecologically linked to surrounding secondary woodland.	Ecologically linked to surrounding secondary woodland.
Potential value	Low – channelized watercourse have very limited potential, natural upstream portion is small.	Low – channelized watercourse have very limited potential
Nursery ground	Tadpoles, dragonfly and damselfly larvae present.	Tadpoles, dragonfly and damselfly larvae present.
Age	Unknown	Unknown
Abundance/ Richness of Wildlife	Low	Low
<b>Ecological value</b>	<b>Low; natural upstream section is of low to moderate value.</b>	<b>Low</b>

*Developed Area*

8.5.5 The developed area includes the Sha Tin WTW, residential areas and transportation infrastructure. This habitat is highly disturbed by human activities. Most of the area was void of vegetation. The majority of vegetation recorded was exotic species which have been planted on the roadside and planters for ornamental purposes. Based on the above observations and the criteria set in Annex 8 of EIAO-TM, ecological value of the developed area is detailed in **Table 8.16**.

**Table 8.16 Ecological Evaluation of the Developed Area Habitat within the Study Area**

Criteria	Developed Area
Naturalness	Man-made habitat; highly disturbed by human activities.

Criteria	Developed Area
Size	Moderate – 56.77 ha
Diversity	Flora diversity: Low to moderate (169 species recorded), Fauna diversity: Low (36 avifaunal species, 4 mammal species, 14 dragonfly species, 39 butterfly species and 12 herpetofaunal species).
Rarity	A very common habitat in Hong Kong.  No flora species of conservation importance recorded.  Four species of avifauna (Chinese Pond Heron, Eastern Buzzard, Collared Scops Owl and Rufous-capped Babbler), 4 species of mammals (Short-nosed Fruit Bat, Japanese Pipistrelle, Rhesus Macaque and Pallas's Squirrel), 2 species of dragonflies (Scarlet Basker and Emerald Cascader) and 1 species of herpetofauna (Chinese Mountain Snake) of conservation importance recorded.
Re-creatability	Easily re-creatable.
Fragmentation	Most of the habitat is continuous.
Ecological linkage	Some physical linkages to secondary woodlands and watercourses.
Potential value	Low – Enhancement potential for urbanized areas are very limited.
Nursery ground	No significant record.
Age	Not applicable.
Abundance/Richness of Wildlife	Low
<b>Ecological value</b>	<b>Low</b>

## 8.6 Identification of Potential Ecological Impacts

8.6.1 The construction of the Project would commence in 2015 for completion in early-2021 (see construction programme in **Appendix 2.1**). Whilst, the Project is estimated to be in operation in 2021. The proposed major scope of works for the Project would comprise:

- Demolition of the existing facilities of the South Works in phases including south clarifier No.1-No.4, the associated filter beds, as well as the filtered water pumping station for the South Works ; and common facilities for both the South and North Works including Water Treatment Works Logistics Centre, alum saturator tanks, as well as the administration block and the Dangerous Goods (DGs) store;
- Reprovisioning of the South Works to the proposed output of 550,000m<sup>3</sup>/day;
- Construction of the new common facilities for both the North and the South Works including an administration building, visitor facilities, regional laboratory (Mainland East laboratory), pre-treatment facilities, Water Treatment Works Logistics Centre, switchgears and power supply, treated water pumping station, surge suppression facilities, and washwater recovery facilities;

- Cut-back of the existing engineered slope located west of the existing clarifiers and the secondary woodland behind for re-provisioning of Water Treatment Works Logistics Centre and pre-treatment facilities;
- Construction of a new access road along the northern and western edges of the Filter Bed area of the North Works; and
- Provision of all other associated civil, geotechnical, mechanical and electrical works..

8.6.2 Potential ecological impact that may arise during the construction and operational phases are outlined below.

*Construction Phase*

- Loss of vegetation
- Direct impact due to loss of habitat and associated wildlife;
- Habitat fragmentation;
- Indirect impact to wildlife associated with habitat loss and fragmentation, such as restriction of habitat utilization (i.e., transit, feeding and roosting), degradation of habitat quality / ecological function; and
- Indirect impact to the surrounding habitats and associated wildlife due to noise disturbance, construction dust, site runoff, and increased human activities.

*Operation Phase*

- Habitat fragmentation;
- Disturbance from the Project operation including noise and human disturbance; and
- Effluent discharge (e.g. washwater and overflow of the processed water from treatment works components).

**8.7 Prediction & Evaluation of Ecological Impacts**

*Construction Phase*

Habitat and Vegetation Impact

8.7.1 Site formation for the above construction works requires vegetation clearance. Natural habitat within the works area of the Project requiring site formation would be turned into developed area and permanently affected. The natural habitats are utilized by wildlife for foraging, roosting or breeding. The destruction of the natural habitat would cause impact to foraging, roosting or breeding habitat as a consequence. The approximate areas of directly affected terrestrial habitats are summarized in **Table 8.17** below.

**Table 8.17 Direct Habitat Impacted**

Habitat Type	Ecological Value	Area (ha)
Secondary Woodland	High (directly impact area of reduced value)	0.69
Plantation	Low	0.23
Developed Area	Low	8.12
<b>Total</b>		<b>9.04</b>

8.7.2 Approximately 9.04 ha of habitats would be directly impacted during the construction phase. Of which, about 90% of the affected habitats are within developed area and plantation of low ecological

value. The impact to plantation is caused by the construction of a new access road. In addition, these habitats are subjected to frequent human disturbance and therefore the direct impact is considered to be low. Furthermore, potential roosts of Short-nosed Fruit Bat (*Cynopterus sphinx*) was recorded within the developed area habitat of the works area, measures to mitigate impact to potential roosting habitat of Short-nosed Fruit Bat are recommended.

- 8.7.3 The remaining habitat impact is within the secondary woodland habitat of high ecological value. The impact to woodland is account by the cutting back of the existing slope located west of the existing clarifiers for accommodation of Water Treatment Works Logistics Centre and pre-treatment facilities as well as formation of access roads. The species diversity and richness in this habitat are moderate. Several avifaunal, mammal and butterfly species of conservation importance were recorded in this habitat. However, the affected woodland portion is small in size and located at the woodland/developed area edge. Edge-habitats are typically subjected to higher levels of disturbance and therefore generally support faunal generalists that are adapted to human disturbance and use a range of habitats. As a result of this, the core areas of this habitat are likely to have the higher ecological value, while that on the periphery is reduced. Moreover, similar habitat for any displaced fauna is available nearby. In view of these, the direct impact is considered to be moderate. Measures to mitigate the impact to secondary woodland are required.
- 8.7.4 The Project would unavoidably require removal of the existing vegetation in secondary woodland, plantation and developed area habitats. Vegetation cover in the plantation and developed area is low and the affected vegetation is confined to common and amenity planting. However; vegetation cover in the secondary woodland is high, and diversity is moderate. The affected vegetation includes native, rare and protected species. Four flora species of conservation importance (i.e. Incense Tree, Ailanthus, Lamb of Tartary, and Hong Kong Eagle's Claw) would be directly affected. In view of this and the low number of individuals to be affected, the impact due to the reduction of vegetation is considered to be moderate. Measures to mitigate the impact to vegetation in the secondary woodland habitat are required.

#### Direct Impact to Fauna

- 8.7.5 In addition to direct impact to terrestrial habitat and vegetation, the construction activities of the Project (e.g. during site clearance, and construction site formation stages) have a potential to cause direct injury / mortality to wildlife. No substantial direct impacts to wildlife with high levels of mobility (e.g. avifauna) are anticipated. Animals with lower mobility (e.g. amphibians and reptile) would be at a higher level of risk, and could be injured or killed by construction activities.
- 8.7.6 Though the number of amphibian and reptile inhabit in the works area is abundant, the species are common and widespread in Hong Kong, such as Asian Common Toad (*Bufo melanostictus*), Asiatic Painted Frog (*Kaloula pulchra pulchra*) and Bowring's Gecko (*Hemidactylus bowringii*). On the other hand, only a rare record of one reptile species of conservation importance, Chinese Mountain Snake (*Sibynophis chinensis chinensis*), was made from the proposed works area. The majority of the works area is not its favourite habitat. Therefore, adverse direct impacts are considered minor.

#### Habitat Fragmentation

- 8.7.7 Construction phase activities could lead to a direct 'barrier' effect, where the movement of animals (particularly terrestrial mammals and herpetofauna) through an area would be obstructed. The division of the habitats into two or more 'patches' may lead to indirect fragmentation impacts. Whilst fragmentation effects are often difficult to quantify, potential impacts resulting from habitat fragmentation would include:
- Decline in species number and densities over and above that which would be expected from habitat loss alone;
  - Loss of 'core' or characteristic species dependant on large habitat patches, and concomitant increases in 'edge' or more facultative species; and
  - Other changes in community composition.

- 8.7.8 The impact to natural habitat is located at the edge of secondary woodland/developed area. No habitat fragmentation impact is therefore expected.

#### Disturbance Impact

- 8.7.9 Construction activities would increase human activities and noise disturbance from traffic and construction machinery, and would in turn bring about indirect impacts to nearby habitats and their associated fauna. Potential consequences to wildlife include avoidance of areas in the vicinity of the works areas, and decline in density in areas close to the source of disturbance.
- 8.7.10 The construction phase would be temporary and for a duration of 6 years. Moreover, wildlife inhabiting the woodland habitats near to Sha Tin WTW is currently subjected to noise due to human activities in Sha Tin WTW (i.e. some minor construction works, traffic and human disturbance). Therefore, construction work would not significantly intensify the noise and human disturbance impact to wildlife nearby. No adverse impact to wildlife is therefore expected.

#### Construction Dust

- 8.7.11 Dust generated during the construction phase and improper storage or dumping of construction materials could degrade the habitats adjacent to works areas. Construction dust could cover leaves and result in lethal/sublethal effects by reduction in photosynthetic rate, abrasion, and blockage of stomata. The habitats nearby are subjected to dust pollution arising from minor construction work and road traffic within the Sha Tin WTW. The level of dust elevation would be insignificant compared to the current level (refer to **Section 4 of Air Quality Impact Assessment**). Adverse impact is therefore not expected. Nevertheless, the potential impacts would be controlled through implementation of good site practices.

#### Site Runoff

- 8.7.12 The works areas require site formation in the immediate vicinity of Watercourse 1 and Watercourse 2. Accidental spills of oils and other chemicals could affect aquatic communities. It could result in lethal/sublethal impacts (abnormal structures and reproductive retardation) on aquatic organisms. On the other hand, removal of vegetation within works areas during site formation could elevate sediment levels in site run-off. It could impede aquatic communities in the watercourse. Apart from the physical injury caused by larger particles, small particles could clog the respiratory and feeding systems of fish and invertebrates. Increased turbidity could reduce photosynthetic rate of aquatic plants, and affect feeding and other activities of species which are largely sight-dependent.
- 8.7.13 The ecological value of the nearby watercourses is generally low with low species diversity. No ecologically important species susceptible to water pollution were recorded. The impact would be temporary. The sediment levels discharge to the watercourse would be minor (refer to **Section 6 of Water Quality Impact Assessment**). Impact due to site runoff is expected to be low and acceptable. Nevertheless, good construction practices, environmental controls and regular checks on the construction boundaries would be conducted.

#### *Operation Phase*

#### Habitat Impact and Fragmentation

- 8.7.14 The operation phase activities would be confined to the proposed site boundary. No additional land would be occupied during operation. Hence, no direct impact is anticipated during the operation phase.
- 8.7.15 As discussed above, the natural habitat impact is located at the edge of secondary woodland/developed area. No habitat fragmentation impact is therefore expected.

Disturbance Impact

- 8.7.16 The operation of the Project would cause disturbance impact. As a consequence, the wildlife would avoid the adjacent areas of the site and associated access road, and the wildlife density close to the source of disturbance would reduce.
- 8.7.17 The disturbance would be permanent and last throughout the operation phase. It is expected that the level of the disturbance would be similar to the current condition. The disturbance impact to the wildlife nearby is anticipated to be minor and acceptable.

Effluent Discharge

- 8.7.18 During operation phase, washwater effluent and overflow of process water would arise from cleansing of treatment works components and equipment failure. Washwater and overflow water may contain various chemicals. Direct discharge of such effluent could deteriorate water quality of the nearby watercourse.
- 8.7.19 Under this Project, washwater effluent would be properly treated and then recycled back to the Inlet works within the treatment works. On the other hand, standby units and dual power supply would be provided to minimize occurrence overflow. Drainage system would also be used to collect and direct any overflow to public sewers. No effluent would be discharged to the nearby watercourse, and no adverse impact is therefore anticipated.
- 8.7.20 Potential ecological impacts to habitats in the study area resulting from the current Project have been evaluated according to Table 1 of Annex 8 of the TM-EIA, and are summarised in **Table 8.18 – Table 8.21** below.

**Table 8.18 Overall Impact Evaluation of Secondary Woodland**

Evaluation Criteria	Secondary Woodland
Habitat quality	High; the portion affected, which was at the peripheral of the secondary woodland habitat, was of reduced value
Species	<p>Predominantly common and widespread species with moderate diversity.</p> <p>Six flora species of conservation importance were recorded. Of which, four flora species of conservation importance (i.e. Incense Tree, Ailanthus, Lamb of Tartary, and Hong Kong Eagle’s Claw) would be directly affected.</p> <p>Eight species of avifauna, 4 species of mammals and 6 species of butterflies of conservation importance (Black Kite, Common Emerald Dove, Collared Scops Owl, Grey-chinned Minivet, Rufous-capped Babbler, Chestnut-collared Yuhina, Ashy Drongo, Pypmy Wren-babbler, Chinese Horseshoe Bat, Japanese Pipistrelle, Rhesus Macaque, Pallas’s Squirrel, White-banded Flat, Lesser Band Dart, Golden Birdwing, Common Rose, Cornelian, and Orange Punch) were recorded from this habitat type.</p>
Size/Abundance	Direct impact to approximately 0.69 ha of this habitat.
Duration	<p>Direct impact of habitat within footprint of proposed development would be permanent.</p> <p>Short-term disturbance impact (noise, human and construction dust) during the construction phase.</p> <p>Permanent disturbance impact (noise and human disturbance) during the operation phase.</p>

<b>Evaluation Criteria</b>	<b>Secondary Woodland</b>
Reversibility	<p>Direct impact of habitat within footprint of proposed development would be irreversible, although mitigation measures in forms of compensatory habitat would be provided.</p> <p>Construction phase disturbance would be temporary and reversible.</p> <p>Operation phase disturbance would be permanent and irreversible.</p>
Magnitude	Low to moderate in terms of size of habitat impact; low in terms of increase in disturbance.
Overall impact conclusion	<b>Low to moderate</b>

**Table 8.19 Overall Impact Evaluation of Plantation**

<b>Evaluation Criteria</b>	<b>Plantation</b>
Habitat quality	Low
Species	<p>This habitat supports low flora and fauna diversity. Predominately common species of Hong Kong.</p> <p>No flora species of conservation importance were recorded.</p> <p>Two species of avifauna, 2 species of mammals, 1 species of dragonfly and 1 species of butterfly of conservation importance (Black Kite, Grey-chinned Minivet, Rhesus Macaque, Pallas's Squirrel, Emerald Cascader, and Golden Birdwing) recorded from this habitat type.</p>
Size/Abundance	Direct impact to approximately 0.23 ha of this habitat.
Duration	<p>Direct impact of habitat within footprint of proposed development would be permanent</p> <p>Short-term disturbance impact (noise, human and construction dust) during the construction phase.</p> <p>Permanent disturbance (noise and human disturbance) during the operation phase.</p>
Reversibility	<p>Direct impact of habitat within footprint of proposed development would be irreversible.</p> <p>Construction phase disturbance would be temporary and reversible.</p> <p>Operation phase disturbance would be permanent and irreversible.</p>
Magnitude	Low in terms of (a) size of habitat impact and (b) increase in disturbance.
Overall impact conclusion	<b>Low</b>

**Table 8.20 Overall Impact Evaluation of Watercourse**

<b>Evaluation Criteria</b>	<b>Watercourse</b>
Habitat quality	Generally low; natural upstream section of Watercourse 1 is low to moderate.
Species	Composed of mainly common freshwater, flora and fauna species. Species diversity is low.  No flora or freshwater species of conservation importance was recorded.  Watercourse 1: One dragonfly species and one herpetofauna species of conservation importance (Emerald Cascader and Common Water Monitor) recorded.  Watercourse 2: One dragonfly species and two herpetofauna species of conservation importance (Emerald Cascader, Indo-Chinese Rat Snake and Lesser Spiny Frog) recorded.
Size/Abundance	No direct impact to this habitat type
Duration	Short-term disturbance impact (noise, human, construction dust and site runoff) during the construction phase.  Permanent disturbance impact (noise and human disturbance) during the operation phase.
Reversibility	Construction phase disturbance would be temporary and reversible.  Operational phase disturbance would be permanent and irreversible.
Magnitude	Low in terms of increase in disturbance and amount of site runoff.
Overall impact conclusion	<b>Low</b>

**Table 8.21 Overall Impact Evaluation of Developed Area**

<b>Evaluation Criteria</b>	<b>Developed Area</b>
Habitat quality	Low
Species	Flora diversity is low to moderate, fauna diversity is low. Flora and fauna composition is dominated by common and widespread species.  No flora of conservation importance recorded,  Four species of avifauna, 4 species of mammals, 2 species of dragonflies and 1 species of herpetofauna of conservation importance (Chinese Pond Heron, Eastern Buzzard, Collared Scops Owl, Rufous-capped Babbler, Short-nosed Fruit Bat, Japanese Pipistrelle, Rhesus Macaque, Pallas's Squirrel, Scarlet Basker, Emerald Cascader and Chinese Mountain Snake) recorded from this habitat type.
Size/Abundance	Direct impact to approximately 8.12 ha of this habitat.

Evaluation Criteria	Developed Area
Duration	<p>Direct impact of habitat within footprint of proposed development would be temporary, as the affected area would be replaced after construction</p> <p>Short-term disturbance impact (noise, human and construction dust) during the construction phase.</p> <p>Permanent disturbance (noise and human disturbance) during the operation phase.</p>
Reversibility	<p>Direct impact of habitat within footprint of proposed development would be reversible , as the affected area would be replaced after construction</p> <p>Construction phase disturbance would be temporary and reversible.</p> <p>Operation phase disturbance would be permanent and irreversible.</p>
Magnitude	<p>Low in terms of (a) size of habitat impact and (b) increase in disturbance.</p>
Overall impact conclusion	<p><b>Low</b></p>

*Impacts to Species of Conservation importance*

- 8.7.21 A total of 6 flora and 30 fauna (comprising 13 avifauna, 5 mammal, 3 reptile, 1 amphibian, 6 butterfly and 2 dragonfly) species of conservation importance were recorded within the study area. Species recorded within the proposed works areas of the Project would be directly impacted. Whilst those inhabiting the nearby habitats would be mildly disturbed.
- 8.7.22 A summary of potential ecological impacts to the species of conservation importance recorded in the study areas during the recent surveys is provided in **Table 8.22** below.

**Table 8.22 Summary of Potential Impacts to Species of Conservation Importance**

Species of Conservation importance	Construction Phase Impacts		Operation Phase Impacts	
	Description	Evaluation	Description	Evaluation
Flora species recorded within the works area  (Incense Tree, Ailanthus, Lamb of Tartary, and Hong Kong Eagle's Claw)	Individuals within the works area would be directly affected. Although they are common in Hong Kong (with the exception of Ailanthus with a rare distribution), they are protected under law.  Direct impact is considered to be moderate.	<b>Low to moderate</b>	No impact	<b>No impact</b>
Flora species recorded outside of the works area  (Incense Tree, Lamb of Tartary, Hairy-fruited Ormosia, and Hong Kong Pavetta)	Individuals of these species fall outside of the works area and no direct loss is predicted.  Construction dust might cover the plant and disturb photosynthesis. Impact due to construction dust is minor.	<b>Low</b>	No impact	<b>No impact</b>
Avifauna of conservation importance recorded within the works area  (Chinese Pond Heron, Common Emerald Dove, Collared Scops Owl, and Rufous-capped Babbler)	Individuals were recorded within the woodland and developed area habitats of the works area and the nearby area.  The Project would entail impact to roosting and foraging habitats. Nevertheless, alternative habitats are present nearby. In view of the small size of affected habitat, the impact is considered to be low-moderate.  Habitat fragmentation is unlikely as the impact to woodland habitat is located at the woodland/developed area edge. Disturbance impact might affect the quality of their roosting and foraging habitats. Their habitats are subjected to the disturbance from the current Sha Tin WTW operation and increase in disturbance would be minor. No adverse impact is anticipated.	<b>Low to moderate</b>	The roosting and foraging habitat would be permanently occupied. In view of the small size of affected habitat and the presence of alternative habitats nearby, the impact is anticipated to be low.  Habitat fragmentation is unlikely as the impact to woodland habitat is located at the woodland/developed area edge. Disturbance impact might affect the quality of their roosting and foraging habitats. These impacts would be permanent. However, their habits are subjected to the	<b>Low</b>

Species of Conservation importance	Construction Phase Impacts		Operation Phase Impacts	
	Description	Evaluation	Description	Evaluation
			disturbance from the current Sha Tin WTW operation and increase in disturbance would be minor. Impact is anticipated to be minor.	
<p>Avifauna of conservation importance recorded outside the works area</p> <p>(Black Kite, Eastern Buzzard, Grey-chinned Minivet, Chestnut-collared Yuhina, Ashy Drongo, and Pygmy Wren-babbler)</p>	<p>Individuals were recorded outside the works area or flying over the study area. This indicates the study area was used as roosting or foraging sites by the species.</p> <p>There would be no direct loss of their habitats due to proposed works. Construction noise, road traffic, human disturbance and site runoff might affect the quality of their roosting and foraging habitats. However, the magnitudes of these impacts are low, and alternative habitats are available nearby. Therefore impact is anticipated to be low.</p>	<b>Low</b>	Current human activities already exist and their habitats are subjected to the disturbance from the current Sha Tin WTW operation. Any possible increase in disturbance would be minor.	<b>Negligible</b>
<p>Mammals of conservation importance recorded within the works area</p> <p>(Short-nosed Fruit Bat, Japanese Pipistrelle, Pallas's Squirrel, and Rhesus Macaque)</p>	<p>Individuals were recorded within the woodland and developed area habitats of the works area and the nearby area where are used as roosting and foraging ground. Roosting activities of Short-nosed Fruit Bats were found within the works area.</p> <p>These are common and abundant species in Hong Kong. These species have been recorded in various habitats and alternative habitats are nearby. In view of the small size of affected habitat, the impact is considered to be low to moderate.</p> <p>Construction noise, road traffic, human activities and site runoff might affect the quality of their foraging ground. Their habitats are subjected to the disturbance from the current Sha Tin WTW operation and increase in disturbance would be minor. No adverse impact is anticipated.</p>	<b>Low to moderate</b>	<p>The roosting and foraging habitat would be permanently occupied. In view of the small size of affected habitat and the presence of alternative habitats nearby, the impact is anticipated to be low.</p> <p>Currently, human activities already exists and their current habitats are subjected to the current Sha Tin WTW operation. Any possible increase in disturbance would be minor.</p>	<b>Low</b>

Species of Conservation importance	Construction Phase Impacts		Operation Phase Impacts	
	Description	Evaluation	Description	Evaluation
<p>Mammals of conservation importance recorded outside the works area</p> <p>(Chinese Horseshoe Bat, Japanese Pipistrelle and Rhesus Macaque)</p>	<p>Individuals were recorded in the secondary woodland, developed area, and watercourse habitats outside the works area.</p> <p>Construction noise, road traffic and human activities might affect the quality of their foraging ground. The species are widely distributed throughout Hong Kong. The magnitudes of these impacts are low and alternative habitats are present nearby. Impact is expected to be very low.</p>	<b>Very low</b>	<p>The foraging grounds are located far away where disturbance to the species is negligible.</p>	<b>Negligible</b>
<p>Herpetofauna of conservation importance recorded within the works area</p> <p>(Lesser Spiny Frog and Chinese Mountain Snake)</p>	<p>Amphibian was recorded in the watercourse within the works area whereas reptile was recorded in the developed area habitat within the works area. No direct loss of these habitats would be resulted under the Project.</p> <p>Construction noise, road traffic and human activities might also affect the quality of their habitats. These habitats are subjected to the disturbance from the current Sha Tin WTW operation. Increase in disturbance is anticipated to be small comparatively.</p>	<b>Low</b>	<p>Current human activities already exists and their current habitats are subjected to the disturbance from the current Sha Tin WTW operation. Any possible increase in disturbance would be minor.</p>	<b>Very low</b>
<p>Herpetofauna of conservation importance recorded outside the works area</p> <p>(Lesser Spiny Frog, Common Water Monitor, and, Indo-Chinese Rat Snake)</p>	<p>Individuals were recorded in various watercourses outside the works area. No direct loss of watercourse habitat would be resulted under the Project.</p> <p>Some watercourses are far from the works area of which no indirection impact would be anticipated.</p> <p>However, other watercourses they inhabit are close to the work areas. Site runoff would discharge and degrade the watercourses if uncontrolled. In view of the scale of works, the discharge is expected to be small. Construction noise,</p>	<b>Low</b>	<p>Current human activities already exists and their current habitats are subjected to the disturbance from the current Sha Tin WTW operation. Any possible increase in disturbance would be minor.</p>	<b>Very low</b>

Species of Conservation importance	Construction Phase Impacts		Operation Phase Impacts	
	Description	Evaluation	Description	Evaluation
	road traffic and human activities might also affect the quality of their habitats. Considering the current level of disturbance, increase in disturbance is anticipated to be small comparatively.			
Butterfly and Dragonfly species of conservation importance recorded within the works area  (Golden Birdwing, Scarlet Basker, and Emerald Cascader)	<p>Individuals were recorded in the developed areas and woodland habitats within the works area. The Project would entail impact to their roosting and foraging habitats. Nevertheless, alternative habitats are present nearby. In view of low number of individuals affected, the impact is considered to be low.</p> <p>Habitat fragmentation is unlikely as the impact to woodland habitat is located at the woodland/developed area edge.</p> <p>Construction noise, road traffic and human activities might also affect the quality of their habitats. These habitats are subjected to the disturbance from the current Sha Tin WTW operation. Increase in disturbance is anticipated to be small comparatively.</p>	<b>Low</b>	Current human activities already exists and their current habitats are subjected to the disturbance from the current Sha Tin WTW operation. Any possible increase in disturbance would be minor.	<b>Very low</b>
Butterfly and dragonfly species of conservation importance recorded outside the works area  (White-banded Flat, Lesser Band Dart,	<p>Individuals were recorded in the secondary woodland, plantation and watercourse habitat outside the works area.</p> <p>Construction noise, road traffic and human activities might also affect the quality of their habitats. Watercourse habitat within Lion Rock Country Park is far from the works area where indirect impact is not anticipated. These habitats are</p>	<b>Negligible</b>	The foraging grounds are located far away where disturbance to the species is negligible.	<b>Negligible</b>

Species of Conservation importance	Construction Phase Impacts		Operation Phase Impacts	
	Description	Evaluation	Description	Evaluation
Golden Common, Cornelian, Punch, and Cascader)	Birdwing, Rose, Orange and Emerald	subjected to the disturbance from the current Sha Tin WTW operation. Butterfly and dragonfly are less susceptible to these indirect impacts. In view of low number of individuals affected, increase in disturbance is anticipated to be negligible.		

*Cumulative Impacts*

8.7.23 The construction activities of the Project are tentatively scheduled to be within the time frame from 2015 to early 2021. Based on the latest available information, only the Shatin to Central Link (SCL) would be constructed concurrently with the Project.

8.7.24 The SCL would be constructed between 2012 and 2018. The Hin Keng Portal is constructed at the plantation and urban area north of Tei Lung Hau stream. Majority of its works would be confined to highly disturbed areas with relatively low ecological value. The works site is about 100 m away from the Project site. Potential cumulative ecological impact is associated with disturbance of secondary woodland and plantation habitat arising from the Hin Keng tunnel portal work sites. This patch of habitats is currently subjected to disturbance from MTR East Rail, and is separated from the Project site by Keng Hau Road. Cumulative increase in disturbance from both projects is considered minor and acceptable.

**8.8 Mitigation of Adverse Ecological Impacts**

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

*Measures to Avoid/Minimize Impact to Woodland*

8.8.2 About 90% of the works area is situated within the existing Sha Tin WTW is of low ecological value. The impact to natural habitat is minimized. In addition, the design of the Project has been revised to avoid and minimize the impact to secondary woodland habitat. Retaining wall behind the future WTW Logistics Centre has been adopted under the current design to minimize impact to woodland. The presence of the bored pile wall would save about 1,400m<sup>2</sup> of woodland at the concerned location (Refer to **Figure 8.7** as illustration). The slope stabilization work adjacent to the proposed access road at the northern boundary of works area would be constructed by retaining wall instead of soil nails. This would reduce the amount of vegetation removal required and thereby minimize the footprint of the slope at the woodland habitat.

*Measures to Avoid/Minimize Impact to Flora Species of Conservation importance*

8.8.3 Four flora species of conservation importance including Incense Tree, Ailanthus, Lamb of Tartary, and Hong Kong Eagle's Claw were recorded within the works area. Prior to the commencement of the works being undertaken, a detailed vegetation survey would be conducted by a suitably qualified botanist/ecologist with over 7 years experience, for the works area requiring vegetation clearance, to confirm the location and health condition of flora species of conservation importance. Transplantation would be recommended as far as possible to minimize the direct impact to these important species. All the healthy and young individuals and seedlings suitable for transplantation would be identified and rescued. They would be transplanted directly to suitable receptor site within the woodland compensation area or temporarily kept in the nursery site until the receptor site is ready for planting of the rescued individuals. A transplantation proposal with location plan, details of the transplantation methodologies and programme along with post-transplantation monitoring would be submitted for approval prior to transplantation.

8.8.4 Vegetation survey revealed that Incense Tree (*Aquilaria sinensis*) and Ailanthus (*Ailanthus fordii*) within the works area were relatively large in size (2 – 13 m in height) and grown on hillside. The affected individuals will be transplanted as far as practicable.

*Measures to Avoid/Minimize Impact to Bat Roosting Site*

8.8.5 Evidence of Short-nosed Fruit Bat (*Cynopterus sphinx*) roosting activity was recorded within the works area. In order to avoid impacts on this species, the tree with records of an active roost and trees showing evidence of roosting activity should be retained where possible. Where Chinese Fan-palm (*Livistona chinensis*) removal is required, these should be checked by suitably qualified ecologist with over 7 years relevant experience for roosting bats prior to their removal. If roosting bats are observed,

a strategy for passive removal will be agreed with the AFCD and implemented. This could include undertaking the works just after the bats have left the roost (i.e. dusk).

- 8.8.6 The inclusion of Chinese Fan-palm of similar size as the affected plant within the areas of compensatory planting or other suitable areas is recommended to replace affected specimens, and compensate for the impact to roosting opportunities for this bat species.

*Measures to Minimize Disturbance Impact*

- 8.8.7 In general, the disturbance impacts to terrestrial habitat and associated wildlife arising from the land-based construction activities could be minimized by adopting the following mitigation measures:
- Use of Quiet Mechanical Plant during the construction phase should be adopted wherever possible.
  - Hoarding or fencing should be erected around the works area boundaries during the construction phase. The hoarding should screen adjacent habitats from construction phase activities, reduce noise disturbance to these habitats and also to restrict access to habitats adjacent to works areas by site workers.
  - Regular spraying of haul roads to minimize impacts of dust deposition on adjacent vegetation and habitats during the construction activities.

*Measures to Avoid/Minimize Impact to Watercourse*

- 8.8.8 To minimize the contamination of wastewater discharge, accidental chemical spillage and construction site run-off to the receiving water bodies, mitigation measures such as diverting the site runoff to silt trap facilities before discharging into storm drain, proper waste and dumping management and standard good site practice for land-based construction:
- The works areas would be reinstated immediately after completion of works;
  - Waste skips should be provided to collect general refuse and construction wastes. The wastes should be disposed of in a timely and appropriate manner;
  - Drainage arrangements should include sediment traps to collect and control construction run-off;
  - Open burning on works sites is illegal, and should be strictly prohibited; and
  - Only well-maintained plant should be operated on site and plant should be serviced regularly during the construction programme.

*Woodland Compensation*

- 8.8.9 The Project would unavoidably result in permanent impact to approximately 0.69 ha of secondary woodland habitat with high ecological value. To compensate for the impact, potentially suitable location for woodland compensation within the Project site has been exhausted. On-site compensation of about 0.23 ha would be provided considering the site constraint of limited space for the proposed works. To further reduce the impact, off-site woodland compensation in the vicinity of the Project site has been extensively explored. The bare slope areas along Tai Po Road (Sha Tin Heights to the north of Sha Tin WTW) have been explored. It is understood that the gradient of the slope areas are steep and engineered slopes having concrete faced and slope retaining structure. Therefore, they are considered not suitable for tree planting purpose in accordance with GEO publication No. 1/2011 – Technical Guidelines on Landscape Treatment and Bio-engineering for Man-made Slopes and Retaining Walls.
- 8.8.10 Approximately 0.29 ha off-site woodland compensation at Sha Tin South Freshwater Service Reservoir and Sha Tin West Service Reservoir would also be adopted. The impact to woodland would therefore be mitigated with provision of total woodland compensation area of about 0.52 ha (**Figure 8.5 and Figure 8.6** refer). The locations for woodland compensation are specifically chosen to

increase the ecological and structural linkage with the nearby woodland. It also serves as a buffer area to screen out the disturbance arising from the Sha Tin WTW operation. Flora species used for woodland compensation would be similar to those native species recorded within the woodland nearby (**Table 8.23** refers). For the proposed offsite woodland compensation at Sha Tin South Freshwater Service Reservoir, planting would be applied on the existing flat area where the paved concrete surface would be removed for planting works. According to Appendix A of ETWB TCW No. 2/2004 Maintenance of Vegetation and Hard Landscape Features, the proposed on-site and off-site compensation woodland will be managed and maintained by the project proponent (i.e. WSD).

**Table 8.23 Flora Species Proposed for Woodland Compensation**

Species	Habitat
<i>Acronychia pedunculata</i>	Tree
<i>Alangium chinense</i>	Tree or shrub
<i>Aquilaria sinensis</i>	Tree
<i>Bischofia javanica</i>	Tree
<i>Bridelia tomentosa</i>	Tree or shrub
<i>Celtis sinensis</i>	Tree
<i>Choerospondias axillaris</i>	Tree
<i>Cinnamomum camphora</i>	Tree
<i>Cleistocalyx nervosum</i> (to be planted near watercourse)	Tree
<i>Ficus microcarpa</i>	Tree
<i>Garcinia oblongifolia</i>	Tree
<i>Litsea glutinosa</i>	Tree
<i>Phyllanthus emblica</i>	Tree or shrub
<i>Schefflera heptaphylla</i>	Tree
<i>Schima superba</i>	Tree
<i>Sterculia lanceolata</i>	Tree
<i>Viburnum odoratissimum</i>	Tree or shrub

8.8.11 For some kind of whips, since lead time is required for native seedling production, local suppliers of native species such as Kadoorie Farm and Botanical Garden should be contacted in advance. The implementation details and management requirement of the woodland compensation area would be provided in Woodland Compensation Plan (WCP), which would be submitted for approval prior to commencement.

## 8.9 Evaluation of Residual Ecological Impacts

8.9.1 The area of secondary woodland habitat would be reduced by about 0.17ha. Feasible woodland compensation locations have been exhaustively investigated and residual impact is minimised as far as practicable. The affected portion, which laid at the peripheral of the secondary woodland habitat and currently subject to disturbance from the Sha Tin WTW operation, was of reduced ecological value. Considering the size and value of the habitat affected, the residual impact is considered to be insignificant, with the implementation of the recommended habitat compensation.

8.9.2 With proper implementation of mitigation measures suggested in **Section 8.8**, potential indirect impact to the wildlife in the nearby habitats (i.e. disturbance impact and site runoff) would be minimized and the residual indirect impact is considered to be acceptable.

## 8.10 EM&A Requirements

8.10.1 Implementation of the recommended mitigation measures would be regularly audited. Details of environmental monitoring and audit (EM&A) requirement are discussed in the separate EM&A Manual.

## **8.11 Conclusion**

- 8.11.1 Four habitat types were identified within the study area including secondary woodland, plantation, watercourse and developed area. The secondary woodland habitat is considered to have high ecological value. The other habitat was regarded as of low value. Six flora and 30 fauna species of conservation importance were recorded from the study area during surveys.
- 8.11.2 Major ecological impacts would include direct impact on the secondary woodland habitat and the floral species of conservation importance. The impact to about 0.69 ha of secondary woodland habitat would be compensated by the creation of about 0.23 ha on-site of woodland habitat within the Sha Tin WTW and about 0.29 ha off-site of woodland habitat at Sha Tin South Freshwater Service Reservoir nearby and northwest of Sha Tin West Service Reservoir (a total of about 0.52 ha). The area of secondary woodland habitat would be reduced by about 0.17ha. Feasible woodland compensation locations have been exhaustively investigated and residual impact is minimised as far as practicable. Considering the size and value of the habitat affected, the residual impact is considered to be insignificant, with the implementation of the recommended habitat compensation.
- 8.11.3 Four flora species of conservation importance (Incense Tree, Ailanthus, Lamb of Tartary, and Hong Kong Eagle's Claw) would be directly affected by the Project. Detailed vegetation surveys should be conducted to identify the affected individuals within the proposed works area. Transplantation is recommended as far as possible to minimize the direct impact to these important species.
- 8.11.4 The implementation of a mitigation strategy for Short-nosed Fruit Bat will avoid impacts to this species, thereby resulting in no adverse impact. Indirect impacts during the construction phase would comprise noise and human disturbance, construction dust, and construction site runoff. With proper implementation of good site practices and noise mitigation measures, no significant adverse ecological impact is anticipated.
- 8.11.5 The level of disturbance during the operation phase would be comparable to the existing condition. No significant adverse impact is therefore expected.
- 8.11.6 With the implementation of the recommended mitigation measures, no unacceptable residual indirect impact due to the construction and operation of the proposed Project would be expected. The implementation of mitigation measures would be subject to regular audit as part of the EM&A programme.

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