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ANNEX

ANNEX A TERRESTRIAL ECOLOGICAL RESOURCES

1 TERRESTRIAL ECOLOGY

1.1 INTRODUCTION

This section presents the terrestrial baseline conditions of ecological resources within the Study Area of Tai O (i.e. 500m from the boundary of the proposed Project Site in Tai O). Baseline conditions for ecological components of the terrestrial and associated freshwater aquatic environment are evaluated based on information from available literature and recent ecological field surveys that were conducted during the wet season of 2011.

1.2 RELEVANT LEGISLATION AND ASSESSMENT CRITERIA

The local relevant regulations, legislation and guidelines for the protection of species and habitats of ecological importance include the following:

- *Technical Memorandum for the Environmental Impact Assessment Ordinance (Cap 499) (EIAO TM);*
- *EIAO Guidance Note No. 6/2010;*
- *EIAO Guidance Note No. 7/2010;*
- *EIAO Guidance Note No. 10/2010;*
- *EIAO Guidance Note No. 11-2010;*
- *Hong Kong Planning Standards and Guidelines Chapter 10 (HKPSG);*
- *Forests and Countryside Ordinance (Cap 96) and its subsidiary legislation the Forestry Regulations;*
- *Wild Animals Protection Ordinance (Cap 170);*
- *Protection of Endangered Species of Animals and Plants Ordinance (Cap 586);*
- *Country Parks Ordinance (Cap 208);*
- *Town Planning Ordinance (Cap 131);*
- *PRC Regulations and Guidelines;*
- *IUCN Red List Categories and Criteria;*
- *China Red Data Book of Endangered Species; and*
- *The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES).*

Annex 16 of the *EIAO-TM* sets out the general approach and methodology for assessments 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 ecological impacts.

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* and *EIAO Guidance Note No. 11/2010* outline the methodologies for ecological field surveys on various terrestrial and marine faunal groups. *Chapter 10* of the *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 addresses the issue of enforcement. The appendices list the legislation and administrative controls for conservation, other conservation related measures in Hong Kong and Government departments involved in conservation.

The *Forests and Countryside Ordinance (Cap 96)* prohibits felling, cutting, burning or destroying of trees and live plants in forests and plantations on Government land. Related subsidiary Regulations prohibit the picking, felling or possession of listed rare and protected plant species. The list of protected species in Hong Kong, which comes 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 destruction and removal. All birds and most mammals are protected under this Ordinance. The Second Schedule of the Ordinance that lists all the animals protected was last revised in June 1992.

The *Protection of Endangered Species of Animals and Plants Ordinance (Cap 586)* was enacted to align Hong Kong to control regime with the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). With effect from 1 December 2006, it replaces the *Animals and Plants (Protection of Endangered Species) Ordinance (Cap 187)*. The purpose of the *Protection of Endangered Species of Animals and Plants Ordinance* is to restrict the import and export of species listed in CITES Appendices so as to protect wildlife from overexploitation or extinction. The Ordinance is primarily related to controlling trade in threatened and endangered species and restricting the local possession of them.

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 reserved generally for the purpose of nature conservation.

The amended *Town Planning Ordinance (Cap 131)* provides for the designation of coastal Protection Areas, Sites of Special Scientific Interest (SSSI), Green Belt or other specified uses that promote conservation or protection of the environment, e.g., Conservation Areas. The authority responsible for administering the *Town Planning Ordinance* is the Town Planning Board.

The Peoples' Republic of China (PRC) is a Contracting Party to the *United Nations Convention on Biological Diversity of 1992*. The Convention requires signatories to make active efforts to protect and manage their biodiversity resources. The Government of the Hong Kong SAR has stated that it will be "committed to meeting the environmental objectives" of the Convention (PELB 1996). In 1988 the PRC ratified the *Wild Animal Protection Law*, which lays down basic principles for protecting wild animals. The Law prohibits killing of protected animals, controls hunting, and protects the habitats of wild animals, both protected and non-protected. The Law also provides for the creation of lists of animals protected at the state level, under Class I and Class II. There are 96 animal species in Class I and 156 in Class II. Class I provides a higher level of protection for animals considered to be more threatened.

The International Union for Conservation of Nature and Natural Resources (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.

China Red Data Book of Endangered Species is a joint publication of China National Environmental Protection Agency (NEPA) and the Endangered Species Scientific Commission, PRC (ESSC). The first four volumes of this series cover China's vertebrates (i.e. aves, pisces, amphibia, reptilian and mammalia). The criteria of categories of species included in these volumes are 'extinct', 'extirpated', 'endangered', 'vulnerable', 'indeterminate' and 'rare'. These categories are basically based on the criteria set out by the IUCN Species Survival Commission (IUCN-SSC) for its global Red List. However, there are some important differences. The category "Extirpated" includes those species which experts believe have been lost from China, although they may be secure in the other countries. The use of the category "Rare" has been discontinued by the IUCN-SSC, however, it is used here for those species that have always been rare in China but are not necessary to be vulnerable or endangered.

CITES is an international agreement between governments. It aims to ensure that international trade in specimens of wild animals and plants does not threaten their survival. Roughly 5,000 species of animals and 28,000 species of plants are protected by CITES against over-exploitation through

international trade. They are listed in the three CITES Appendices, in which the species are grouped according to how threatened they are by international trade. Appendix I lists species that are the most endangered and are threatened with extinction. Appendix II lists species that are not necessarily now threatened with extinction but that may become so unless trade is closely controlled. And Appendix III is a list of species included at the request of a Party that already regulates trade in the species and that needs the cooperation of other countries to prevent unsustainable or illegal exploitation.

1.3 DESCRIPTION OF THE STUDY AREA

The Study Area of the terrestrial ecological assessment in Tai O is 500 m from the boundary of the project components including the upgrade and expansion of the existing Tai O Sewage Treatment Works (STW) for which reclamation is required, the construction of a new submarine sewage outfall at Tai O STW, and the construction of the new Fan Kwai Tong and Hang Mei Sewage Pumping Stations (SPS), the associated rising mains, a new sewerage system and some effluent reuse facilities (*Figure 1.1*).

The Study Area covers most area of Tai O, which is on the west side of Lantau Island. Most of Tai O's development has been concentrated along both sides of Tai O Creek and some coastal fringes. Except the proposed Hang Mei SPS which is located on the edge of a vegetated area, all of the project components are located within existing developed areas.

The existing Tai O STW is located along the northern coastal fringe of Tai O Study Area. The whole area is fenced off and has paved surfaces with very little vegetation. The upgrade and expansion work will be undertaken within the existing STW as well as a small adjacent area on which reclamation works will be carried out during the site formation stage. A new submarine outfall will also be extended from the upgraded Tai O STW to cater for the increase in sewage flow.

The proposed Fan Kwai Tong SPS is located along Lantau Trail (Stage 7) between Fan Kwai Tong and Nam Chung Tsuen. Village houses and associated plants commonly seen in rural places can be found in this area. The new Hang Mei SPS is located to the south of Wang Hang Village next to Tai O Road. The proposed SPS site is currently vacant and vegetation is largely absent from the area.

All of the proposed rising mains, sewers and effluent reuse facilities to be constructed (with a total length of around 3.2 km) are along existing footpaths or roads. Most of them will be located in residential and commercial areas, except two sections of the proposed rising main in Hang Mei where it will run across Tai O Creek (*Figure 1.1*).

1.4 SITE OF CONSERVATION IMPORTANCE

1.4.1 LANTAU NORTH COUNTRY PARK

The vegetated uplands in the south and east of the Study Area fall within the boundary of the Lantau North Country Park (LNCP). The closest distance between the LNCP and the project site boundary is approximately 50 m at the proposed sewers in Wang Hang Village.

LNCP was designated in 1978. It occupies about 22 square kilometres of land, encompassing Sunset Peak, Yi Tung Shan, Lin Fa Shan, northern slopes of Lantau Peak, Nei Lak Shan and the region north of Ngong Ping. According to AFCD (2011) ⁽¹⁾, flora species that are commonly found in this CP include Hong Kong *Gordonia* (*Gordonia axillaris*), Rhododendrons and Azaleas, Orchids, Schima (*Schima superba*), Chinese Alangium (*Alangium chinense*), Wax Tree (*Rhus succedanea*), Uvaria (*Uvaria macrophylla*), and Hong Kong Asarum (*Asarum hongkongense*). Fauna species that can also be found include mammals such as Chinese Ferret Badger (*Melogale moschata*), Red Muntjac (*Muntiacus muntjac*) and Eurasian Wild Pig (*Sus scrofa*); reptiles such as Burmese Python (*Python molurus bivittatus*), Blue-tailed Skink (*Eumeces quadrilineatus*), as well as Hong Kong Newt (*Paramesotriton hongkongensis*). Among these flora and fauna species, many are locally protected or considered to be of conservation concern.

1.4.2 TAI O EGRETRY

To study the long-term trends of the ardeid breeding population in Hong Kong, volunteers of the Hong Kong Bird Watching Society (HKBWS) started to conduct a yearly systematic egretty count since 2000 ⁽²⁾. Although having a relatively low number of nest (<40), the Tai O Egretty had been actively used by ardeids until 2007. In 2007, the egretty was situated near Kat Hing Back Street among bamboo plants and contained 18 nests of Little Egret (*Egretta garzetta*) and 18 nests of Black-crowned Night Heron (*Nycticorax nycticorax*) ⁽³⁾. However, the egretty was found to be abandoned between 2008 and 2014 ⁽⁴⁾⁽⁵⁾.

1.4.3 CONSERVATION AREA (CA)

Within the Study Area of Tai O, CA zone are found at patches of woodland in Po Chue Tam and the adjacent pond, an extensive area northeast of Sun Ki Street, the wetlands east of Lung Tin Estate and north of Leung Uk Tsuen, the river bank along Tai O Creek next to Hang Mei, as well as the Tai O Mangrove Replanting Area (MRA) created from disused salt-pans (*Figure 1.1*).

- (1) Description as per AFCD website. Available at http://www.afcd.gov.hk/english/country/cou_vis/cou_vis_cou/cou_vis_cou_ln/cou_vis_cou_ln.html
- (2) HKBWS. Egretty Counts Reports 2000 - 2010.
- (3) HKBWS. Egretty Counts Report. 2007.
- (4) HKBWS. Egretty Counts Reports 2008 - 2014.
- (5) Appendix 8.1a

According to the planning intention of Outline Zoning Plan No. DPA/I-TOF/2, the above-mentioned areas were gazetted to protect and retain the existing natural landscape, ecological or topographical features of the area for conservation, educational and research purposes and the separate sensitive natural environment such as Lantau North Country Park from the adverse effects of development. Development in these areas is generally not allowed. Only those benefitting the conservation of its existing natural landscape of scenic quality or are essential infrastructure projects with overriding public interest may be permitted. No construction or upgrading works under the Project will be carried out in the CA area.

1.4.4 COASTAL PROTECTION AREA (CPA)

CPA occurs in the Study Area, along a long strip of coastline to the north of Tai O Island and another coastal strip to the east of Po Chue Tam (*Figure 1.1*). According to the planning intention of Outline Zoning Plan No. DPA/I-TOF/2, the CPA zone was gazetted to conserve, protect and retain the natural coastlines and the sensitive coastal natural environment, including attractive geological features, physical landform or area of high landscape, scenic or ecological value, with a minimum of built development. It may also cover areas which serve as natural protection areas sheltering nearby developments against the effects of coastal erosion. There is a general presumption against development in this zone. No construction or upgrading works under the Project will be carried out in the CPA area (*Figure 1.1*).

1.4.5 GREEN BELT (GB)

Extensive areas of GB are found at Fu Shan on Tai O Island as well as along the hillslopes of Cheung Shan, Sze Shan and Tsim Fung Shan. A lowland area adjoining Leung Uk Tsuen is also put under this zone, which functions as a buffer between the wetland and village type development in Leung Uk Tsuen (*Figure 1.1*). There is a general presumption against development in this zone. No construction or upgrading works under the Project fall within the GB zone (*Figure 1.1*).

1.4.6 BUTTERFLY HOTSPOT

Habitats along footpath near Shek Tsai Po and Fu Shan in Tai O are considered as “butterfly hotspot” by Hong Kong Lepidopterist’s Society⁽¹⁾. Fifty-one species of butterfly were recorded in this hotspot. Important habitats of butterfly hotspot, including “woodland and shrubland”, are not near proposed sewer facilities.

(1) Chan, R.H.S., Chau, W.K., Cheung, W.K., Chow, S.M., Ho, J.S.C., Kan, J.S.C., Lau, S.W.H. and Ng, E.K.L. 2012. Encyclopedia of Hong Kong Butterflies – Search for Butterflies. Hong Kong Lepidopterists’ Society Ltd.

1.5 **LITERATURE REVIEW OF ECOLOGICAL CHARACTERISTICS AND HISTORICAL ECOLOGICAL SURVEYS**

1.5.1 **INTRODUCTION**

A literature review was conducted to characterise the existing conditions within the Study Area and to identify habitats and species of potential importance in the area. The literature review included Government and private sector reports, independent and Government published literature, academic studies, vegetation maps and land use maps. Reviewed information included, but was not limited to, the following:

- *Hong Kong Biodiversity – Newsletter of Agriculture, Fisheries and Conservation Department (AFCD);*
- *Annual report and other publications of The Hong Kong Bird Watching Society;*
- *Memoirs of Hong Kong Natural History Society;*
- *Porcupine! Newsletter of Ecology & Biodiversity, The School of Biological Sciences, The University of Hong Kong;*
- *Ngong Ping Sewage Treatment Works and Sewerage EIA (079/2002). Ove Arup & Partners (Hong Kong) Ltd;*
- *Tai O Sheltered Boat Anchorage EIA (042/2000). Scott Wilson (Hong Kong) Ltd; and*
- *Lantau-Hong Kong's Jewel –A Biodiversity Study on Lantau. Yip and Noffke*

1.5.2 **HABITAT AND VEGETATION**

Wetlands at Tai O and Mangrove Replanting Area (MRA)

Collectively, wetlands at Tai O include mangrove, mudflat, fish ponds and brackish marsh, etc. They were once proposed for designation as an SSSI by the Green Lantau Association (GLA) in 1998 due to the presence of Tai O Egret, rare wildlife species and wetland-dependent species as well as its contribution to the local biodiversity ⁽¹⁾.

Scott Wilson (2000) ⁽²⁾ performed a detailed study of the distribution and composition of mangroves at Tai O. During their survey, mangroves occurred in various wetlands, including the marshes to the north of Tai O Creek, abandoned fish ponds, the salt pans and the tidal riparian zone of Tai O Creek. A variety of mangrove and mangrove associated species, including *Acanthus ilicifolius*, *Acrostichum aureum*, *Aegiceras corniculatum*, *Avicennia*

(1) Green Lantau Association (GLA). 1998. *A conservation Strategy for Lantau*. Report dated July 1998.

(2) Scott Wilson (Hong Kong) Ltd. 2000. *Tai O Sheltered Boat Anchorage*. EIA Report (042/2000).

marina, *Bruguiera gymnorrhiza*, *Clerodendrum inerme*, *Excoecaria agallocha*, *Hibiscus tiliaceus* and *Kandelia obovata* were recorded in the intertidal zone. Typical backshore species such as *Derris trifoliata*, *Ipomoea brasiliensis*, *Suaeda australis* and *Sesuvium portulacastrum* were also recorded.

To provide an off-site compensation for the mangrove loss due to the construction of Chek Lap Kok Airport and the development of the north coast of Lantau Island, a Mangrove Replanting Area (MRA) was formed to the north of Nam Chung Tsuen in Tai O during the year 2003 – 2005 (Figure 1.1). This area was originally an intertidal area of disused saltpans and was dominated by *Kandelia obovata* and *Avicennia marina* in terms of number of plants, seedlings and canopy ⁽¹⁾. After the restoration of mangroves, the MRA serves ecological functions as other mangrove habitats, including water purification, recycling of nutrients, storage of carbon and coastal protection, etc. It also attracts water birds (e.g. Little Egret *Egretta garzetta*, Great Egret *Ardea alba* and Grey Heron *Ardea cinerea*) as well as other intertidal fauna such as Fiddler Crabs (*Uca* spp.), Mud crab (*Scylla* spp.) and Mudskippers (*Periophthalmus cantonensis*) (observation during the current baseline survey). It has been gazetted as a CA area under the Outline Zoning Plan No. DPA/I-TOF/2 (Section 1.4.3). According to the project design, a portion of the proposed sewer and rising main near Nam Chung Tsuen and Leung Uk Tsuen will be laid along the existing roads bordering the MRA (Figure 1.1).

Other Habitats in Tai O

A habitat map covering the whole area of the current Study Area was provided by Scott Wilson (2000) ⁽²⁾. Woodland (in foothills and behind villages such as Fan Kwai Tong Tsuen, Nam Chung Tsuen, Leung Uk Tsuen, San Tsuen and Hang Mei Tsuen), shrubland/grassland (in uplands of Fu Shan and Tsim Fung Shan), developed area (including villages and other built-up areas along the main roads) and stream (i.e. Tai O Creek) were present within the Study Area apart from the wetlands mentioned above. Ove Arup (2002) ⁽³⁾ also presented a habitat map which covered most of the current Study Area. It was largely consistent with the one provided by Scott Wilson, only that small areas of abandoned agricultural land and plantation were identified near villages such as Hang Mei and Sun Tsuen.

No plant species of conservation interest was reported in both of the above EIA reports. However, five rare or very rare plant species were recorded in Tai O by Xing *et al.* (2000) ⁽⁴⁾, i.e. *Blyxa aubertii*, *Camellia assimilis*, *Malaisia scandens*, *Ottelia alsinoides* and *Rhododendron championiae*, but their exact locations within Tai O were not detailed.

(1) Scott Wilson (Hong Kong) Ltd. 2000. *Tai O Sheltered Boat Anchorage*. EIA Report (042/2000).

(2) Scott Wilson (Hong Kong) Ltd. 2000. *Tai O Sheltered Boat Anchorage*. EIA Report (042/2000).

(3) Ove Arup & Partners (Hong Kong) Ltd. 2002. *Ngong Ping Sewage Treatment Works and Sewerage* EIA Report (079/2002).

(4) Xing, F.W., Ng, S.C., and Chau, L.K.C. 2000. *Gymnosperms and angiosperms of Hong Kong*. *Memoirs of the Hong Kong Natural History Society*. 23: 21-136.

1.5.3

MAMMALS

There are limited records of terrestrial mammals within the Study Area. Barking Deer *Muntiacus reevesi* was once recorded near Tai O (Reels 1996) ⁽¹⁾. This species is protected under the *Wild Animals Protection Ordinance* (Cap. 170) in Hong Kong. Also, at least two individuals of the Japanese Pipistrelle *Pipistrellus abramus* were seen foraging above the abandoned salt pans which now become the MRA during the EIA Study for *Ngong Ping Sewage Treatment Works and Sewerage* ⁽²⁾. Although being abundant in Hong Kong, this bat is protected under the *Wild Animals Protection Ordinance* (Cap. 170).

1.5.4

BIRDS

Bird use of salt pans in Tai O was studied by Scott Wilson (2000) ⁽³⁾. A total of 26 species were recorded in the salt pans including one rare species, Plumbeous Water Redstart (*Rhyacornis fuliginosa*), but no species of conservation interest was found in that survey. During the EIA study for *Ngong Ping Sewage Treatment Works and Sewerage* ⁽⁴⁾, three species of conservation interest were identified within the current Study Area. They were Black Kite (*Milvus migrans*), Lesser Coucal (*Centropus bengalensis*) and Pacific Reef Egret (*Egretta sacra*). Other bird species of conservation interest at Tai O also include Banded Rail *Rallus striatus* and Yellow-breasted Bunting *Emberiza aureola* (GLA 1998 ⁽⁵⁾ and HKBWS 2011 ⁽⁶⁾).

GLA (1998) ⁽⁷⁾ considered the Tai O area as one of the most important bird breeding area on Lantau in terms of bird species numbers, most likely because of the high diversity of habitats available in a relatively confined area. The Avifauna of Hong Kong ⁽⁸⁾ published by HKBWS summarised the results of Hong Kong Breeding Bird Survey in the years 1993-1996. According to this survey, confirmed or probable breeding of a number of bird species were found in Tai O, including Little Egret (*Egretta garzetta*), Chinese Pond Heron (*Ardeola bacchus*), Black-crowned Night Heron (*Nycticorax nycticorax*), Black Kite (*Milvus migrans*), Chinese Francolin (*Francolinus pintadeanus*), White-breasted Waterhen (*Amaurornis phoenicurus*), Large Hawk Cuckoo (*Hierococcyx sparveriioides*), Indian Cuckoo (*Cuculus micropterus*), Common Koel (*Eudynamis scolopacea*), Greater Coucal (*Centropus sinensis*), Lesser Coucal (*Centropus bengalensis*), Little Swift (*Apus nipalensis*), White-throated Kingfisher (*Halcyon smyrnensis*), Barn Swallow (*Hirundo rustica*), Red-whiskered Bulbul (*Pycnonotus jocosus*), Chinese Bulbul (*Pycnonotus sinensis*), Long-tailed Shrike

(1) Reels, G. T. (1996). *Distribution of large mammals in Hong Kong - a summary of sightings made since mid-1992*. Porcupine! 15:36-38.

(2) Ove Arup & Partners (Hong Kong) Ltd. 2002. *Ngong Ping Sewage Treatment Works and Sewerage EIA Report* (079/2002).

(3) Scott Wilson (Hong Kong) Ltd. 2000. *Tai O Sheltered Boat Anchorage*. EIA Report (042/2000).

(4) Ove Arup & Partners (Hong Kong) Ltd. 2002. *Ngong Ping Sewage Treatment Works and Sewerage EIA Report* (079/2002).

(5) Green Lantau Association (GLA). 1998. *A conservation Strategy for Lantau*. Report dated July 1998.

(6) Hong Kong Bird Watch Society (HKBWS). 2011. *The Hong Kong Bird report. 2005-2006*.

(7) Green Lantau Association (GLA). 1998. *A conservation Strategy for Lantau*. Report dated July 1998.

(8) HKBWS. (2001). *The Avifauna of Hong Kong*.

(*Lanius schach*), Oriental Magpie Roabin (*Copsychus saularis*), Blue Whistling Thrush (*Myophonus caeruleus*), Masked Laughingthrush (*Garrulax perspicillatus*), Hwamei (*Garrulax canorus*), Yellow-bellied Prinia (*Prinia flaviventris*), Plain Prinia (*Prinia inornata*), Common Tailorbird (*Orthotomus sutorius*), Great Tit (*Parus major*), Japanese White-eye (*Zosterops japonicus*), Crested Myna (*Acridotheres cristatellus*), Black Drongo (*Dicrurus macrocercus*), Hair-crested Drongo (*Dicrurus hottentottus*), Blue Magpie (*Urocissa erythrorhyncha*), Common Magpie (*Pica pica*) and Large-billed Crow (*Corvus macrorhynchos*). Among them, Greater Coucal and Hwamei are species of conservation interest. However, it should be noted that, locations of the breeding sites of these bird species were presented in a map divided into squares of 1 km × 1 km and 5 km × 5 km, and hence their exact locations in Tai O are unclear.

The conservation status and local commonness of the bird species of conservation interest previously recorded in Tai O are summarized in Table 1.1.

Table 1.1 *Bird Species of Conservation Interest Previously Recorded within Tai O*

Species	Commonness in Hong Kong	Hong Kong Protection Status*	PRC Protection Status	China Red Data Book	CITES Appendix	IUCN
Pacific Reef Egret (<i>Egretta sacra</i>)	Uncommon		II	Rare	--	Least Concern
Black Kite (<i>Milvus migrans</i>)	Common	Cap. 586	II	--	--	Least Concern
Banded Rail (<i>Rallus striatus</i>)	Scarce		--	Rare	--	--
Yellow-breasted Bunting (<i>Emberiza aureola</i>)	Common				--	Endangered
Greater Coucal (<i>Centropus sinensis</i>)	Common		II	Vulnerable	--	Least Concern
Lesser Coucal (<i>Centropus bengalensis</i>)	Common		II	Vulnerable	--	Least Concern
Chinese Hwamei (<i>Garrulax canorus</i>)	Common	Cap. 586	--	--	-	Least Concern

Note:

* All avifauna species in Hong Kong are listed under the Wild Animals Protection Ordinance (Cap. 170).

1.5.5 HERPETOFAUNA (AMPHIBIANS & REPTILES)

Literature review showed a relatively diverse herpetofauna in Tai O area. Snakes previously recorded in Tai O included Common Rat Snake *Ptyas mucosus* ⁽¹⁾ and Mangrove Water Snake *Enhydris bennetti* ⁽²⁾. For the Mangrove

(1) Ades (ed.). 1995. G. T. Rambles. *Wildlife Windows Three*. Porcupine! 13 (August 1995), Newsletter of the Dept. of Ecology and Biodiversity, University of Hong Kong.

(2) Green Lantau Association (GLA). 1998. *A conservation Strategy for Lantau*. Report dated July 1998.

Water Snake, Tai O is one of the two sites outside Inner Deep Bay where it has been recorded in Hong Kong. This species has a narrow global distribution, being found only along the coast of southern China between Hainan and Fujian Province ⁽¹⁾.

In terms of skinks and turtles, Chinese Forest Skink (*Ateuchosaurus chinensis*) was found in a plantation habitat on Tai O Island ⁽²⁾. And according to the literature review of Ove Arup (2002) ⁽³⁾, Reeve's Terrapin (*Chinemys reevesii*) was once recorded in the wet cultivated fields at Tai O Leung Uk before the fields were abandoned.

Dudgeon and Chan ⁽⁴⁾ recorded four frog species in Leung Uk Marsh, east of the old salt pans, i.e. Rough-skinned Floating Frog *Occidozyga lima*, Paddy Frog *Rana limnocharis*, Three-striped Grass Frog *Rana macrodactyla* and Brown Tree Frog *Polypedates megacephalus*. Two additional species were heard calling at Leung Uk marsh during field surveys in 1999, i.e. Asian Common Toad *Bufo melanostictus* and Gunther's Frog *Rana guentheri*. In addition, there are some more records of Short-legged Toad (*Xenophrys brachykolos*), Asiatic Painted Frog (*Kaloula pulchra pulchra*), Ornate Pigmy Frog (*Microhyla ornata*) and Romer's Tree Frog (*Liuixalus romeri*) within the current Study Area as well ⁽⁵⁾.

Of all the above-mentioned herpetofauna species, two amphibian species and two reptile species are considered as species of conservation interest. The conservation status and commonness in Hong Kong of these species are listed in Table 1.2.

Table 1.2 *Herpetofauna Species of Conservation Interest Previously Recorded within Tai O*

Species	Commonness in Hong Kong	Hong Kong Protection Status*	PRC Protection Status	China Red Data Book	CITES Appendix	IUCN
<i>Amphibians</i>						
Short-legged Toad (<i>Xenophrys brachykolos</i>)	Common	-	-	-	-	Endangered
Romer's Tree Frog (<i>Liuixalus romeri</i>)	Restricted	Cap. 170	-	-	-	Endangered
Rough-skinned	Very				-	Least

(1) Zhao, E. M. and Adler, K. 1993. *Herpetology of China*. Society for the Study of Amphibians and Reptiles, Oxford.

(2) Lazell, J. 1996. *Prizes of plunder: Hong Kong herpetological highlights*. Porcupine! 15:12, Newsletter of the Dept. of Ecology and Biodiversity, University of Hong Kong.

(3) Ove Arup & Partners (Hong Kong) Ltd. 2002. *Ngong Ping Sewage Treatment Works and Sewerage EIA Report (079/2002)*.

(4) Dudgeon, D. and E. W. C. Chan. 1996. *Ecological Study of Freshwater Wetland Habitats in Hong Kong*. Prepared for the Agriculture and Fisheries Department, Hong Kong Government. Report dated November 1996.

(5) Chan S.K.F. et al. (2005). *A Field Guide to the Amphibians of Hong Kong*. Agriculture, Fisheries and Conservation Department.

Species	Commonness in Hong Kong	Hong Kong Protection Status*	PRC Protection Status	China Red Data Book	CITES Appendix	IUCN
Floating Frog (<i>Occidozyga lima</i>)	restricted distribution range in Hong Kong (may be locally extinct)					Concern
<i>Reptiles</i>						
Common Rat Snake (<i>Ptyas mucosus</i>)	Widely distributed	Cap. 586	-	Endangered	II	-
Reeve's Terrapin (<i>Chinemys reevesii</i>)	Widely distributed	Cap. 170	-	Conservation Dependent	III	Endangered

1.5.6

BUTTERFLIES AND ODONATES (DRAGONFLY & DAMSELFLY)

The protected Common Birdwing butterfly *Troides helena* was recorded at Leung Uk marsh during the field surveys for *Tai O Sheltered Boat Anchorage* EIA ⁽¹⁾. This is an uncommon species in Hong Kong, and is protected under both the *Wild Animals Protection Ordinance* (Cap. 170) and the *Protection of Endangered Species of Animals and Plants Ordinance* (Cap. 586).

An odonate species of conservation interest, Four-spot Midget *Mortonagrion hirosei*, was recorded in the Tai O reedbed within the Study Area by AFCD. This damselfly is considered as “near-threatened” by IUCN. This species is mainly found in reedbeds, mangroves and marshes with short, dense grass along the coast in Hong Kong (Tam *et al.* 2010) ⁽²⁾.

1.5.7

AQUATIC FAUNA

Freshwater survey by Ove Arup (2002) ⁽³⁾ found two shrimp species (i.e. Atyid shrimp *Caridina cantonensis* and Palaemonid shrimp *Macrobrachium* sp.), one freshwater crab species (i.e. local mitten crab *Eriocheir japonicus*) in Tai O main stream.

Regarding freshwater fishes, the same study recorded a total of 12 species in the Tai O main stream, including *Anguilla marmorata*, *Anguilla japonica*, *Yaoshanicus arcus*, *Capoeta semifasciolatus*, *Cirrhinus molitorella*, *Silurus cochinchinensis*, *Oreochromis mossambicus*, *Eleotris oxycephala*, *Glossogobius giurus*,

(1) Scott Wilson (Hong Kong) Ltd. 2000. *Tai O Sheltered Boat Anchorage*. EIA Report (042/2000).

(2) Tam, T.W., Leung, K.S., Kwan, B.S.P., Wu, K.K.Y., Tang, S.S.H., So, I.W.Y., Cheng, J.C.Y., Yuen, E.F.M., Tsang, Y.M. and Hui, W.L. 2011. *Field Guide to the Dragonflies of Hong Kong*. Agriculture, Fisheries and Conservation Department, Hong Kong.

(3) Ove Arup & Partners (Hong Kong) Ltd. 2002. *Ngong Ping Sewage Treatment Works and Sewerage* EIA Report (079/2002).

Tridentiger trigonocephalus, *Ctenogobius giurinus* and a species from the family of Mugilidae. The Giant Mottled Eel (*Anguilla marmorata*) is listed as 'Endangered' in the China Red Data Book because it is widely hunted for its meat and is believed to be overfished. It is a Class II protected animal in PR China and in Hong Kong it is an uncommon species. Japanese Eel *Anguilla japonica* is also listed as 'Endangered' in the China Red Data Book as well as IUCN Red List, and uncommon in Hong Kong ⁽¹⁾.

Fishes inhabit the estuary of Tai O Creek, which receives the influence of tidal water, are mainly brackish water or marine species such as juvenile Pony fish *Leiognathus daura*, suggesting that the creek's tidally influenced zone may provide nursery functions for this species ⁽²⁾.

1.6 ECOLOGICAL BASELINE SURVEYS METHODOLOGY

1.6.1 INTRODUCTION

Following the literature review of available ecological data characterising the Study Area, a number of more focused baseline field surveys were conducted to supplement the review findings.

The ecological baseline surveys in Tai O were conducted in May - October 2011 and followed survey transects and sampling points, which were designed to cover all representative habitats within the Study Area including the Project Site and were shown in *Figure 1.2*. Habitat types covered by each sampling point are listed in *Table 1.3*.

Table 1.3 *Types of Habitats Covered by Sampling Points in Tai O*

Sampling Point No.	Type of Habitat
1	Watercourse (subject to tidal influence)
2	Pond
3	Developed Area/Village
4	Mangrove/Marsh/Reedbed
5	Mudflat/Developed Area/Village
6	Woodland
7	Coastal area
8	Mangrove/Woodland
9	Woodland/Plantation
10	Mangrove/Marsh/Reedbed
11	Marsh/Reedbed/Grassland
12	Developed Area/Village

Both day-time and night-time surveys were carried out in Tai O and the methodology of the ecological surveys was made reference to the technical guidelines of ecological assessment in *Annexes 8 and 16* of EIAO-TM and the related Guidance Notes (GN 7/2010 and GN 10/2010). *Table 1.4* summarises

- (1) Virginia L.F. Lee, Samuel K. S. Lam, Franco K. Y. Ng, Tony K. T. Chan and Maria L. C. Young (2004). Field Guide to the Freshwater Fish of Hong Kong. Agriculture, Fisheries and Conservation Department, Friends of Country Park and Cosmos Book Ltd. Hong Kong.
- (2) Scott Wilson (Hong Kong) Ltd. 2000. *Tai O Sheltered Boat Anchorage*. EIA Report (042/2000).

the flora and fauna surveys carried out in terrestrial and freshwater habitats in the Study Area of Tai O. Detailed methodologies are provided in the following paragraphs.

Table 1.4 *Summary of the Ecological Baseline Surveys – Tai O*

Survey Type	Brief Methodology	Survey Period
Habitat and Vegetation	Habitat mapping and vegetation identification through ground truthing in major habitats.	Monthly from May to October 2011
Bird	Quantitative (point count and transect count method) and qualitative (recorded within the Study Area) survey including day and night surveys covering the wet season.	Monthly from May to October 2011
Mammal	Quantitative (active searching along the survey transect) and qualitative (recorded within the Study Area); including day and night surveys covering the wet season.	Monthly from May to October 2011
Herpetofauna	Quantitative (active searching along the survey transect) and qualitative (recorded within the Study Area); including day and night surveys covering the wet season.	Monthly from May to October 2011
Butterfly	Quantitative (point count and transect count method) and qualitative (recorded within the Study Area) survey; including only day-time surveys covering the wet season.	Monthly from May to October 2011
Odonates (i.e. Dragonfly and Damselfly)	Quantitative (point count and transect count method) and qualitative (recorded within the Study Area) survey; including only day-time surveys covering the wet season.	Monthly from May to October 2011
Freshwater Aquatic Assemblage	Active searching in freshwater streams,; using hand net and kick sampling; including only day-time surveys in the wet season.	Two times in July and August 2011

1.6.2 **HABITAT AND VEGETATION SURVEY**

A preliminary habitat map of suitable scale (ie 1:5,000) prepared during the literature review were used during the baseline survey to map habitats within the Study Area. The preliminary habitat map was produced based on latest aerial photos and verified by field ground-truthing to generate the final habitat map (*Figures 1.3a – 1.3e*). Plant species within each habitat type were identified and their relative abundance were recorded with special attention to rare or protected species. Nomenclature and conservation status of plant species follow those documented in the AFCD's biodiversity database ⁽¹⁾ as well as Xing *et al.* (2000) ⁽²⁾, Wu and Lee (2000) ⁽³⁾, Siu (2000) ⁽⁴⁾ and Yip *et al.* (2010) ⁽⁵⁾. Habitats were characterised and defined with reference to size,

(1) AFCD. (2010). HK Biodiversity Database. Available at: <http://www.afcd.gov.hk/english/conservation/hkbiodiversity/database/search.asp>

(2) Xing FW, Ng S.C., and Chau L.K.C. 2000. Gymnosperms and angiosperms of Hong Kong. *Memoirs of the Hong Kong Natural History Society* 23: 21-136.

(3) Wu S.H and Lee T.C. 2000. Pteridophytes of Hong Kong. *Memoirs of the Hong Kong Natural History Society*: 23:5-20.

(4) Siu, L.P.G. 2000. Orchidaceae of Hong Kong. *Memoirs of the Hong Kong Natural History Society*: 23:137-148

(5) Yip, J. Y. Y., Yip, J. K. L., Liu, E. K. Y, Ngar, Y. N. and Lai, P. C. C. (2010) *A Floristic Survey of Marshes in Hong Kong*. *News Letter of Hong Kong Biodiversity*. 19: 7 - 16.

vegetation type, flora species present, dominant species, species diversity and abundance, community structure, seasonality and inter-dependence as well as the presence of any feature of ecological importance. Photographic records of habitats were taken and presented in *Figures 1.4a - 1.4c* for better illustration of the site conditions.

1.6.3 TERRESTRIAL MAMMAL SURVEY

As most mammals occur at low densities, all sightings, tracks, and signs of mammals (including scats, footprints) were actively searched along the sampling transects (as shown in *Figure 1.2*). Nomenclature for mammals followed AFCD (2006) ⁽¹⁾. Whilst quantification of abundance of mammals in the Study Area is not required, due to the difficulties in translating sights and tracks (e.g. burrows) to actual abundance, a list of mammals recorded during the surveys were provided. Trapping, camera trapping and bat detector were not adopted in this EIA Study.

1.6.4 AVIFAUNA SURVEY

Birds in each habitat type recorded within the Study Area were surveyed quantitatively and qualitatively by using point count method and transect count method. Locations of sampling points and transects are shown in *Figure 1.2*. For point count method, ten minutes were spent counting birds at each sampling point, and all birds seen or heard within 30 m of each point were counted and identified to species where possible. For transect count method, all birds seen or heard within 30m from either sides of the sampling transect were counted and identified to species where possible. Signs of breeding (e.g. nests, recently fledged juveniles) within the Study Area were also recorded, if any. Observations were made using binoculars (at least 8x) and photographic records were taken, if possible. Bird species encountered outside transects/counting points but within the Study Area were also recorded to produce a complete species list. Nomenclature and protection of the bird species followed those documented in the AFCD's biodiversity database ⁽²⁾, Hong Kong Bird Watching Society's (HKBWS) website ⁽³⁾ and Viney *et al.* (2006) ⁽⁴⁾.

1.6.5 HERPETOFAUNA SURVEY

Herpetofauna surveys were conducted through direct observation and active searching in all habitat types along the sampling transects (as shown in *Figure 1.2*) and in potential hiding places such as among leaf litter, inside holes, under stones and logs within the Study Area. Particular attention was given to streams and watercourses. Auditory detection of species-specific calls was

(1) Chen, S.K., Cheung K.S., Ho C.Y., Lam F.N., Tang W.S. 2006. A Field Guide to the Terrestrial Mammals of Hong Kong. AFCD.

(2) AFCD. 2010. HK Biodiversity Database. Available at: <http://www.afcd.gov.hk/english/conservation/hkbiodiversity/database/search.asp>

(3) HKBWS. 2015. List of Hong Kong Birds. Available at: <http://www.hkbws.org.hk/BBS/index.php?styleid=7>.

(4) Viney, C., Phillipps, K., Ying, L.C. 2006. *Birds of Hong Kong and South China*. Government Publications Centre, Hong Kong.

also used to survey frogs and toads. Nomenclature and status used for reptiles followed Karsen *et al* (1998) ⁽¹⁾ and AFCD (2006) ⁽²⁾ while those of amphibians followed AFCD (2005) ⁽³⁾.

1.6.6 **BUTTERFLIES AND ODONATES (IE DRAGONFLIES & DAMSELFLIES) SURVEYS**

Butterflies and odonates in different habitats of the Study Area were surveyed using point count method and transect count method (*Figure 1.2*). Particular attention was paid to aquatic habitats. Butterflies and odonates within 10 m from either side of the sampling transect, or within 30 m of each sampling point, were identified and counted. Odonates and butterflies encountered outside counting points/transects but within the Study Area were also recorded in order to produce a complete species list. Nomenclature for butterflies followed Yiu (2004) ⁽⁴⁾, and odonates nomenclature followed Tam *et al.* (2011) ⁽⁵⁾.

1.6.7 **FRESHWATER AQUATIC ASSEMBLAGE SURVEY**

After field ground-truthing, the freshwater section of Tai O Creek was confirmed for further freshwater survey. The location of the sampling points (3 points in total) is shown in *Figure 1.2*. Aquatic fauna, including freshwater macro-invertebrates (e.g. freshwater crabs, shrimps, freshwater molluscs and aquatic insect larvae) and fishes, in the streams were studied by direct observation and active searching by hand nets and standard field sampling techniques (e.g. kick sampling) for most parts of the freshwater stream course. Organisms were recorded and identified to the lowest possible taxon, and their relative abundances were reported. Nomenclature for fish followed Lee *et al* (2004) ⁽⁶⁾, while those for the macro-invertebrates followed Dudgeon (1999) ⁽⁷⁾.

1.6.8 **CRITERIA OF EVALUATING SPECIES OF CONSERVATION INTEREST**

Species listed under local legislation and international conventions for conservation of wildlife were given special attention. References were also made to those protected by law in China. Specifically speaking, flora or fauna species protected by the following laws/regulations or listed under the following conventions were considered to be species of conservation interest. However this excludes exotic weeds, escaped cultivars or captive species, vagrants and introduced species which have lower ecological value.

(1) Karsen, S.J., Lau M.W.N., Bogadek A. 1998. Hong Kong Amphibians and Reptiles. Urban Council, Hong Kong.

(2) AFCD. 2006. A Field Guide to the Venomous Land Snakes of Hong Kong. Friends of Country Park.

(3) AFCD. 2005. A Field Guide to the Amphibians of Hong Kong. Friends of Country Park.

(4) Yiu, V. 2004. Field Guide to the butterflies of Hong Kong. Hong Kong Discovery Ltd.

(5) Tam, T., Leung, K., Kwan B. S. P., Wu, K. K. Y., Tang, S. S. H., So, I. W. Y., Cheng, J. C.Y., Yuen, E. F. M, Tsang, Y. and Hui W. (2010) *The Dragonflies of Hong Kong. Agriculture, Fisheries and Conservation Department, Friends of Country Park and Cosmos Book Ltd. Hong Kong.*

(6) Virginia L.F. Lee, Samuel K. S. Lam, Franco K. Y. Ng, Tony K. T. Chan and Maria L. C. Young. (2004). Field Guide to the Freshwater Fish of Hong Kong. Agriculture, Fisheries and Conservation Department, Friends of Country Park and Cosmos Book Ltd. Hong Kong.

(7) Dudgeon, D. (1999). *Tropical Asian Streams*. Hong Kong University Press.

- *Forests and Countryside Ordinance (Cap 96) and its subsidiary legislation the Forestry Regulations;*
- ‘Rare’ or ‘Very Rare’ plant species listed in Xing *et al.* (2000) ⁽¹⁾
- *Wild Animals Protection Ordinance (Cap 170);*
- *Protection of Endangered Species of Animals and Plants Ordinance (Cap 586);*
- *PRC Wild Animal Protection Law;* and
- *China Red Data Book of Endangered Species;*

1.7 RESULTS OF ECOLOGICAL BASELINE SURVEYS

The information presented in the following sections has been based on the findings of baseline surveys performed and the requirement of the EIA Study Brief (ESB- 212/2009). The importance of potentially impacted ecological resources identified within the Study Area was assessed using the *EIAO-TM* methodology.

1.7.1 HABITAT AND VEGETATION

Twelve habitat types were recorded within the Study Area. These included mangrove, marsh/reedbed, mudflat, pond, woodland, plantation, shrubland, grassland, watercourse, agricultural land, developed area/village and coastal area. Habitats found are shown in the habitat maps (Figures 1.3a – 1.3e). Photographic records of each habitat are presented in Figures 1.4a – 1.4c. A total of 250 plant species were recorded during the ecological baseline surveys (Annex A1). Two rare plant species, Wild Sensitive-plant *Chamaecrista leschenaultiana* and Aubert’s *Blyxa Blyxa aubertii*, ⁽²⁾ were identified during the surveys in the habitats of pond and agricultural lands, respectively. Table 1.5 lists the number of plant species recorded in, and total area occupied by, each habitat in the Study Area.

Table 1.5 Plant Species and Area of Each Habitat of Study Area

Habitat	Number of Plant Species Recorded	Approximate Size within the Study Area in ha (% of Total Area)
Mangrove	20	19.7 (6.6%)
Marsh/Reedbed	31	5.9 (1.9%)
Mudflat	1	5.6 (1.9%)
Pond	25	15.5 (5.2%)
Woodland	86	103.9 (34.7%)
Plantation	47	1.9 (0.6%)

(1) Xing FW, Ng S.C., and Chau L.K.C. 2000. Gymnosperms and angiosperms of Hong Kong. *Memoirs of the Hong Kong Natural History Society* 23: 21-136

(2) Xing, F., Ng, S. C., & Chau, L. K. C. (2000). Gymnosperms and angiosperms of Hong Kong. *Memoirs of the Hong Kong Natural History Society*, 23, 21-136.

Habitat	Number of Plant Species Recorded	Approximate Size within the Study Area in ha (% of Total Area)
Shrubland	62	60.7 (20.3%)
Grassland	32	22.7 (7.6%)
Watercourse	27	8.1 (2.3%)
Agricultural Land	29	2.6 (0.9%)
Developed Area/Village	101	48.7 (16.3%)
Coastal Area	22	3.9 (1.3%)

Mangrove

Mangrove refers to an intertidal soft-bottomed habitat colonized by true mangrove species (i.e. *Kandelia obovata*, *Avicennia marina*, *Aegiceras corniculatum*, *Acrostichum aureum*, *Excoecaria agallocha*, *Heritiera littoralis*, *Bruguiera gymnorrhiza* and *Lumnitzera racemosa* ⁽¹⁾) and their associates (e.g. *Acanthus ilicifolius*). Within the Study Area mangroves were found in several locations, including the stands around the pond at Po Chue Tam, the stands around some abandoned fish ponds in the northeast of the Study Area, the stands along the intertidal riparian zones of Tai O Creek, the stands along the pond bunds of the designated MRA and a large area to the north of Leung Uk Tsuen (Figures 1.3a – 1.3e). The total area of these mangrove stands is estimated to be approximately 19.7 ha.

The front part of the mangrove stands was dominated by two pioneer mangrove species *Kandelia obovata* and *Avicennia marina*, reaching a height of 2 – 4 m. Apart from them, four more Hong Kong native true mangrove species were identified. They were *Bruguiera gymnorrhiza* and *Excoecaria agallocha* (two middle zone mangrove species), *Acrostichum aureum* and *Aegiceras corniculatum*. An exotic mangrove species *Sonneratia apetala* was also recorded in low abundance, suggesting an initial invasion of this species. Backshore mangrove associates such as *Hibiscus tiliaceus* and *Clerodendrum inerme* and some common wetland plants such as *Acanthus ilicifolius* and *Derris trifoliata* were present as well. A total of 20 plant species was recorded within the habitat of mangrove during the ecological baseline surveys, and no species of conservation interest was found (Annex A1).

Marsh/Reedbed

Two patches of marsh with frequent shallow water and featuring reeds, wetland ferns and sedges were identified within the Study Area. One is to the north of Leung Uk Tsuen and the other to the north of Tai O Creek (Figures 1.3a – 1.3e). The total area of this habitat is about 5.9 ha, accounting for 1.9% of the Study Area.

(1) AFCD's Website. Available at: http://www.afcd.gov.hk/english/conservation/con_wet/con_wet_man/con_wet_man_local/con_wet_man_local_true.html.

The marsh to the north of Leung Uk Tsuen was dominated by Common Reedgrass *Phragmites australis* and was therefore a continuous reedbed. It is physically and hydrologically separated from the MRA by the elevated concrete roadway leading to Leung Uk Tsuen and Nam Chung Tsuen, but still subject to the tidal influence through Tai O Creek. Compared with the survey result of Ove Arup (2002) ⁽¹⁾, the area of this reedbed has reduced by half. Mangrove where several large individuals of the exotic species *Sonneratia apetala* were spotted has established in its northern area. Without human clearance of the mangrove seedlings, this reedbed would further reduce in area due to the continued development of mangrove community. The marsh to the north of Tai O Creek is an area of abandoned salt pan. Marsh ferns including Mangrove Fern *Acrostichum aureum* and Interrupted Tri-vein Fern *Cyclosorus interruptus* and aquatic vegetable *Eleocharis* sp. were the most abundant plants. Small patches of reedbed dominated by Common Reedgrass *Phragmites australis* scattered in the marsh as well. Although many salt pan bunds has degenerated, mangrove trees and its associated species were still found to be established along the old bunds. These mangrove species included *Kandelia obovata*, *Aegiceras corniculatum* and *Clerodendrum inerme*.

A total of 31 plant species were recorded in the habitat of marsh/reedbed. Among them, no species of conservation interest were found but only two species with restricted distribution in Hong Kong were identified, i.e. Duck's Tongue Grass *Monochoria vaginalis* and Mangrove Fern *Acrostichum aureum* (Annex A1).

Mudflat

Mudflat was found in a sheltered area between Shek Tsai Po and Tai Chung (Figures 1.3a – 1.3e). The mudflat was about 5.6 ha in size, accounting for 1.9% of the Study Area. It was covered during high tide and exposed during low tide every day. The mudflat predominately consisted of silts, clays and gravel, with only several bunches of *Kandelia obovata* growing in this habitat (Figure 1.4a).

Pond

This habitat includes a variety of water bodies such as lagoon, abandoned fish ponds and some inundated areas which were paddy fields or salt pans in the past, with a total area of about 15.5 ha (5.2% of the Study Area). All of them are believed to receive tidal influence in certain extent.

(1) Ove Arup & Partners (Hong Kong) Ltd. 2002. *Ngong Ping Sewage Treatment Works and Sewerage EIA Report* (079/2002).

Within the Study Area, ponds were mainly found at Po Chue Tam, north of Tai O Creek, the MRA and west of Buddhist Fat Ho Memorial School. Some small and isolated ponds were also found near village houses and agricultural lands (Figures 1.3a – 1.3e). The pond at Po Chue Tam is an artificial tidal lagoon in the estuary of Tai O Creek. Mangroves densely occupied its bund, in particular in the northern and western sides. *Kandelia obovata* and *Hibiscus tiliaceus* were the dominant species. A group of continuous abandoned fish ponds were located to the east of Sun Ki Street. Due to their connection with tidal water, bunds of these abandoned fish ponds were colonised by mangroves (e.g. *Kandelia obovata* and *Aegiceras corniculatum*), mangrove associates (e.g. *Clerodendrum inerme*) and other plant species commonly seen in mangrove community (e.g. *Derris trifoliata* and *Vitex rotundifolia*). Both of the MRA and the area west of Buddhist Fat Ho Memorial School are used to be salt pans and now abandoned and inundated even during low tide. Mangroves plants dominated by *Kandelia obovata* colonized the edges of the bunds.

A total of 25 plant species were recorded within this habitat with one species of conservation interest found, Wild Sensitive-plant *Chamaecrista leschenaultiana*. This rare species usually occurs in wasteland and grassland. It was previously recorded in Ngong Ping but not in Tai O ⁽¹⁾. During the ecological baseline surveys, a cluster of Wild Sensitive-plant was seen growing on the grassy bund of a small abandoned fish pond along the southern side of Tai O Road. Figure 1.3d shows the location of this species and its photographic record is provided in Figure 1.5.

Woodland

Woodland is the largest habitat in terms of area within the Study Area (103.9 ha, 34.7% of the total area). It was found in foothills and ravines of Fu Shan, Sze Shan and Tsim Fung Sha, behind villages of Fan Kwai Tong Tsuen, Nam Chung Tsuen, Leung Uk Tsuen, Hang Mei Tsuen and Wang Hang Village and at a small elevated area at Po Chue Tam behind the Yeung Hau Temple (Figures 1.3a – 1.3e).

This habitat had a semi-closed to closed canopy, which ranged from 8m to 12 m in height depending on the local topography and the canopy species. Tree species such as *Celtis sinensis*, *Mallotus paniculatus* and *Pinus elliottii* were commonly found on this canopy. Judging from the height and species composition of the canopy, woodland within the Study Area is estimated to have an age of more than 20 years. The mid-storey of this habitat was occupied by shrubs (e.g. *Lantana camara*, *Litsea rotundifolia*, *Ligustrum sinense* and *Psychotria asiatica*) and small to medium sized trees (e.g. *Aporosa dioica*, *Sterculia lanceolata* and *Phyllanthus emblica*), and understory occupied by low lying herbs including *Centella asiatica* and *Torenia benthamiana* of low density due to the shaded condition. Besides, climbers such as *Ampelopsis cantoniensis*, *Celastrus hindsii* and *Zanthoxylum nitidum* and ferns *Paederia*

(1) Xing, F.W., Ng, S.C., and Chau, L.K.C. 2000. *Gymnosperms and angiosperms of Hong Kong*. Memoirs of the Hong Kong Natural History Society. 23: 21-136.

scandens were commonly found to be intermingled with the branches of trees and shrubs, which increased the structural complexity of the woodland.

Within this habitat, a total of 86 plant species were recorded. No rare or protected plants but only three species with restricted distribution in Hong Kong were identified during the ecological baseline surveys. They are Hong Kong Torenia *Torenia benthamiana*, Three-leaved Eleutherococcus *Eleutherococcus trifolius* and Little-fruited Grape *Vitis balanseana* (Annex A1).

Plantation

The plantation habitat within the Study Area was found along Tai O Road and the road bordering the eastern side of the MRA, as well as on the hill slopes behind San Tsuen (Figures 1.3a – 1.3e). Its total area was approximately 1.9 ha and accounted for merely 0.6% of the overall Study Area.

Exotic tree species Mountain Fig *Ficus altissima* and Paper-bark Tree *Melaleuca leucadendron* were planted on both sides of the road east of the MRA, with a rather uniform height of 4 m to 5 m. In comparison, the plantation along Tai O Road comprised relatively more diverse trees with varying heights ranging from 3 m to 8 m. The dominant trees were also exotic species, which included *Eucalyptus robusta*, *Bombax ceiba*, *Archontophoenix alexandrae* and *Aleurites moluccana*. Landscaping plants such as *Duranta erecta* and *Alpinia zerumbet* cv. *Variegata* were found in planters along Tai O Road as well. But grasses (e.g. *Apluda mutica* and *Bidens alba*) have begun to spread out and colonised the planters due to the lack of active management.

The plantation woodland along the hillside behind San Tsuen had a semi-closed canopy at a height of approximately 10 m and was extensively planted with the exotic tree species *Acacia confusa* which has been widely used in Hong Kong during the past few decades because of its adaptability to poor soil conditions.

During the ecological baseline surveys, a total of 47 plant species were recorded within this habitat, and no species of conservation interest were found during the surveys (Annex A1).

Shrubland

As a stage in the natural succession towards young woodland, the habitat of shrubland within the Study Area always occurs adjacent to woodland, either on a higher elevation or in a more close vicinity to villages where human activities may impede its succession (Figures 1.3a – 1.3e). Its total area was approximately 60.7 ha and accounted for 20.3% of the overall Study Area. It had similar plant composition to the surrounding woodland but with proportionally more shrub species (e.g. *Litsea rotundifolia* and *Psychotria asiatica*), pioneer trees (e.g. *Ficus hispida*, *Pandanus tectorius* and *Rhus chinensis*) and woody climbers (e.g. *Tetracera asiatica* and *Zanthoxylum nitidum*), with an average height ranging from 2 m to 3 m. The understorey vegetation of this habitat includes herbs (e.g. *Liriope spicata* and *Torenia benthamiana*) and ferns (e.g. *Blechnum orientale*).

The ecological baseline surveys recorded 62 plant species in shrubland and most of the plant species are locally common or very common. Four plant species with restricted distribution in Hong Kong were also identified in this habitat, i.e. *Clerodendrum canescens*, *Ajuga nipponensis*, *Torenia benthamiana* and *Eleutherococcus trifoliatus*. However, no plant species of conservation interest were found (*Annex A1*).

Grassland

The upland area of Fu Shan and Sze Shan within the Study Area were dominated by grassland (*Figures 1.3a – 1.3e*). Because of the bouldered steep terrain and grassy nature, this habitat is generally open and simple in structure and had an average plant height of 0.5 m to 1 m. Its total area was approximately 22.7 ha and accounted for 7.6% of the overall Study Area. Herbs (e.g. *Digitaria sanguinalis* and *Melastoma candidum*) and ferns (e.g. *Dicranopteris pedata*) grew extensively in this area. Most of the species are wind resistant and are well adapted to the relatively dry environment. Isolated trees such as *Phoenix hanceana*, *Phyllanthus emblica* and *Rhus* spp. were also spotted within the habitat.

A total of 32 plant species was recorded within grassland during the ecological baseline surveys (*Annex A1*). One plant species which is considered Vulnerable in China and listed in Category II of Wild plant under State protection was identified, i.e. Cycad-fern *Brainea insignis*, a large terrestrial fern mostly found at high altitudes in open places. But it is common in Hong Kong as described in AFCD's webpage on "Rare and Precious Plants of Hong Kong" and thus not considered as a species of conservation interest.

Watercourse

The watercourse within the Study Area flows in a southeast to northwest direction, divides into branches when it approaches Lung Tin Estate and Kat Hing Back Street and finally empties into the sea (*Figures 1.3a – 1.3e*). Its total area was approximately 8.1 ha and accounted for 2.3% of the overall Study Area.

The upper reach of the watercourse was relatively natural. Large cobbles were present at the stream bottom with a visible layer of silts and leaf litter accumulated in the areas where water flow slowed down. Plant species recorded in its riparian zone were similar to those in the adjacent woodland, including trees *Ficus hispida*, *Macaranga tanarius*, *Mallotus paniculatus* and *Litsea glutinosa*, shrub *Breynia fruticosa*, and herbs *Alpinia hainanensis* and *Melastoma candidum*. Since a barrier was present across the stream and it obstructed the incoming tidal water (see habitat photo on *Figure 1.4b* for a better illustration), this section of the watercourse was freshwater in nature. A large amount of Water Dragon *Ludwigia adscendens*, a common freshwater plant species, was present in this section with its floating stems and leaves on water surface.

The middle and lower reaches of the watercourse (i.e. Tai O Creek) received tidal influence. This section ran through residential area and along existing roads and was subject to a certain degree of channelisation or bank reinforcement. Due to its connection with tidal water, mangroves dominated by *Kandelia obovata* and mangrove associates such as *Acanthus ilicifolius* colonized the earthen parts of the banks and extended until the estuary area.

The baseline ecological surveys recorded 27 plant species in the habitat of watercourse. All of them are common or very common species in Hong Kong. No rare or protected plant was identified within this habitat (*Annex A1*).

Agricultural Land

Two small areas of agricultural land were identified within the Study Area. They were located at Hung Mei in the east and adjacent to a large patch of marsh in the north (*Figures 1.3a – 1.3e*). The total area of this habitat was approximately 2.6 ha (0.9% of the Study Area).

The agricultural land at Hung Mei was found to have been abandoned and the field was overgrown by shrubs (e.g. *Lantana camara*), grasses (e.g. *Bidens alba*) and climbers (e.g. *Mikania micrantha*). In the northern agricultural land, farming activities were observed during the baseline surveys. Plants cultivated in this area included vegetables such as Water Spinach *Ipomoea aquatica*, Egg-plant *Solanum melongena* and Hairy Gourd *Benincasa hispida* as well as a range of fruit trees such as *Averrhoa carambola*, *Citrus* sp., *Clausena lansium*, *Dimocarpus longan* and *Litchi chinensis*.

There was a small pool associated with the northern active agricultural land. Water was stored in this pool all year round for the purpose of irrigation. A rare submerged aquatic herb species Aubert's Blyxa *Blyxa aubertii* was found growing in this pool ⁽¹⁾. The exact location of this rare plant is shown in *Figure 1.3b* and its photographic recorded is provided in *Figure 1.5*. Aubert's Blyxa is usually found in paddy fields, ponds, channels and other wetland habitat and it was previously recorded in Tai O ⁽²⁾. In total, 29 plant species were recorded in the habitat of agricultural land. A complete vegetation list is provided in *Annex A1*.

Developed Area/Village

Developed area/village within the Study Area referred to all built-up areas and wastelands. Village houses (in particular the stilt houses along both sides of Tai O Creek channel) and village shops on Kat Hing Back Street and Tai O Wing On Street were the major components. Also, this habitat included culture centre, park, school, clinic, temple/church and other public

- (1) Yip, J. Y. Y., Yip, J. K. L., Liu, E. K. Y., Ngar, Y. N. and Lai, P. C. C. (2010). *A Floristic Survey of Marshes in Hong Kong*. News Letter of Hong Kong Biodiversity. 19: 7 - 16.
- (2) Xing, F.W., Ng, S.C., and Chau, L.K.C. 2000. *Gymnosperms and angiosperms of Hong Kong*. Memoirs of the Hong Kong Natural History Society. 23: 21-136.

facilities including the existing Tai O Sewage Treatment Work west of Kau San Tei (Figures 1.3a – 1.3e). It was about 48.7 ha in area and accounted for 16.3% of the whole Study Area.

The baseline surveys recorded 101 plant species in this habitat and most of the plant species are common or very common in Hong Kong. Vegetation is dominated by ornamental trees (e.g. *Araucaria cunninghamii*, *Bauhinia blakeana*, *Delonix regia*, *Hibiscus tiliacous*, *Michelia champaca*, *Plumeria rubra* and *Thuja orientalis*) and fruit trees (e.g. *Dimocarpus longan*, *Carica papaya*, and *Musa acuminata* cv. *Cavendishii*), suggesting intensive human influence on this habitat. Other plant species frequently recorded included landscaping and gardening shrubs such as *Catharanthus roseus*, *Cordyline fruticosa*, *Duranta erecta*, and *Thevetia peruviana* cv. *Aurantiana*.

Five plant species with restricted distribution in Hong Kong were recorded in this habitat. They were Humaped Fig Tree *Ficus tinctoria* subsp. *Gibbosa*, Buddhist Pine *Podocarpus macrophyllus*, Wild Indigo *Indigofera suffruticosa*, White Leadwort *Plumbago zeylanica* and Malabar-Nightshade *Basella alba*. No rare or protected plant species (i.e. species of conservation interest) were identified within developed area/village.

Coastal Area

Coastal area is found in the east of the Study Area (Figures 1.3a – 1.3e). This habitat is about 3.9 ha in area and accounts for merely 1.3% of the Study Area.

The coastal area at Fan Kwai Tong comprised both rocky shore (hard bottom) and sandy shore (soft bottom). Since it was in close proximity to village houses, this coastline received human disturbances to some extent, with rubbish spotted on the beach. The coastal area along the northern fringe of the Study Area consisted of rocky shore (hard bottom), boulder shore (soft bottom), as well as a short section of artificial seawall at the proposed upgraded Tai O STW and its vicinity (see Figure 1.4c in this Report for photographic records of this habitat and Figure 1.1 in *Tai O Marine Ecological Baseline Report* for detailed locations of the hard bottom and soft bottom habitats).

Due to the relatively harsh growing conditions, limited vegetation grew in this habitat. A total of 22 plant species were recorded during the ecological baseline surveys (Annex A1). Most of them were common coastal plants such as *Cerbera manghas*, *Hibiscus tiliaceus*, *Portulaca oleracea*, and *Wedelia biflorab*. No plant species of conservation interest was identified.

1.7.2

MAMMALS

Three individuals of bat were recorded near the village houses of Leung Uk Tsuen. However, they were not identified to a species level (Annex A2).

1.7.3

BIRDS

A total of 46 bird species were recorded within the Study Area during the ecological baseline surveys (Annex A3). Of all these bird species, twelve species were wetland-dependent birds, which require various wetland habitats for breeding, nesting, feeding and rearing young. They were Little Egret (*Egretta garzetta*), Great Egret (*Ardea modesta*), Cattle Egret (*Bubulcus coromandus*), Grey Heron (*Ardea cinerea*), Striated Heron (*Butorides striatus*), Black-crowned Night Heron (*Nycticorax nycticorax*), Yellow Bittern (*Ixobrychus sinensis*), Grey-tailed Tattler (*Tringa brevipes*), Common Sandpiper (*Actitis hypoleucos*), White-breasted Waterhen (*Amaurornis phoenicurus*), White-throated Kingfisher (*Halcyon smyrnensis*) and Common Kingfisher (*Alcedo atthis*). The habitats frequently used by these species within the Study Area included mangrove, marsh/reedbed and pond etc.

According to the Egretty Count Report by Hong Kong Bird Watching Society (HKBWS), there was an egretty in Tai O actively used by ardeids until 2007⁽¹⁾ (See Section 1.4.2 in Literature Review for the description of Tai O Egretty). During the current ecological baseline report, no active or abandoned egretty could be found within the Study Area as well.

Abundance and species number of the birds in each type of habitat, based on the results of the transect count, are shown in Table 1.6. Higher numbers of bird individuals were recorded in the developed area/village, mangrove, marsh/reedbed and woodland. It is believed that, for the developed area/village, large groups of the common urban bird species such as Eurasian Tree Sparrow (*Passer montanus*), Barn Swallow (*Hirundo rustica*) and Japanese White-eye (*Zosterops japonicus*) contributed its highest bird abundance. In terms of bird species richness, the above four habitats again showed higher diversity than the other habitats did. Mangrove supported the most diverse bird species, with 23 species recorded within this habitat, followed by developed area/village (22 species), woodland (21 species) and marsh/reedbed (20 species).

Table 1.6 *Bird Abundance and Number of Species Recorded in Each Habitat along the Survey Transects within Study Area*

Habitat	Total Number of Birds Recorded Along the Transects	Number of Bird Species Recorded Along the Transects
Mangrove	114	23
Marsh/Reedbed	86	20
Mudflat	6	3
Pond	7	4
Woodland	81	21
Plantation	14	5
Shrubland	44	11
Grassland	21	10
Watercourse	13	7

(1) HKBWS. Egretty Counts Reports 2000 - 2010

Habitat	Total Number of Birds Recorded Along the Transects	Number of Bird Species Recorded Along the Transects
Agricultural Land	3	2
Developed Area/Village	154	22
Coastal Area	43	7

Based on the results of the point count method, a total of 280 bird individuals of 26 different species at all of the twelve sampling points were recorded during each survey. The bird abundance and species diversity recorded at each point are summarised in *Table 1.7*. The highest bird abundance was recorded at Point 5 which covers the habitats of mudflat and Developed Area/Village, while the highest species richness was found at Sampling Point 8 looking at mangrove and woodland.

Table 1.7 *Bird Abundance and Number of Species Recorded at Each Sampling Point*

Sampling Point No.	Type of Habitat	Bird Abundance	Number of Bird Species
1	Watercourse (subject to tidal influence)	12	6
2	Pond	11	9
3	Developed Area/Village	9	7
4	Mangrove/Marsh/Reedbed	6.5	5
5	Mudflat/Developed Area/Village	23.5	10
6	Woodland	13	4
7	Coastal area	5	4
8	Mangrove/Woodland	18.5	15
9	Woodland/Plantation	10.5	7
10	Mangrove/Marsh/Reedbed	11	9
11	Marsh/Reedbed/Grassland	4.5	5
12	Developed Area/Village	15.5	11

Most of the bird species recorded were generally common and widespread in Hong Kong (e.g. Spotted Dove *Streptopelia chinensis*, Chinese Bulbul *Pycnonotus sinensis*, Red-Whiskered Bulbul *Pycnonotus jocosus*, Japanese White-eye *Zosterops japonica* and Oriental Magpie Robin *Copsychus saularis*). And there are four bird species of conservation interest, including Black Kite *Milvus migrans*, Greater Coucal *Centropus sinensis*, Lesser Coucal *Centropus bengalensis* and Collared Scops Owl (*Otus bakkamoena*) (*Annex A3*, recorded during the surveys (NB all bird species in Hong Kong are also protected under *Wild Animals Protection Ordinance (WAPo)*(Cap. 170)). Their locations are shown on *Figures 1.3a – 1.3e*.

Black Kite (*Milvus migrans*) is a very widespread and common species in Hong Kong. It is conspicuous in the urban area and over Victoria Harbour all year around. It is more numerous in winter than in summer and the number peaks in December and January ⁽¹⁾. It is found in a wide variety of coastal and inland habitats, including small islands, sea-coasts, intertidal mudflat, fish

(1) Carey, G.J., Chalmers, M.L., Diskin, D.A., Kennerley, P.R., Leader, P.J., Leven, M.R., Lewthwaite, R.W., Melville, D.S., Turnbull, M., and Young, L. (2001). The Avifauna of Hong Kong. Hong Kong Bird Watching Society, Hong Kong.

ponds, reservoirs, landfills and grassy hillsides at all altitudes. It is listed as a Class II Protected Animal of the PRC and being a member of the Falconiformes it is listed in CITES *Appendix II* as well as being protected under Cap 586 in Hong Kong. During the surveys it was recorded perching at or flying over many habitats including grassland, plantation, shrubland, woodland, developed area, coastal area, marsh/reedbed and mangrove. Due to its high occurrence in varying habitats, location of Black Kite was not present on habitat maps.

Greater Coucal (*Centropus sinensis*) is of ecological interest as it is listed as Class II Protected Animal of the PRC and is categorised as Vulnerable in *China Red Data Book*, despite its commonness and widespread distribution in Hong Kong. It is frequently found in various habitats in Hong Kong, including grasslands, mangroves, marshes, agricultural lands with scattered trees and bushes, open canopy shrubland, fung shui woods and gardens, and has been noted foraging in refuse. During the ecological survey, its calling was heard at several spots in the marsh/reedbed, woodland and developed area/village (Figures 1.3a – 1.3e).

The Lesser Coucal (*Centropus bengalensis*) is a Class II Protected Animal in PRC and categorised as Vulnerable in *China Red Data Book*. In Hong Kong, it is a common resident and favours overgrown shrubby areas and hillsides with scattered trees ⁽¹⁾. During the ecological survey, its calling was heard in the woodland at Shek Tsai Po (Figures 1.3a – 1.3e).

The Collared Scops Owl (*Otus bakkamoena*) is a Class II Protected Animal of the PRC and is protected under Cap 586 in Hong Kong, and listed in Appendix II of CITES. The species is a common resident in Hong Kong. It is nocturnal and occurs in any wooded habitat ⁽²⁾. It was heard calling in the woodlands behind Wang Hang Village and Hang Mei Tsuen during the night survey (Figures 1.3a – 1.3e).

1.7.4

HERPETOFAUNA

Nine reptiles, including Long-tailed Skink *Mabuya longicaudata*, Changeable Lizard *Calotes versicolor*, Four-clawed Gecko *Gehyra mutilate*, Chinese Gecko *Gekko chinensis*, Bowring's Gecko *Hemidactylus bowringii*, Tokay Gecko *Gekko gecko*, Common Wolf Snake *Lycodon aulicus*, Checkered Keelback *Xenochrophis piscator*, Chinese Water Snake *Enhydris chinensis*, and four amphibian species, including Brown Tree Frog *Polypedates megacephalus*, Gunther's Frog *Rana guentheri*, Paddy Frog *Fejervarya limnocharis* and Asiatic Painted Frog *Kaloula pulchra pulchra*, were recorded during the ecological baseline surveys (Annex A4). All of these herpetofauna were found during transect surveys, and most of them are abundant or widely distributed in Hong Kong except the Tokay

(1) Viney, C., Phillipps, K., and Lam, C.Y. (1996). *Birds of Hong Kong and South China*. Government Printer, Hong Kong.

(2) Viney, C., Phillipps, K., and Lam, C.Y. (1996). *Birds of Hong Kong and South China*. Government Printer, Hong Kong.

Gecko and Chinese Water Snake ⁽¹⁾, which are considered as a species of conservation interest.

Tokay Gecko (*Gekko gecko*) is listed in CITES *Appendix I* (for species that are the most endangered and are threatened with extinction worldwide), classified as 'Endangered' in the *China Red Data Book* and a Class II Protected Animal of the PRC. Within Hong Kong, it is distributed in rocky areas in Tung Chung and Sham Wat on Lantau Island, Lion Rock Country Park ⁽²⁾. During the ecological survey, its calling was heard in the marsh near Leung Uk Tsuen and in woodland behind Wang Hang Village (*Figure 1.3e*).

Chinese Water Snake (*Enhydris chinensis*) is classified as 'Near Threatened' in the *China Red Data Book*. This species is active during both day and night time. It inhabits freshwater or estuarine areas including wet agricultural fields, mangroves and fishponds ⁽³⁾. Three Chinese Water Snakes showed above the water surface in the reedbed near Leung Uk Tsuen during a night survey.

1.7.5

BUTTERFLIES

There were a total of 54 species of butterflies recorded within the Study Area during the ecological surveys (*Annex A5*). Nine uncommon species (i.e. Grass Demon *Udaspes folus*, Magpie Flat *Abraximorpha davidii*, Bush Hopper *Ampittia dioscorides*, Plains Cupid *Chilades pandava*, Small Cabbage White *Pieris rapae*, Three-spot Grass Yellow *Eurema blanda*, Danaid Egg-fly *Hypolimnna misippus*, Red Lacewing *Cethosia biblis*, Common Nawab *Polyura athamas*) were identified, while the rest recorded species are common in Hong Kong ⁽⁴⁾.

The abundance and species richness of butterflies in each habitat, based on the results of transect count surveys are shown in *Table 1.8*. The highest butterfly abundance was found in woodland, which also supported the most diverse butterfly species. Developed area/village had the second highest butterfly abundance and species richness. The butterfly species (41 species) recorded in these two habitats accounted for more than 70% of the total butterfly species in the Study Area. The higher vegetation diversity in these two habitats (101 plant species in developed area/village and 86 species in woodland; *Table 1.5*) which may contain more nectar plants for butterflies would be one of the possible reasons. Apart from this, the well shaded woodland understorey would provide favourable habitats for certain butterfly species such as Large Faun *Faunis eumeus* in the family of Amathusiidae and the browns (in the family of Satyridae). No butterfly was recorded within the habitat of mudflat.

(1) Hong Kong Biodiversity Database. Available at:
<http://www.afcd.gov.hk/english/conservation/hkbiodiversity/database/search.asp>

(2) Hong Kong Biodiversity Database. Available at:
<http://www.afcd.gov.hk/english/conservation/hkbiodiversity/database/search.asp>

(3) AFCD. 2006. A Field Guide to the Venomous Land Snakes of Hong Kong. Friends of Country Park.

(4) Hong Kong Biodiversity Database. Available at:
<http://www.afcd.gov.hk/english/conservation/hkbiodiversity/database/search.asp>

Table 1.8 *Butterfly Abundance and Number of Species Recorded in Each Habitat along the Survey Transects within Study Area*

Habitat	Total Number of Butterflies Recorded Along the Transects	Number of Butterfly Species Recorded Along the Transects
Mangrove	12	10
Marsh/Reedbed	9	7
Mudflat	0	0
Pond	1	1
Woodland	64	28
Plantation	9	4
Shrubland	12	11
Grassland	9	7
Watercourse	2	2
Agricultural Land	5	2
Developed Area/Village	56	24
Coastal Area	10	7

The butterfly abundance and species diversity recorded at each sampling point are summarised in *Table 1.9*. Point 12, which is located within the developed area/village but also in close vicinity of woodland, showed the highest butterfly abundance and richness.

Table 1.9 *Butterfly Abundance and Species Richness at Each Sampling Point*

Sampling Point No.	Type of Habitat	Butterfly Abundance	Number of Butterfly Species
1	Watercourse (subject to tidal influence)	1	1
2	Pond	0	0
3	Developed Area/Village	0	0
4	Mangrove/Marsh/Reedbed	0	0
5	Mudflat/Developed Area/Village	5	5
6	Woodland	0	0
7	Coastal area	5	5
8	Mangrove/Woodland	3	2
9	Woodland/Plantation	0	0
10	Mangrove/Marsh/Reedbed	2	2
11	Marsh/Reedbed/Grassland	2	2
12	Developed Area/Village	19	10

1.7.6 ODONATES (DRAGONFLIES AND DAMSELFLIES)

A total of 13 dragonfly species and five damselfly species were recorded within the Study Area during the surveys (*Annex A6*), with Wandering Glider *Pantala flavescens* as the dominant species in terms of abundance. All of them are common or abundant as considered by the AFCD's Hong Kong Biodiversity Database ⁽¹⁾.

(1) Hong Kong Biodiversity Database. Available at:
<http://www.afcd.gov.hk/english/conservation/hkbiobiodiversity/database/search.asp>

The relative abundance and species richness of odonates (both dragonflies and damselflies) in each type of surveyed habitat, based on the results of the transect surveys are shown in *Table 1.10*. Grassland had the highest odonate abundance, followed by marsh/reedbed. Both were because of large colonies of Wandering Glider appeared in the habitats. In terms of species richness, the most species number was recorded in marsh/reedbed. Many of them prefer marshy or swampy areas, for example Blue Percher Marsh Skimmer *Orthetrum luzonicum*, *Diplacodes trivialis*, Pied Percher *Neurothemis tullia tullia*, Red-faced Skimmer *Orthetrum chrysis* and Crimson Darter *Crocothemis servilia servilia*. No odonate species was recorded within the habitat of mudflat.

Table 1.10 *Odonate Abundance and Number of Species Recorded in Each Habitat along the Survey Transects within Study Area*

Habitat	Total Number of Odonates Recorded Along the Transects	Number of Odonate Species Recorded Along the Transects
Mangrove	12	4
Marsh/Reedbed	62	8
Mudflat	0	0
Pond	3	3
Woodland	6	4
Plantation	0	0
Shrubland	0	0
Grassland	176	2
Watercourse	2	2
Agricultural Land	11	5
Developed Area/Village	29	7
Coastal Area	13	2

The odonate abundance and species diversity recorded at each sampling point are summarised in *Table 1.11*. Dragonflies or damselflies were observed at Points 3, 7, 8, 9 and 12, with one species recorded in each of the sampling point. Among the five sampling points, Point 7 had the highest odonate abundance. Again, this is due to more individuals of Wandering Glider were present at that point.

Table 1.11 Odonate Abundance and Species Richness at Each Sampling Point

Sampling Point No.	Type of Habitat	Odonate Abundance	Number of Odonate Species
1	Watercourse (subject to tidal influence)	0	0
2	Pond	0	0
3	Developed Area/Village	7	1
4	Mangrove/Marsh/Reedbed	0	0
5	Mudflat/Developed Area/Village	0	0
6	Woodland	0	0
7	Coastal area	12	1
8	Mangrove/Woodland	4	1
9	Woodland/Plantation	5	1
10	Mangrove/Marsh/Reedbed	0	0
11	Marsh/Reedbed/Grassland	0	0
12	Developed Area/Village	1	1

1.7.7 FRESHWATER AQUATIC ASSEMBLAGE

Freshwater survey was conducted within the freshwater section before the stream water reaches the barrier (Figure 1.2 and also see the description of watercourse in Section 1.7.1). A total of 24 freshwater fauna taxa were recorded during the surveys. These included freshwater fishes, insect larvae and shrimps (Annex A7).

Two shrimp species, *Caridina cantonensis* and *Macrobrachium hainanense*, were found among the vegetation and leave litter along banks. Both are very common in Hong Kong. Fifteen taxa of insect larvae including mayflies, dragonflies, caddisflies and stoneflies etc. were also recorded. The presence of stonefly, which is intolerant to water pollution, may indicate good water quality within this section of the water course. In terms of abundance, *Procloeon* sp. from the family Baetidae, the most abundant and widespread family of Hong Kong mayflies ⁽¹⁾, was the commonest species observed during the freshwater surveys.

The surveyed watercourse section supported relatively high diversity of freshwater fishes, with a total of eight species identified during the surveys. They are Sharphead Sleeper *Eleotris oxycephala*, Variable Platyfish *Xiphophorus variatus*, Swordtail *Xiphophorus hellerii*, Fork Tongue Goby *Glossogobius giuris*, goby *Rhinogobius duospilus*, Jewelfish *Hemichromis stellifer*, Chinese Barb *Puntius semifasciolatus* and a cyprinid fish *Nicholsicypris normalis*. All of these fishes are locally common and some of them such as Variable Platfish, Swordtail and Jewelfish are popular aquarium fishes ⁽²⁾. In the light of the short distance between this stream and Hang Mei Tsuen, it is believed that the aquarium fishes might be firstly released by the nearby villagers or other peoples and then become naturalized.

(1) Dudgeon, D. (1999). *Tropical Asian Streams*. Hong Kong University Press.

(2) Virginia L.F. Lee, Samuel K. S. Lam, Franco K. Y. Ng, Tony K. T. Chan and Maria L. C. Young. (2004). *Field Guide to the Freshwater Fish of Hong Kong*. Agriculture, Fisheries and Conservation Department, Friends of Country Park and Cosmos Book Ltd. Hong Kong.

The ecological importance of the habitats and wildlife identified within the Study Area during the surveys are evaluated in accordance with the *EIAO TM Annex 8* criteria, and presented in *Tables 1.12 - 1.23*. Habitats recorded within the Study Area included mangrove, marsh/reedbed, mudflat, pond, woodland, plantation, shrubland, grassland, watercourse, agricultural land, developed area/village and coastal area. The ecological value of mangrove, marsh/reedbed and woodland was considered to be moderate to high. The mudflat and upper section of the watercourse are considered to have moderate ecological value. The ecological value of pond, shrubland, middle and downstream of the watercourse, developed area/village and coastal area was considered to be low to moderate. And that of mudflat, plantation, grassland and agricultural land was considered to be low.

Table 1.12 *Ecological Evaluation of Mangrove within Study Area of Tai O*

Criteria	Mangrove
Naturalness	Largely undisturbed and the mangrove stands in the MRA are recreated habitat.
Size	Mangroves were found in several locations including the stands around the pond at Po Chue Tam, the stands around some abandoned fish ponds in the northeast of the Study Area, the stands along the intertidal riparian zones of Tai O Creek, the stands along the pond bunds of the designated MRA and a large area to the north of Leung Uk Tsuen, with an overall area of approximately 19.7 ha (6.6% of the total Study Area).
Diversity	Low floral diversity (20 plant species recorded) with moderate to high structural complexity due to the stilt roots of mangrove plants. Moderate terrestrial faunal diversity.
Rarity	Bird species of conservation interest included Black Kite <i>Milvus migrans</i> .
Re-creatability	This habitat can be readily re-created under the condition of proper sea level and flux.
Fragmentation	Fragmented.
Ecological Linkage	Most of the mangrove stands are linked to ponds and watercourse receiving intertidal influence, while in the north of Leung Uk Tsuen, this habitat is adjacent to a patch of reedbed and began to colonize the latter.
Potential Value	With a moderate to high potential value to increase in size if given sufficient time and proper sediment and tidal conditions.
Nursery/ Breeding Ground	Nil.
Age	Young.
Abundance/ Richness of Wildlife	High for birds, moderate for butterflies, and low for the other fauna groups.
Overall Ecological Value	Moderate to high.

Table 1.13 Ecological Evaluation of Marsh/Reedbed within Study Area of Tai O

Criteria	Marsh/Reedbed
Naturalness	Largely undisturbed, mostly originated from abandoned fields and salt pans.
Size	Two patches of marsh were identified within the Study Area. One is to the north of Leung Uk Tsuen and the other to the north of Tai O Creek. The total area of this habitat was about 5.9 ha, accounting for 1.9% of the Study Area.
Diversity	Low to moderate floral diversity (31 plant species recorded) with low to moderate structural complexity. Moderate terrestrial faunal diversity.
Rarity	Bird species of conservation interest included Black Kite <i>Milvus migrans</i> , and Greater Coucal <i>Centropus sinensis</i> . Reptile species of conservation interest included Tokay Gecko <i>Gekko gekko</i> and Chinese Water Snake <i>Enhydris chinensis</i> . Odonate of conservation interest included <i>Mortonagrion hirosei</i> (recorded by AFCD).
Re-creatability	Able to be re-created under suitable hydrological conditions.
Fragmentation	Fragmented.
Ecological Linkage	Linked to adjacent mangrove and agricultural land.
Potential Value	Could be enhanced with the clearance of the mangrove seedlings in adjacent area and management of water levels, and therefore having the potential ability to support a variety of uncommon species (especially birds).
Nursery/ Breeding Ground	Nil.
Age	Evolved since the cessation of salt-extraction activity, > 20 years.
Abundance/ Richness of Wildlife	Moderate to high for all fauna groups.
Overall Ecological Value	Moderate to high.

Table 1.14 Ecological Evaluation of Mudflat within Study Area of Tai O

Criteria	Mudflat
Naturalness	Largely natural but receiving human disturbances from nearby developed area.
Size	Approximately 5.6 ha, located in the sheltered area between Shek Tsai Po and Tai Chung in the Study Area.
Diversity	Low floral diversity (one plant species recorded) with low structural complexity. Mudflat generally supports high marine faunal diversity.
Rarity	No species of conservation interest was recorded in this habitat.
Re-creatability	Able to be re-created under suitable hydrological conditions.
Fragmentation	Not fragmented within the Study Area.
Ecological Linkage	Not functionally linked to any highly valued habitat in close proximity.
Potential Value	Could be enhanced with active clearance of the mangrove seedlings.
Nursery/ Breeding Ground	Mudflat recognised as an important nursery ground for marine organisms.
Age	Not applicable.
Abundance/ Richness of Wildlife	Low for all terrestrial fauna groups but mudflat recognised to support high abundance of marine organisms.

Criteria	Mudflat
Overall Ecological Value	Moderate.

Table 1.15 *Ecological Evaluation of Pond within Study Area of Tai O*

Criteria	Pond
Naturalness	The pond at Po Chue Tam had artificial bank and the others originated from abandoned fish ponds, fields and salt pans.
Size	Located at Po Chue Tam, north of Tai O Creek, the MRA and west of Buddhist Fat Ho Memorial School and some small and isolated ponds near village houses and agricultural lands, with an overall area of approximately 15.5 ha (5.2% of the total Study Area).
Diversity	Low floral diversity (25 plant species recorded). Low terrestrial faunal diversity.
Rarity	Plant species of conservation interest Wild Sensitive-plant <i>Chamaecrista leschenaultiana</i> .
Re-creatability	Could be re-created.
Fragmentation	Fragmented except for the continuous abandoned fish ponds to the north of Tai O Creek
Ecological Linkage	Linked to adjacent mangrove and agricultural land.
Potential Value	Would change into marsh or mangrove habitat given sufficient time and left the area without active management.
Nursery/ Breeding Ground	Nil.
Age	Over 30 years. Some fishponds have probably been abandoned for about 10 years
Abundance/ Richness of Wildlife	Low for all fauna groups.
Overall Ecological Value	Low to moderate.

Table 1.16 *Ecological Evaluation of Woodland within Study Area of Tai O*

Criteria	Woodland
Naturalness	Dominated by native plants with limited disturbances.
Size	Patches of woodland were found in foothills and ravines of Fu Shan, Sze Shan and Tsim Fung Sha, behind villages of Fan Kwai Tong Tsuen, Nam Chung Tsuen, Leung Uk Tsuen, Hang Mei Tsuen and Wang Hang Village and at a small elevated area at Po Chue Tam behind the Yeung Hau Temple; the largest habitat with an overall area of approximately 103.9 ha (34.7% of the total Study Area).
Diversity	Moderate to high floral diversity (86 plant species recorded) with high structural complexity. Moderate faunal diversity.
Rarity	Bird species of conservation interest included Black Kite <i>Milvus migrans</i> , Greater Coucal <i>Centropus sinensis</i> , Lesser Coucal <i>Centropus bengalensis</i> and Collared Scops Owl <i>Otus lettia</i> ; Reptile species of conservation interest, Tokay Gecko <i>Gekko gekko</i> .
Re-creatability	Habitat characteristics and species composition are relatively natural. In the absence of disturbance, it would take at least 30 years for the woodland to be re-created.

Criteria	Woodland
Fragmentation	The north patch is largely continuous, while the close canopy of the southern patches is often opened or chopped by built-ups.
Ecological Linkage	Functionally links to the shrubland and grassland in close proximity. Largely fell within the Lantau North Country Park, Conservation Area and Green Belt zones.
Potential Value	With a high potential value to become mature woodland if given sufficient time and protection from disturbances such as hillfires.
Nursery/ Breeding Ground	Nil.
Age	> 30 years based on tree size, woodland structure and species composition.
Abundance/ Richness of Wildlife	Moderate to high for birds, butterflies and odonates; low for the other fauna groups.
Overall Ecological Value	Moderate to high.

Table 1.17 Ecological Evaluation of Plantation within Study Area of Tai O

Criteria	Plantation
Naturalness	Man-made habitat, dominated by exotic trees and shrubs.
Size	The total area of this habitat is approximately 1.9 ha (0.6% of the total Study Area).
Diversity	Moderate floral diversity (47 plant species recorded) with low structural complexity in the light of uniform tree height and absence of mid and understorey vegetation. Low faunal diversity.
Rarity	One bird species of conservation interest, Black Kite <i>Milvus migrans</i> .
Re-creatability	For the plantation woodland along northern hillsides, it would take about 10 years for the trees to be re-created. For the plantation along Tai O Road and the road east of the MRA, habitat characteristics and species composition are relatively easy to be re-created.
Fragmentation	Fragmented.
Ecological Linkage	Not functionally linked to any highly valued habitat in close proximity.
Potential Value	Generally low, but low to moderate for the plantation behind San Tsuen through colonization by native species if given sufficient time and protection from disturbances.
Nursery/ Breeding Ground	Nil.
Age	5 - 10 years.
Abundance/ Richness of Wildlife	Low for all fauna groups.
Overall Ecological Value	Low.

Table 1.18 Ecological Evaluation of Shrubland within Study Area of Tai O

Criteria	Shrubland
Naturalness	Semi-natural habitats mainly covered by native species.
Size	Always adjacent to woodland with an overall area of approximately 60.7 ha (20.3% of the total Study Area).
Diversity	Moderate diversity of plants (62 species) with moderate structural complexity. Low to moderate faunal diversity.
Rarity	One bird species of conservation interest, Black Kite <i>Milvus migrans</i> .
Re-creatability	In the absence of disturbance, it would take at least 5 years for the shrubland to be re-created.
Fragmentation	Mainly existed as continuous patches and surrounded by woodland, grassland or developed area.
Ecological Linkage	Not functionally linked to any highly valued habitat, bordering woodland in close proximity. Largely fell within the Lantau North Country Park and Conservation Area zone.
Potential Value	Low to moderate to become mature shrubland and then young woodland if given sufficient time and protection from disturbance.
Nursery/ Breeding Ground	Nil.
Age	5 - 8 years.
Abundance/ Richness of Wildlife	Moderate for butterflies and birds, low for the other fauna groups.
Overall Ecological Value	Low to moderate

Table 1.19 *Ecological Evaluation of Grassland within Study Area of Tai O*

Criteria	Grassland
Naturalness	Natural succession would be frequently impeded by disturbances such as hill fires.
Size	The total area of this habitat is approximately 22.7 ha (7.6% of the total Study Area).
Diversity	Relatively low diversity of plants (32 species) with low structural complexity. Low faunal diversity.
Rarity	No flora or fauna species of conservation interest were found in this habitat.
Re-creatability	Readily re-creatable.
Fragmentation	Mainly concentrated in the upland area of Fu Shan and Sze Shan, generally not fragmented.
Ecological Linkage	Not functionally linked to any highly valued habitat, bordering woodland and shrubland located at lower levels. Largely fell within the Lantau North Country Park and Conservation Area zone.
Potential Value	Subject to practice of management and level of disturbance (e.g. hill fires).
Nursery/ Breeding Ground	Nil.
Age	Very young.
Abundance/ Richness of Wildlife	Low to moderate for birds and butterflies; low for the other fauna groups.
Overall Ecological Value	Low.

Table 1.20 *Ecological Evaluation of Watercourse within Study Area of Tai O*

Criteria	Watercourse
Naturalness	Upstream (freshwater section): generally natural. Middle and down stream (subject to tidal influence): subject to a certain degree of channelisation or bank reinforcement.
Size	Total area of this habitat is 8.1 ha, accounting for 2.3% of the total Study Area
Diversity	Low to moderate diversity of plants (27 species) given its small area. Low terrestrial fauna diversity, moderate for freshwater fauna (esp. for fishes).
Rarity	No flora or fauna species of conservation interest were found in this habitat.
Re-creatability	Moderate re-creatability, the characteristic of natural stream banks and stream bed can be recreated through the incorporation of ecologically friendly stream design.
Fragmentation	Not applicable.
Ecological Linkage	The upstream section linked to adjacent woodland; the middle and down stream sections not functionally linked to any highly valued habitat.
Potential Value	Upstream: moderate in general if provided with sufficient time to allow more aquatic species to establish and protection from disturbance; Middle and down stream: low ecological potential expect the estuary area.
Nursery/ Breeding Ground	Nil.
Age	Not applicable.
Abundance/ Richness of Wildlife	Moderate for freshwater assemblage, low for the other fauna groups.
Overall Ecological Value	Moderate for the freshwater upstream section Low to moderate for the middle and downstream.

Table 1.21 Ecological Evaluation of Agricultural Land within Study Area of Tai O

Criteria	Agricultural Land
Naturalness	Man-made habitat although the patch at Hang Mei was abandoned.
Size	Two patches of agricultural lands identified at Hang Mei in the east and adjacent to a large patch of marsh in the north, with an overall area of approximately 2.6 ha (0.9% of the total Study Area).
Diversity	Low to moderate diversity of plants (29 species) given its small area. Low fauna diversity.
Rarity	One plant species of conservation interest, Aubert's Blyxa <i>Blyxa aubertii</i> .
Re-creatability	Readily re-creatable.
Fragmentation	Isolated within the Study Area.
Ecological Linkage	In close proximity to marsh and woodland, but not functionally linked to any highly valued habitat.
Potential Value	Highly depending on the management practice of land owners, e.g. wet agricultural land often has higher ecological value due to the comparatively high diversity of fauna it supports.
Nursery/ Breeding Ground	Nil.
Age	Not applicable.
Abundance/ Richness of Wildlife	Low to moderate to odonates; low to all the other fauna groups.
Overall Ecological Value	Low

Table 1.22 Ecological Evaluation of Developed Area/Village within Study Area of Tai O

Criteria	Developed Area/Village
Naturalness	Man-made habitat dominated by ornamental trees and fruit trees.
Size	Including all built-up areas and wastelands with an overall area of approximately 48.7 ha (16.3% of the total Study Area).
Diversity	Moderate to high floral diversity (101 plant species recorded). Moderate faunal diversity.
Rarity	Bird species of conservation interest included Black Kite <i>Milvus migrans</i> and Greater Coucal <i>Centropus sinensis</i> .
Re-creatability	Readily re-creatable.
Fragmentation	Continuously present along both sides of Tai O Creek as well as the lowland area long coastline; some small and isolated areas of public facilities were located at hillsides.
Ecological Linkage	Not functionally linked to any highly valued habitat, but bordering nearly all of the other habitats within the Study Area. .
Potential Value	Low.
Nursery/ Breeding Ground	Nil.
Age	Not applicable.
Abundance/ Richness of Wildlife	Moderate to high for birds, moderate for butterflies, odonates and herpetofauna, low for mammals.
Overall Ecological Value	Low to moderate.

Table 1.23 Ecological Evaluation of Coastal Area within Study Area of Tai O

Criteria	Coastal Area
Naturalness	Rocky shore: largely natural. Sandy shore and boulder shore: receiving human influence. Seawall: artificial habitat.
Size	Total area of this habitat is about 3.9 ha (1.3% of the total Study Area).
Diversity	Low in plant species diversity (22 plant species recorded) and structural complexity. Low in fauna diversity.
Rarity	No flora or fauna species of conservation interest were found in this habitat.
Re-creatability	Difficult to be re-created except the seawalls.
Fragmentation	Located continuous along the north of Fan Kwai Tong Tsuen and the northern periphery of the Study Area.
Ecological Linkage	Not functionally linked to any highly valued habitat in close proximity. Rocky shore and boulder shore mainly bordering woodland and shrubland, while sandy shore and seawall mainly bordering developed area/village.
Potential Value	Low to moderate.
Nursery/Breeding Ground	Nil.
Age	Not applicable.
Abundance/Richness of Wildlife	Low for all fauna groups.
Overall Ecological Importance	Low to moderate

A list and evaluation of the species of ecological conservation interest recorded during ecological baseline surveys within the Study Area, according to the EIAO-TM, are given in Table 1.24. The locations of these species of conservation interest, whenever available, are presented in Figures 1.3a – 1.3e.

Table 1.24 Evaluation of Species of Conservation Interest recorded within Study Area of Tai O during Ecological Baseline Surveys










Species	Location and Activities (if any)	Protection Status	Distribution	Commonness in HK
Plant				
Wild Sensitive-plant <i>Chamaecrista leschenaultiana</i>	On the grassy bund of a small abandoned fish pond along the southern side of Tai O Road	-	Previously recorded in Ngong Ping.	Rare.
Aubert's Blyxa <i>Blyxa aubertii</i>	In a small pool associated with the northern active agricultural land.	-	Previously recorded in Tai O and Sai Keng.	Rare.

Species	Location and Activities (if any)	Protection Status	Distribution	Commonness in HK
Bird*				
Black Kite <i>Milvus migrans</i>	Perched at or flew over many habitats including grassland, plantation, shrubland, woodland, developed area, coastal area, marsh/reedbed and mangrove.	Appendix II of CITES; Class II Protected Animal of PRC; Protected under <i>Protection of Endangered Species of Animals and Plants Ordinance</i> (Cap. 586).	Found in a wide variety of coastal and inland habitats, including small islands, sea-coasts, intertidal mudflat, fish ponds, reservoirs, landfills and grassy hillsides at all altitudes; East Eurasia	Common and widespread. Resident and Winter Visitor.
Greater Coucal <i>Centropus sinensis</i>	Calling heard at several spots in marsh/reedbed, woodland and developed area/village.	Class II Protected Animal of PRC; Listed as 'Vulnerable' in <i>China Red Data Book</i> .	Resident throughout the Oriental region, apart from Taiwan, the Philippines and Sulawesi; Found in many types of habitats in Hong Kong.	Common and widespread resident in Hong Kong.
Lesser Coucal <i>Centropus bengalensis</i>	Calling heard in the woodland at Shek Tsai Po.	Class II Protected Animal in PRC; listed as 'Vulnerable' in <i>China Red Data Book</i> .	Oriental and lives in South China; favoring shrub- and tree-covered hillsides.	Common and Widely distributed in Hong Kong.
Collared Scops Owl <i>Otus bakkamoena</i>	Calling heard in the woodlands behind Wang Hang Village and Hang Mei Tsuen during the night survey	Class II Protected Animal of the PRC; protected under Cap 586 in Hong Kong; Listed in Appendix II of CITES	East and southeast Asia, resident in Southern and eastern China.	Common resident. Widely distributed in shrubland throughout Hong Kong.
Reptile				
Tokay Gecko <i>Gekko gekko</i>	Calling heard in the marsh near Leung Uk Tsuen and in woodland behind Wang Hang Village.	Appendix I of CITES; Class II Protected Animal in PRC; listed as 'Endangered' in <i>China Red Data Book</i> .	Rocky areas surrounded by thick bush or forest	Recorded in Tung Chung and Sham Wat on Lantau Island, Lion Rock Country Park
Chinese Water Snake <i>Enhydra chinensis</i>	Showed up above the water surface in the reedbed near Leung Uk Tsuen during night survey	Listed as 'Near Threatened' in <i>China Red Data Book</i> .	Freshwater or brackish wetlands	Recorded in central and northern New Territories.

* **Note:** All birds in Hong Kong are protected under the *Wild Animals Protection Ordinance* (Cap 170).

Legend

Project Information

-  Proposed Sewer
-  Proposed Rising Main
-  Existing Submarine Outfall (to be abandoned)
-  Proposed Submarine Sewage Outfall (tentative alignment)
-  Proposed Fan Kwai Tong SPS
-  Proposed Hang Mei SPS
-  Proposed Upgraded Tai O STW
-  Proposed Temporary Works Area
-  500m Study Area

Area of Conservation Interest

-  Tai O Butterfly Hotspot
-  Lantau North Country Park
-  Mangrove Planting Area (MRA)
-  Conservation Area (CA)
-  Coastal Protection Area (CPA)
-  Greenbelt

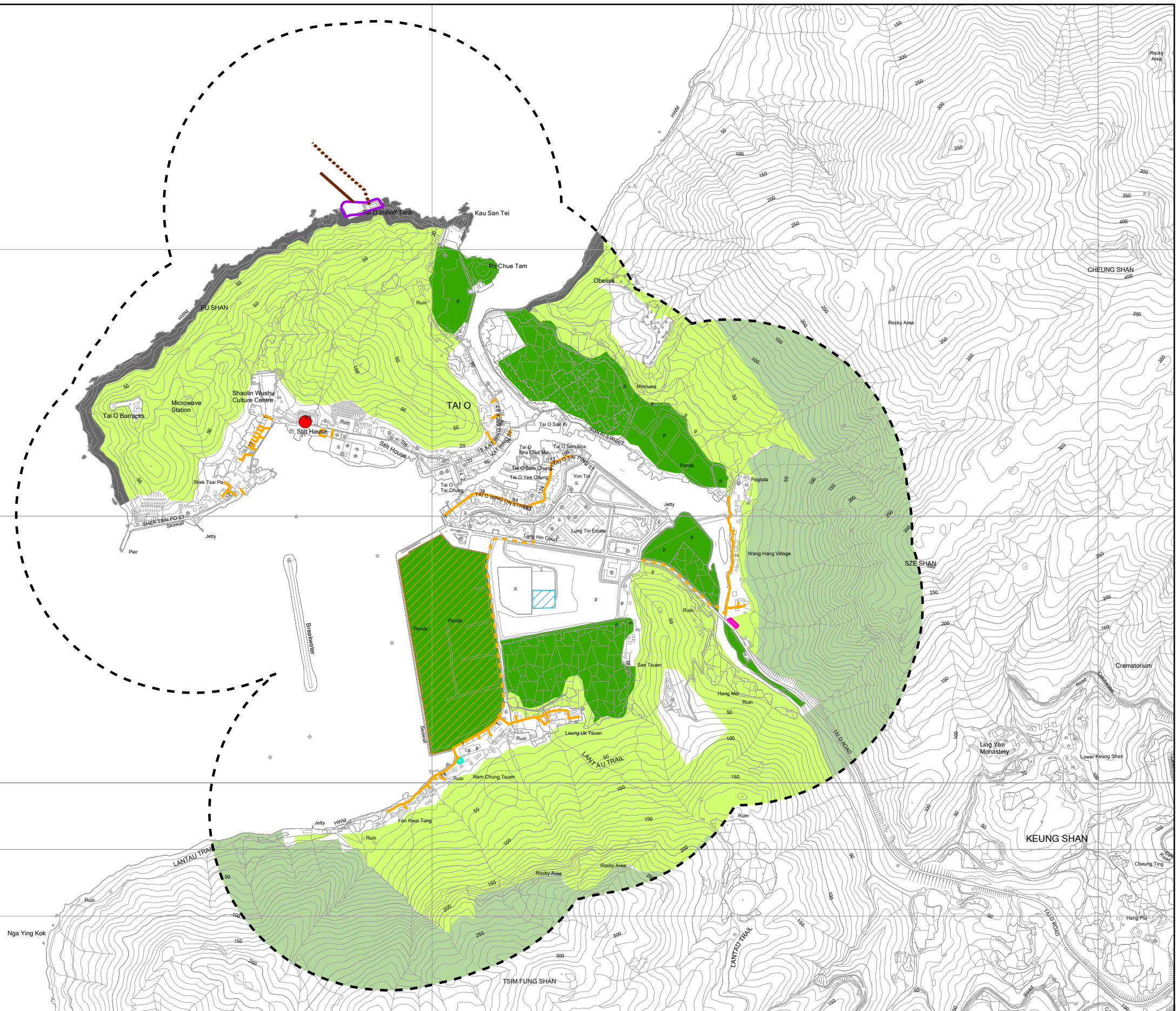


Figure 1.1

Study Area of Ecological Baseline Survey - Tai O

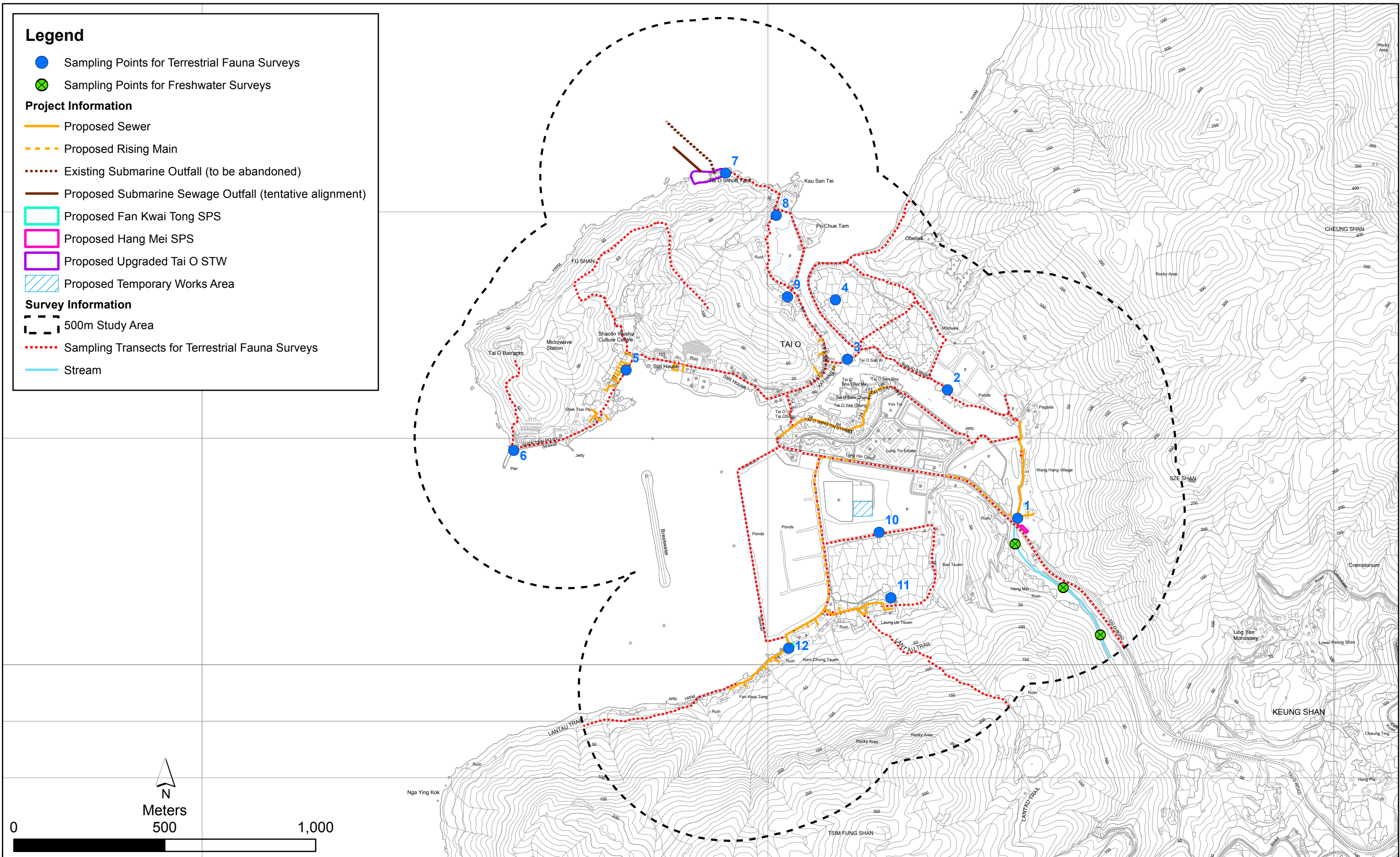


Figure 1.2

Locations of Study Area, Survey Transects and Sampling Points for Terrestrial and Freshwater Fauna Surveys - Tai O

Legend

Species of Conservation Interest

Plant

- Aubert's Blyxa
- Wild Sensitive-plant

Bird*

- ▲ Black-crowned Night Heron
- ▲ Cattle Egret
- ▲ Collared Scops Owl
- ▲ Great Egret
- ▲ Greater Coucal
- ▲ Grey Heron
- ▲ Grey-tailed Tattler
- ▲ Lesser Coucal
- ▲ Striated Heron
- ▲ White-throated Kingfisher
- ▲ Yellow Bitten

* Black Kite, Little Egret not presented due to its high occurrence in varying habitats.

Reptile

- ★ Checkered Keelback
- ★ Tokay Gecko

Bat

- Unidentified Bat

Butterfly

- + Small Cabbage White
- + Red Lacewing
- + Magpie Flat
- + Grass Demon
- + Danaid Egg-Fly

Project Information

- Proposed Sewer
- Proposed Rising Main
- - - Existing Submarine Outfall (to be abandoned)
- Proposed Submarine Sewage Outfall (tentative alignment)
- · - · - Sampling Transects for Terrestrial Fauna Surveys
- Proposed Fan Kwai Tong SPS
- Proposed Hang Mei SPS
- Proposed Upgraded Tai O STW
- Proposed Temporary Works Area
- 500m Study Area

Habitat Type

- Mangrove
- Marsh / Reedbed
- Mudflat
- Pond
- Woodland
- Plantation
- Shrubland
- Grassland
- Watercourse
- Agricultural Land
- Developed Area / Village
- Coastal Area

Figure 1.3b

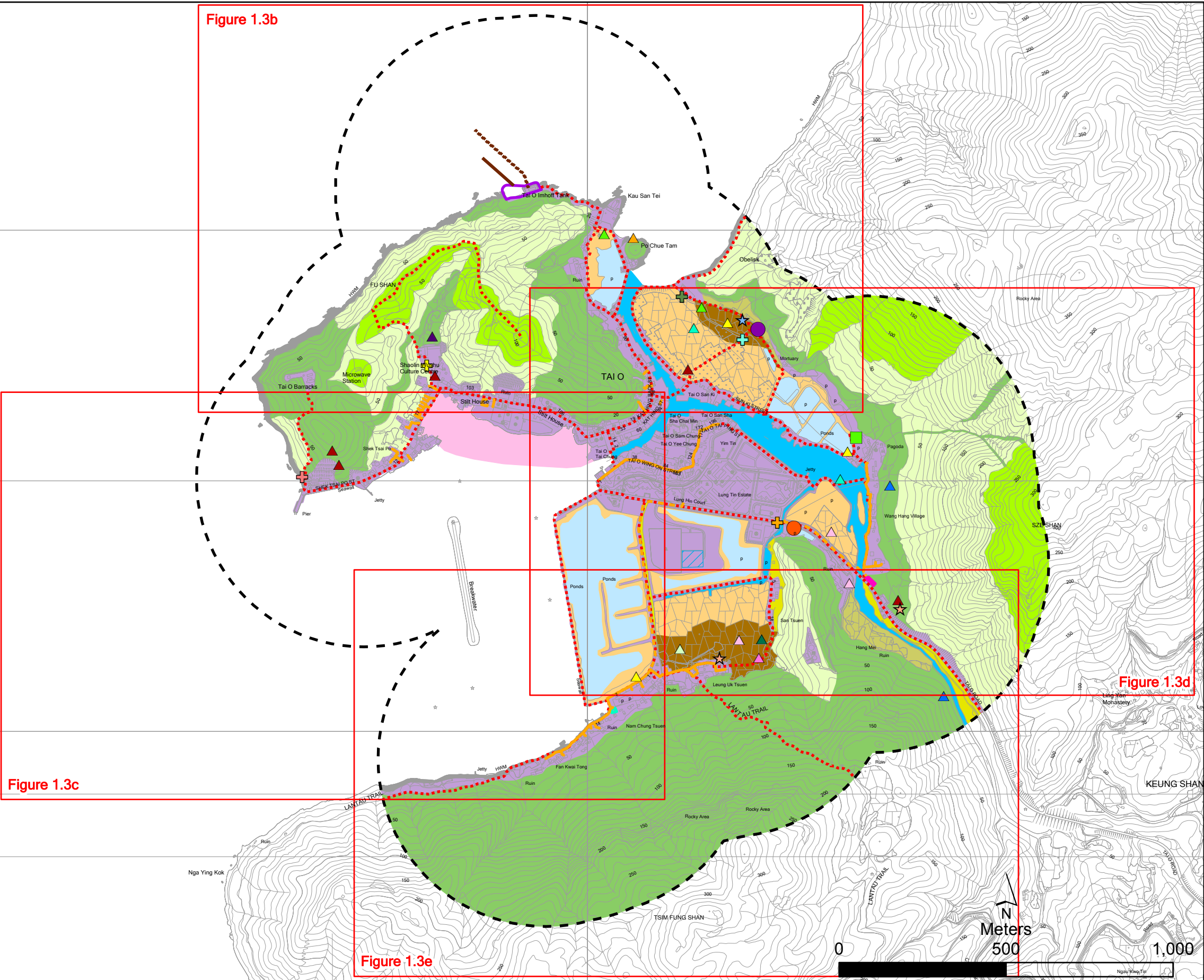


Figure 1.3c

Figure 1.3d

Figure 1.3e

Figure 1.3a

Habitat Map and Species of Conservation Interest - Tai O

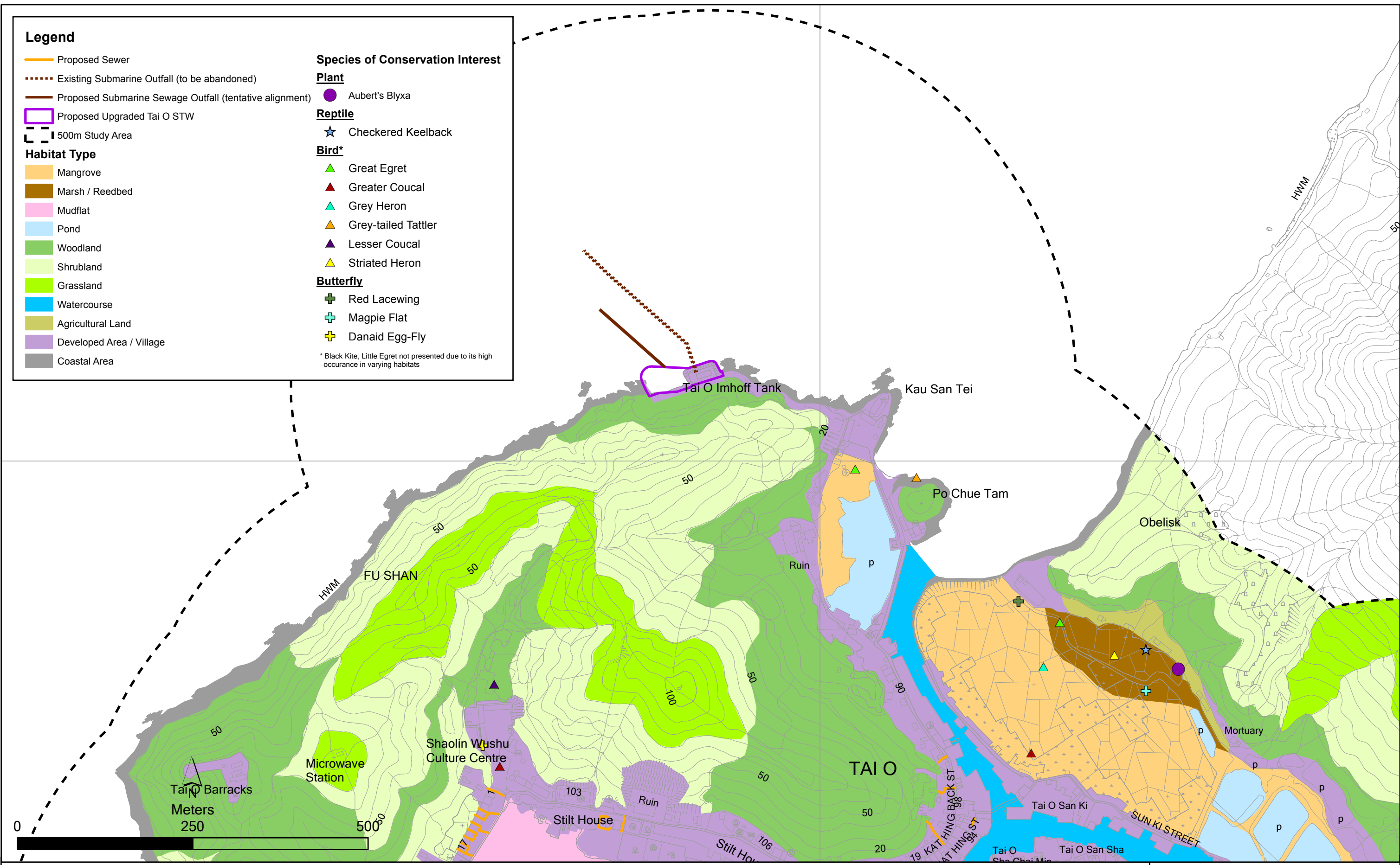


Figure 1.3b

Habitat Map and Species of Conservation Interest - Tai O



Figure 1.3c

Habitat Map and Species of Conservation Interest - Tai O

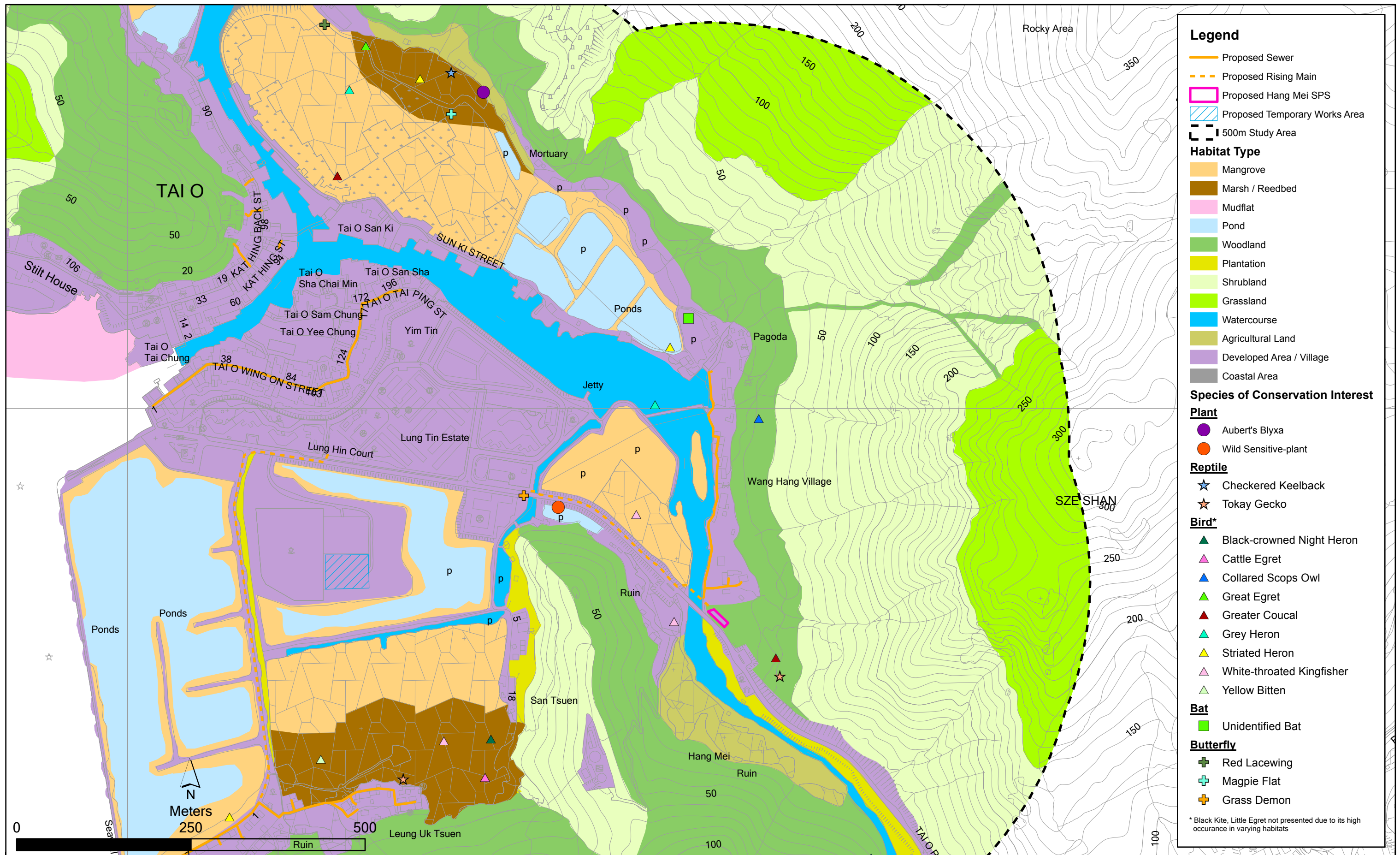


Figure 1.3d

Habitat Map and Species of Conservation Interest - Tai O

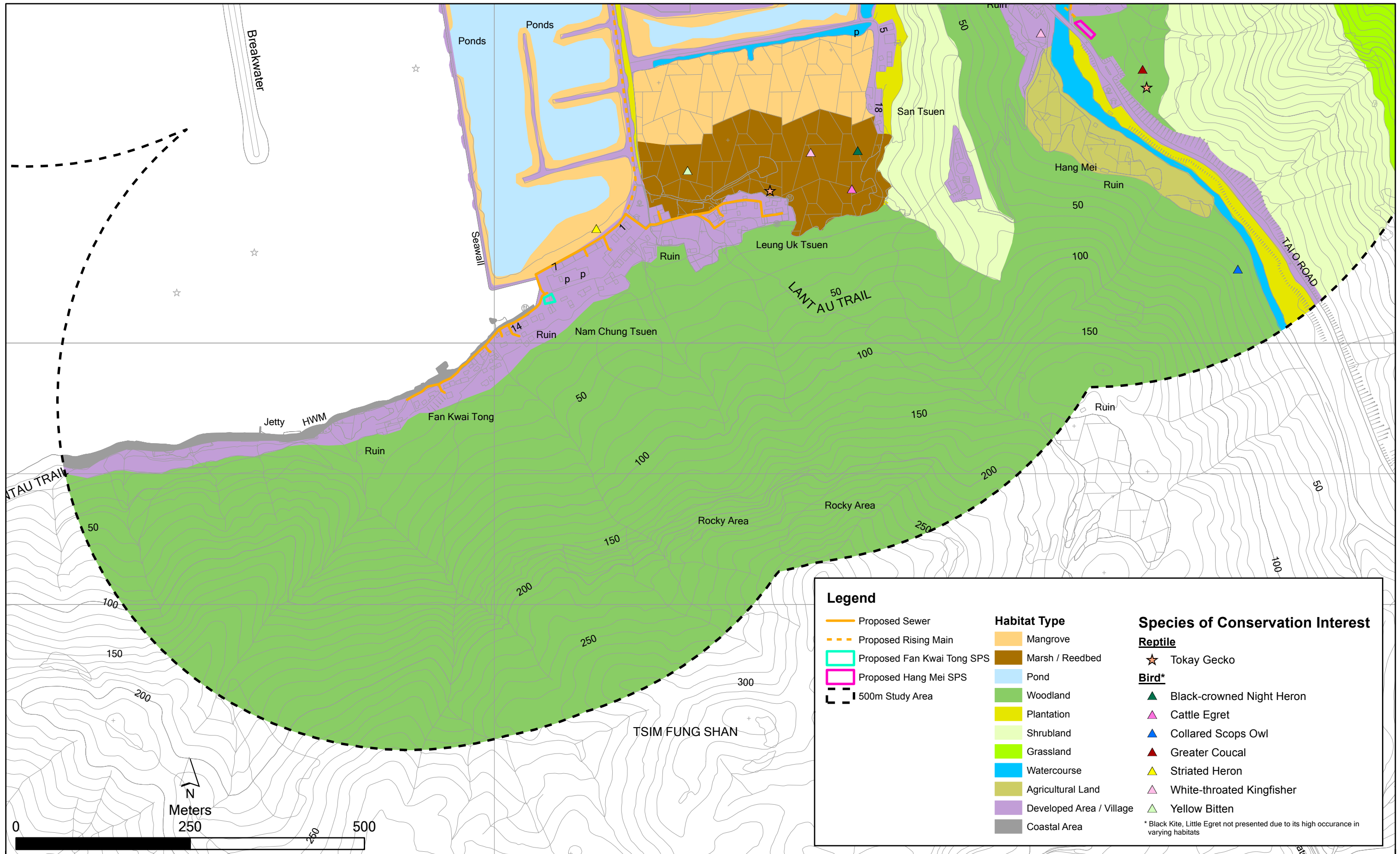


Figure 1.3e

Habitat Map and Species of Conservation Interest - Tai O



Mangrove



Marsh/Reedbed



Mudflat



Pond



Woodland



Plantation

Figure 1.4a

Photographic Records of Habitats Identified within the Study Area
– Tai O (1 of 3)

Date: 4/01/2012



Shrubland



Grassland



Watercourse
(Upstream)



Watercourse
(Tai O Creed)



Agricultural Land



Developed Area/Village

Figure 1.4b

Photographic Records of Habitats Identified within the Study Area
– Tai O (2 of 3)

Date: 4/01/2012



Coastal Area
(Sandy Shore)



Coastal Area
(Rocky Shore)



Coastal Area
(Boulder Shore)



Coastal Area
(Seawall)

Figure 1.4c

Photographic Records of Habitats Identified within the Study Area
– Tai O (3 of 3)

Date: 4/01/2012



Wild Sensitive-plant (*Chamaecrista leschenaultiana*)



Aubert's Blyxa (*Blyxa aubertii*)

Figure 1.5 Photographic Record of Species of Ecological Conservation Interest
– Tai O

FILE: 0133209
DATE: 12/01/2012

Environmental
Resources
Management



Annex A

Terrestrial Ecological Resources

Growth Form	Species Name	Origin	Status	MG	MA	MU	PO	WO	PL	SH	GR	ST	AL	DA	CA
Tree	<i>Clausena lansium</i>	E	C										1	1	
Tree	<i>Cleistocalyx operculatus</i>	N	C									1			
Tree	<i>Cratoxylum cochinchinense</i>	N	VC					1		1					
Tree	<i>Delonix regia</i>	E	P					1						2	
Tree	<i>Dimocarpus longan</i>	E	C					1	1				2	3	
Tree	<i>Diospyros kaki</i>	N	C											1	
Tree	<i>Eriobotrya japonica</i>	E	P										1		
Tree	<i>Eucalyptus robusta</i>	E	P						2						
Tree	<i>Excoecaria agallocha</i>	N	C	1											
Tree	<i>Ficus altissima</i>	E	P						3						
Tree	<i>Ficus hispida</i>	N	VC					1	3	2		3		2	
Tree	<i>Ficus hirta</i>	N	C					1				2	1		
Tree	<i>Ficus microcarpa</i>	N	C					1	1			2	1	1	1
Tree	<i>Ficus rumphii</i>	E	C		1										
Tree	<i>Ficus superba</i>	N	C		1									1	
Tree	<i>Ficus tinctoria subsp. Gibbosa</i>	N	RE											1	
Tree	<i>Ficus variegata var. chlorocarpa</i>	N	C					1							
Tree	<i>Hibiscus tiliaceus</i>	N	C	2	1		2		1					3	3
Tree	<i>Kandelia obovata</i>	N	VC	5	1	2	4					3			
Tree	<i>Ligustrum sinense</i>	N	C					2		2					
Tree	<i>Litchi chinensis</i>	E	C										1		
Tree	<i>Litsea glutinosa</i>	N	VC				1	2		1		2			
Tree	<i>Macaranga tanarius</i>	N	C						2			3		1	2
Tree	<i>Mallotus paniculatus</i>	N	VC					3	3	3		1	1	2	1
Tree	<i>Mangifera indica</i>	E	P										2	1	
Tree	<i>Manilkara zapota</i>	E	P											1	
Tree	<i>Melaleuca leucadendron</i>	E	P						3						
Tree	<i>Melia azedarach</i>	E	C		1									1	
Tree	<i>Michelia champaca</i>	E	P											1	
Tree	<i>Microcos nervosa</i>	N	C					2	2					1	
Tree	<i>Morus alba</i>	N	C											1	
Tree	<i>Murraya paniculata</i>	E	P						1						
Tree	<i>Musa acuminata cv. Cavendishii</i>	E	P											2	
Tree	<i>Pandanus tectorius</i>	N	VC	2	1		1	1		2		1			
Tree	<i>Phoenix hanceana</i>	N	C								1				

Growth Form	Species Name	Origin	Status	MG	MA	MU	PO	WO	PL	SH	GR	ST	AL	DA	CA
Tree	<i>Photinia benthamiana</i>	N	C												1
Tree	<i>Phyllanthus emblica</i>	N	VC					1			1				
Tree	<i>Pinus elliottii</i>	E	P					3							
Tree	<i>Plumeria rubra</i>	E	P											1	
Tree	<i>Podocarpus macrophyllus</i>	N	RE											1	
Tree	<i>Psidium guajava</i>	E	C						1				1	1	
Tree	<i>Rhus chinensis</i>	N	C					1		2	1				
Tree	<i>Rhus hypoleuca</i>	N	C								1				
Tree	<i>Rhus succedanea</i>	N	C							1					
Tree	<i>Sapium discolor</i>	N	VC					1	2	2		1		2	
Tree	<i>Sapium sebiferum</i>	N	C		1			1	2	2				2	
Tree	<i>Schefflera heptaphylla</i>	N	VC					2		1					
Tree	<i>Scolopia chinensis</i>	N	C	2			1								
Tree	<i>Sonneratia apetala</i>	E	C	1	1										
Tree	<i>Sterculia lanceolata</i>	N	VC					2	2						
Tree	<i>Syzygium jambos</i>	E	C											1	
Tree	<i>Tamarindus indica</i>	E	P											1	
Tree	<i>Terminalia catappa</i>	E	P											1	
Tree	<i>Tetradium glabrifolium</i>	N	C					1		1					
Tree	<i>Thuja orientalis</i>	E	P											2	
Tree	<i>Zanthoxylum avicennae</i>	N	C					1		1					
Shrub	<i>Acanthus ilicifolius</i>	N	C	2	2							1			
Shrub	<i>Aegiceras corniculatum</i>	N	C	2	1		1					1			
Shrub	<i>Alchornea trewioides</i>	N	C						1						
Shrub	<i>Avicennia marina</i>	N	C	3											
Shrub	<i>Boehmeria nivea</i>	E	C					1						1	2
Shrub	<i>Breynia fruticosa</i>	N	VC					1		2	1	1			
Shrub	<i>Bruguiera gymnorhiza</i>	N	RE	1											
Shrub	<i>Carmona microphylla</i>	E	P											1	
Shrub	<i>Capsicum annuum L. var. conoides</i>	E	P										1		
Shrub	<i>Catharanthus roseus</i>	E	C		1									3	
Shrub	<i>Chrysalidocarpus lutescens</i>	E	P											1	
Shrub	<i>Clerodendrum canescens</i>	N	RE							1					
Shrub	<i>Clerodendrum fortunatum</i>	N	C							1					
Shrub	<i>Clerodendrum inerme</i>	N	C	2	2		2					1			

Growth Form	Species Name	Origin	Status	MG	MA	MU	PO	WO	PL	SH	GR	ST	AL	DA	CA
Shrub	<i>Clerodendrum splendens</i>	E	C											1	
Shrub	<i>Cordyline fruticosa</i>	E	P											2	
Shrub	<i>Desmodium heterocarpon</i>	N	VC								2				
Shrub	<i>Desmos chinensis</i>	N	C					1		1					
Shrub	<i>Duranta erecta</i>	E	C						1					3	
Shrub	<i>Ficus hirta</i>	N	C											1	
Shrub	<i>Glochidion eriocarpum</i>	N	VC					1		1					2
Shrub	<i>Hibiscus rosa-sinensis</i>	E	P											1	
Shrub	<i>Indigofera suffruticosa</i>	E	RE											1	
Shrub	<i>Lagerstroemia indica</i>	E	P											2	
Shrub	<i>Lantana camara</i>	E	C		1			2	2	1	1		2	2	2
Shrub	<i>Leucaena leucocephala</i>	E	VC				1		1					2	1
Shrub	<i>Litsea rotundifolia var. oblongifolia</i>	N	VC					2		3					
Shrub	<i>Lycium chinense</i>	E	P										1		
Shrub	<i>Malvastrum coromandelianum</i>	E	C					1	2					1	
Shrub	<i>Michelia figo</i>	E	P											1	
Shrub	<i>Osmanthus fragrans</i>	E	P											2	
Shrub	<i>Paliurus ramosissimus</i>	N	C		1			1							
Shrub	<i>Pereskia aculeata</i>	E	P											1	
Shrub	<i>Phyllanthus cochinchinensis</i>	N	VC					1		2					
Shrub	<i>Phyllanthus reticulatus</i>	N	C				1								
Shrub	<i>Pluchea indica</i>	N	C	2			1								
Shrub	<i>Plumbago zeylanica</i>	N	RE				1							1	
Shrub	<i>Premna serratifolia</i>	N	C				1								
Shrub	<i>Psychotria asiatica</i>	N	VC					2		3					
Shrub	<i>Rhododendron pulchrum</i>	E	P											1	
Shrub	<i>Rosa chinensis</i>	E	P											1	
Shrub	<i>Rhapis excelsa</i>	N	C					1							
Shrub	<i>Rhodomyrtus tomentosa</i>	N	VC					1		1	2				
Shrub	<i>Sageretia thea</i>	N	VC	1					2						
Shrub	<i>Sauropus spatulifolius</i>	E	P							1				1	
Shrub	<i>Sida rhombifolia</i>	N	C						1						1
Shrub	<i>Solanum melongena</i>	E	P										1		
Shrub	<i>Solanum torvum</i>	E	C											1	
Shrub	<i>Tadehagi triquetrum</i>	N	VC								1				

Growth Form	Species Name	Origin	Status	MG	MA	MU	PO	WO	PL	SH	GR	ST	AL	DA	CA
Shrub	<i>Taxillus chinensis</i>	N	C					1							
Shrub	<i>Thevetia peruviana</i> cv. <i>Aurantiana</i>	E	P											2	
Shrub	<i>Triumfetta rhomboidea</i>	N	C					1		2	1				
Shrub	<i>Urena lobata</i>	N	C					1	2		1				
Shrub	<i>Vitex negundo</i> L. var. <i>cannabifolia</i>	N	VC	1					1						
Shrub	<i>Vitex rotundifolia</i>	N	C				2								
Shrub	<i>Wikstroemia indica</i>	N	C					1		1					
Herb	<i>L.</i>	N	VC											1	
Herb	<i>Achyranthes aspera</i>	N	C						2				1	1	
Herb	<i>Acrostichum aureum</i>	N	RE	3	4		1								
Herb	<i>Agave americana</i>	E	P											1	
Herb	<i>Ageratum conyzoides</i>	E	C					1		1	1	1			
Herb	<i>Ajuga nipponensis</i>	N	RE							1					
Herb	<i>Alocasia cucullata</i>	N	RE										1		
Herb	<i>Alocasia odora</i>	N	VC					1						1	
Herb	<i>Alpinia hainanensis</i>	N	VC					1		1		2			
Herb	<i>Alpinia zerumbet</i>	N	VC					1		1					
Herb	<i>Alpinia zerumbet</i> cv. <i>Variegata</i>	E	P						1						
Herb	<i>Apluda mutica</i>	N	VC				1		2		1				
Herb	<i>Artemisia indica</i>	N	C											1	
Herb	<i>Aster subulatus</i>	E	C											1	
Herb	<i>Belamcanda chinensis</i>	E	P											1	
Herb	<i>Beta vulgaris</i> L. var. <i>cicla</i> L.	E	P		1								1		
Herb	<i>Bidens alba</i>	E	VC					1	2		2		2	3	2
Herb	<i>Blechnum orientale</i>	N	VC					1		2	1				
Herb	<i>Blyxa aubertii</i>	N	RA										1		
Herb	<i>Brainea insignis</i>	N	RE								1				
Herb	<i>Chamaecrista leschenaultiana</i>	N	RA				1								
Herb	<i>Centella asiatica</i>	N	C					1		1					
Herb	<i>Centotheca lappacea</i>	N	C							1					
Herb	<i>Colocasia esculenta</i>	N	C		1								1		
Herb	<i>Conyza sumatrensis</i>	E	VC						2					1	
Herb	<i>Canna indica</i>	E	P										1		
Herb	<i>Curculigo orchiooides</i>	N	C								1				
Herb	<i>Cuscuta chinensis</i>	N	C							1					

Growth Form	Species Name	Origin	Status	MG	MA	MU	PO	WO	PL	SH	GR	ST	AL	DA	CA
Herb	<i>Cyathula prostrata</i>	N	C											2	
Herb	<i>Cyclosorus interruptus</i>	N	C		4										
Herb	<i>Dactyloctenium aegyptium</i>	N	C				1	1							
Herb	<i>Dicranopteris pedata</i>	N	VC					1			3				
Herb	<i>Digitaria sanguinalis</i>	N	C								3				
Herb	<i>Eleocharis</i> sp.	N	NA		2										
Herb	<i>Elephantopus tomentosus</i>	N	C						3		1				
Herb	<i>Emilia sonchifolia</i>	N	VC											1	
Herb	<i>Eragrostis tenella</i>	N	VC								1				
Herb	<i>Euphorbia hirta</i>	E	C											1	
Herb	<i>Gynura divaricata</i>	N	VC					1		1					
Herb	<i>Hedychium coronarium</i>	E	C		2										
Herb	<i>Helicteres angustifolia</i>	N	VC					1							
Herb	<i>Ipomoea aquatica</i>	E	P										1		
Herb	<i>Ipomoea batatas</i>	E	P										1		
Herb	<i>Ipomoea pes-caprae</i>	N	C				1								
Herb	<i>Panicum maximum</i>	E	VC					1	1	1	1	2			
Herb	<i>Kyllinga monocephala</i>	E	VC		1										
Herb	<i>Lemna minor</i>	N	C		1										
Herb	<i>Liriope spicata</i>	N	VC					1		2					
Herb	<i>Ludwigia adscendens</i>	N	C									4			
Herb	<i>Ludwigia octovalvis</i>	N	C		1										
Herb	<i>Melastoma candidum</i>	N	C								3	1			
Herb	<i>Mirabilis jalapa</i>	E	P											1	
Herb	<i>Miscanthus floridulus</i>	N	C		1			1			1				
Herb	<i>Miscanthus sinensis</i>	N	C								1	1			1
Herb	<i>Monochoria vaginalis</i>	N	RE		1										
Herb	<i>Oxalis corniculata</i>	N	VC						2					2	
Herb	<i>Oxalis corymbosa</i>	E	VC											2	
Herb	<i>Pandanus austrosinensis</i>	N	C							1					
Herb	<i>Panicum repens</i>	N	VC						2		1			1	
Herb	<i>Paraixeris denticulata</i>	N	C					1		1					
Herb	<i>Phragmites australis</i>	N	VC		4									1	
Herb	<i>Pilea microphylla</i>	E	C											1	
Herb	<i>Polygala glomerata</i>	N	C								1				

Growth Form	Species Name	Origin	Status	MG	MA	MU	PO	WO	PL	SH	GR	ST	AL	DA	CA
Herb	<i>Polygonum chinense</i>	N	VC					1		1					1
Herb	<i>Portulaca oleracea</i>	N	VC												1
Herb	<i>Pteris semipinnata</i>	N	VC					1							
Herb	<i>Pteris vittata</i>	N	VC					1		1					
Herb	<i>Rhynchelytrum repens</i>	E	VC					1			2	1			
Herb	<i>Sansevieria trifasciata</i>	E	P											1	
Herb	<i>Scutellaria indica</i>	N	C							1	1				
Herb	<i>Syngonium auritum</i>	E	C					1		1					
Herb	<i>Talinum paniculatum</i>	E	C											1	
Herb	<i>Torenia benthamiana</i>	N	RE					2		2					
Herb	<i>Tridax procumbens</i>	E	VC						1						
Herb	<i>Wedelia trilobata</i>	E	C		2		1	1	2	1				2	
Herb	<i>Wedelia biflora</i>	N	C		1										2
Climber	<i>Ampelopsis cantoniensis</i>	N	VC					2							
Climber	<i>Asparagus cochinchinensis</i>	N	C					1		1					
Climber	<i>Basella alba</i>	E	RE											1	
Climber	<i>Benincasa hispida</i>	E	P										1		
Climber	<i>Bougainvillea spectabilis</i>	E	P					1		1				2	
Climber	<i>Caesalpinia crista</i>	N	C												
Climber	<i>Caesalpinia vernalis</i>	N	C					1				2		1	
Climber	<i>Celastrus hindsii</i>	N	C					2							
Climber	<i>Cocculus orbiculatus</i>	N	C	2			1	1	1	1				1	
Climber	<i>Dalbergia benthamii</i>	N	C					1		1					
Climber	<i>Dalbergia candenatensis</i>	N	RE	1											
Climber	<i>Derris trifoliata</i>	N	C	2			1								
Climber	<i>Dioscorea bulbifera</i>	N	C											1	
Climber	<i>Eleutherococcus trifoliatus</i>	N	RE					1		1					
Climber	<i>Gnetum luofuense</i>	N	C					1							
Climber	<i>Graphistemma pictum</i>	N	C	3	1		2								
Climber	<i>Ipomoea cairica</i>	E	VC						1					2	
Climber	<i>Ipomoea obscura</i>	N	C				1								
Climber	<i>Lygodium japonicum</i>	N	C					1		2					1
Climber	<i>Mikania micrantha</i>	E	VC				1	1	3	1			1	1	1
Climber	<i>Mussaenda pubescens</i>	N	VC								1				
Climber	<i>Paederia scandens</i>	N	C					2	1	1				2	1

Growth Form	Species Name	Origin	Status	MG	MA	MU	PO	WO	PL	SH	GR	ST	AL	DA	CA
Climber	<i>Passiflora foetida</i>	E	C								1				1
Climber	<i>Pueraria lobata</i> var. <i>montana</i>	N	C							1					
Climber	<i>Ficus pumila</i>	N	VC					1					1		
Climber	<i>Rosa laevigata</i>	N	C									2			
Climber	<i>Tetracera asiatica</i>	N	VC					1		2					
Climber	<i>Thunbergia grandiflora</i>	E	C											1	
Climber	<i>Toxocarpus wightianus</i>	N	VC	2											
Climber	<i>Vitis balanseana</i>	N	RE					1							
Climber	<i>Zanthoxylum nitidum</i>	N	VC		1			1		2					
Climber	<i>Zehmeria indica</i>	N	C					1			1				
Bamboo	<i>Bambusa vulgaris</i>	E	C									2			
Bamboo	<i>Bamboosa</i> sp.	E	NA					1		1				2	
Total no. of species recorded				20	31	1	25	86	47	62	32	27	29	101	22

Remarks:

The habit of the plants, name of species and the origin follow The Checklist of Hong Kong Plants 2004 (AFCD).

The status of species makes references to Xing et al. (2000), Wu and Lee (2000), Siu (2000) and Yip et al. (2010).

Species of conservation interest is highlighted in bold.

Annex A2 Mammal Species Recorded within the Study Area - Tai O

Common Name	Scientific Name	Chinese Name	Statutory Protection in Hong Kong	Status	Habitat
Bat	Unidentified	蝙蝠	Listed in Wild Animals Protection Ordinance (Cap. 170)	-	Developed Area/Village

Common name	Species names	Chinese name	Commonness ⁽¹⁾	Status in Hong Kong ⁽²⁾	Statutory Protection in Hong Kong ⁽³⁾	IUCN Red List ⁽⁴⁾	China Red Data Book Status	PRC List	Fellowes <i>et al.</i> , (2002)	CITES	Habitats ⁽⁵⁾
Black Kite#	<i>Milvus migrans</i>	黑鷹	Common	W, R	Listed in Protection of Endangered Species of Animals and Plants Ordinance (Cap. 586)	LC		Class II Protected Animal of PRC	Regional Concern	Appendix II	PL, SH, MA, WO, GR, DA, CA, MG
Little Egret#	<i>Egretta garzetta</i>	小白鷺	Common	P		LC			Regional Concern		PL, MA, MU, PO, ST, DA, CA, MG
Great Egret#	<i>Ardea modesta</i>	大白鷺	Common	P		LC			Regional Concern		MA, MG
Cattle Egret#	<i>Bubulcus coromandus</i>	牛背鷺	Common	P		LC			Local Concern		MA
Grey Heron#	<i>Ardea cinerea</i>	蒼鷺	Common	W		LC			Potential Regional Concern		ST, MG
Striated Heron#	<i>Butorides striatus</i>	綠鷺	Uncommon	Su		LC			Local Concern		MA, PO, MG
Black-crowned Night Heron#	<i>Nycticorax nycticorax</i>	夜鷺	Common	P		LC			Local Concern		MA
Yellow Bittern#	<i>Ixobrychus sinensis</i>	黃斑葦鶉	Uncommon	M, Su		LC			Local Concern		MA
Grey-tailed Tattler#	<i>Tringa brevipes</i>	灰尾鶉	Common	M		NT			Local Concern		CA
Common Sandpiper#	<i>Actitis hypoleucos</i>	環鶉	Common	M, W		LC					MU
White-breasted Waterhen#	<i>Amaurornis phoenicurus</i>	白胸苦惡鳥	Common	R		LC					MA, MG
Spotted Dove	<i>Streptopelia chinensis</i>	珠頸斑鳩	Abundant	R		LC					PL, SH, MA, MU, WO, DA, CA, MG, AL
Indian Cuckoo	<i>Cuculus micropterus</i>	四聲杜鵑	Uncommon	Su		LC					WO
Plantive Cuckoo	<i>Cacomantis merulinus</i>	八聲杜鵑	Uncommon	Su		LC					WO
Greater Coucal	<i>Centropus sinensis</i>	褐翅鴉鵂	Common	R		LC	Vulnerable	Class II Protected Animal of PRC			MA, WO, DA
Lesser Coucal	<i>Centropus bengalensis</i>	小鴉鵂	Common	R		LC	Vulnerable	Class II Protected Animal of PRC			WO
Collared Scops Owl	<i>Otus bakkamoena</i>	領角鴞	Common	R	Listed in Protection of Endangered Species of Animals and Plants Ordinance (Cap. 586)	LC		Class II Protected Animal of PRC		Appendix II	WO
Common Koel	<i>Eudynamis scolopacea</i>	噪鶇	Common	Su, R		LC					MA, WO
House Swift	<i>Apus nipalensis</i>	小白腰雨燕	Abundant	R, SpM		LC					SH, DA, MG
Barn Swallow	<i>Hirundo rustica</i>	家燕	Abundant	SpM, Su		LC					SH, MA, PO, GR, DA, CA, MG
White-throated Kingfisher#	<i>Halcyon smyrnensis</i>	白胸翡翠	Common	AM, P		LC			Local Concern		MA, DA, MG
Common Kingfisher#	<i>Alcedo atthis</i>	普通翠鳥	Common	AM, P		LC					PO
Light-vented Bulbul	<i>Pycnonotus sinensis</i>	白頸鶇	Abundant	R		LC					SH, MA, ST, WO, GR, DA, MG
Red-whiskered Bulbul	<i>Pycnonotus jocosus</i>	紅耳鶇	Abundant	R		LC					PL, ST, WO, GR, DA
Chestnut Bulbul	<i>Hemixos castanonotus</i>	栗背短腳鶇	Common	R, W		LC					WO, DA
White Wagtail	<i>Motacilla alba</i>	白鶇鶇	Common	W, R		LC					SH
Grey Wagtail	<i>Motacilla cinerea</i>	灰鶇鶇	Common	W		LC					ST
Masked Laughing Thrush	<i>Garrulax perspicillatus</i>	黑臉噪鶇	Abundant	R		LC					MA, WO, MG
Japanese White-eye	<i>Zosterops japonicus</i>	暗綠繡眼鳥	Abundant	R		LC					PL, SH, MA, WO, GR, DA, MG, AL
Fork-tailed Sunbird	<i>Aethopyga christinae</i>	叉尾太陽鳥	Common	R		LC					DA
Yellow-bellied Prinia	<i>Prinia flaviventris</i>	黃腹山鷓鴣	Common	R		LC					SH, MA, GR, MG
Long-tailed Tailorbird	<i>Orthotomus sutorius</i>	長尾縫葉鶇	Common	R		LC					ST, WO
Pale-legged Leaf Warbler	<i>Phylloscopus tenellipes</i>	淡腳柳鶇	Uncommon	AM		LC					WO
Great Tit	<i>Parus major</i>	大山雀	Common	R		LC					SH, WO, DA, CA
Oriental Magpie Robin	<i>Copsychus saularis</i>	鶇鶇	Abundant	R		LC					PL, MA, PO, ST, WO, GR, DA, MG, AL
Long-tailed Shrike	<i>Lanius schach</i>	棕背伯勞	Common	R		LC					SH, MA
Large-billed Crow	<i>Corvus macrorhynchos</i>	大嘴烏鶇	Common	R		LC					MA, WO, DA, MG
Blue Magpie	<i>Urocissa erythrorhynchos</i>	紅嘴藍鶇	Common	R		LC					SH, WO
Common Magpie	<i>Pica pica</i>	喜鶇	Common	R		LC					WO, DA

Annex A3 *Bird Species Recorded within the Study Area - Tai O (Species of conservation interest is in bold.)*

Common name	Species names	Chinese name	Commonness ⁽¹⁾	Status in Hong Kong ⁽²⁾	Statutory Protection in Hong Kong ⁽³⁾	IUCN Red List ⁽⁴⁾	China Red Data Book Status	PRC List	Fellowes <i>et al.</i> , (2002)	CITES	Habitats ⁽⁵⁾
Black Drongo	<i>Dicrurus macrocercus</i>	黑卷尾	Common	M, Su		LC					SH, MA, WO, GR, DA, MG
Hair-crested Drongo	<i>Dicrurus hottentottus</i>	鬃冠卷尾	Common	M, Su, W		LC					WO
Eurasian Tree Sparrow	<i>Passer montanus</i>	樹麻雀	Abundant	R		LC					MA, DA, CA, MG
White-rumped Munia	<i>Lonchura striata</i>	白腰文鳥	Common	R		LC					DA
Scally-breasted Munia	<i>Lonchura punctulata</i>	斑文鳥	Common	R		LC					GR, DA
Crested Myna	<i>Acridotheres cristatellus</i>	八哥	Common	R		LC					MA, GR, DA, MG
Black-collared Starling	<i>Sturnus nigricollis</i>	黑領椋鳥	Common	R		LC					MA, DA, MG

Notes:

⁽¹⁾ **Commonness as per AFCD database:** Available at <http://www.afcd.gov.hk/english/conservation/hkbiodiversity/database/search.asp?lang=en>.

⁽²⁾ Status according to Viney et al. The Birds of Hong Kong and South China (2005) (8th Edition):

R=resident; W=winter visitor; S=summer visitor; M=migrant; A=autumn; Sp=spring; P=present all year, exact composition unknown.

⁽³⁾ All wild birds are Protected under Wild Animal Protection Ordinance (Cap. 170).

⁽⁴⁾ **IUCN Conservation Status Category:**

Critically Endangered: CR; Endangered: EN; Vulnerable: VU; Near Threatened: NT; Least Concern: LC; Data Deficient: DD; Not Assessed: NA

⁽⁵⁾ **Habitat:** WO = Woodland, SH = Shrubland, GR = Grassland mosaic, PL = Plantation, AL = Agricultural Land, DA = Developed Area/Village, CA = Coastal Area, MA = Marsh/Reed Bed, PO = Pond, MG = Mangrove, MU = Mudflat and ST = Stream.

This symbol indicates the bird is a wetland-dependent bird species.

Annex A4 Herpetofauna Species Recorded within the Study Area - Tai O (Species of conservation interest is in bold.)

Common Name	Scientific Name	Chinese Name	IUCN Red List ⁽¹⁾	China Red Data Book Status ⁽²⁾	PRC List	Fellowes <i>et al.</i> , (2002)	CITES	Distribution in Hong Kong ⁽³⁾	Habitats ⁽⁴⁾
Amphibian									
Gunther's Frog	<i>Rana guentheri</i>	沼蛙	LC					Widely distributed throughout Hong Kong.	MA, DA, MG
Brown Tree Frog	<i>Polypedates megacephalus</i>	斑腿泛樹蛙	LC					Widely distributed in Hong Kong.	MA, WO, DA
Asian Painted Frog	<i>Kaloula pulchra pulchra</i>	花狹口蛙	LC					Widely distributed in Hong Kong.	DA
Paddy Frog	<i>Rana limnocharis</i>	澤蛙	LC					Widely distributed in Hong Kong.	MA, DA
Reptile									
Long-tailed Skink	<i>Mabuya longicaudata</i>	長尾南蜥	NA					Widely distributed throughout Hong Kong.	DA
Changeable Lizard	<i>Calotes versicolor</i>	變色樹蜥	NA					Widely distributed throughout Hong Kong.	DA
Four-clawed Gecko	<i>Gehyra mutilata</i>	截趾虎	NA					Widely but thinly distributed throughout Hong Kong.	DA
Chinese Gecko	<i>Gekko chinensis</i>	壁虎	LC					Widely distributed throughout Hong Kong.	DA
Bowring's Gecko	<i>Hemidactylus bowringii</i>	原尾蜥虎	NA					Distributed throughout Hong Kong.	DA
Tokay Gecko	<i>Gekko gekko</i>	大壁虎	NA	EN	Class II Protected Animal of PRC	Regional Concern		Distributed in rocky areas in Tung Chung and Sham Wat on Lantau Island, Lion Rock Country Park. Population on Hong Kong Island are considered as escaped from snake shops.	MA, WO
Checkered Keelback	<i>Xenochrophis piscator</i>	漁游蛇	LC				Appendix III	Widely distributed in streams in the New Territories and Lantau Island.	MA
Chinese Water Snake	<i>Enhydryis chinensis</i>	中國水蛇	LC	LC				Distributed in freshwater or brackish wetlands in central and northern New Territories.	MA
Notes:									
⁽¹⁾ IUCN Conservation Status Category: Critically Endangered: CR; Endangered: EN; Vulnerable: VU; Near Threatened: NT; Least Concern: LC; Data Deficient: DD; Not Assessed: NA									
⁽²⁾ China Red Data Book Status: Endangered: EN; Least Concern: LC									
⁽³⁾ Distribution in Hong Kong as per AFCD database: Available at http://www.afcd.gov.hk/english/conservation/hkbiodiversity/database/search.asp?lang=en .									
⁽⁴⁾ Habitat: WO = Woodland, SH = Shrubland, GR = Grassland mosaic, PL = Plantation, AL = Agricultural Land, MA = Marsh/Reed Bed, DA = Developed Area/Village, CA = Coastal Area, PO = Pond, MG = Mangrove, MU = Mudflat and ST = Stream.									

Annex A5 *Butterfly Species Recorded within the Study Area - Tai O (Species of conservation interest is in bold.)*

Common Name	Scientific Name	Chinese name	Commonness ⁽¹⁾	Fellowes <i>et al.</i> , (2002)	Habitat ⁽²⁾
Hesperiidae					
Grass Demon	<i>Udaspes folus</i>	薑弄蝶	Rare		DA
Magpie Flat	<i>Abraximorpha davidii</i>	白弄蝶	Rare		MA
Chestnut Angle		角翅弄蝶	Common		WO, CA
Contiguous Swift	<i>Polytremis lubricans</i>	黃紋孔弄蝶	Common		WO, GR, DA
Bush Hopper	<i>Ampittia dioscorides</i>	黃斑弄蝶	Uncommon		WO
Lycaenidae					
Lesser Grass Blue	<i>Zizina otis</i>	毛眼灰蝶	Common		DA
Plains Cupid	<i>Chilades pandava</i>	曲紋紫灰蝶	Uncommon		CA
Transparent Six-line Blue	<i>Nacaduba kurava</i>	古樓娜灰蝶	Common		DA
Dark Cerulean	<i>Jamides bochus</i>	雅灰蝶	Common		DA
Gram Blue Cupid	<i>Euchrysops cnejus</i>	棕灰蝶	Uncommon		AL
Common Hedge Blue	<i>Acytolepis puspa</i>	鈕灰蝶	Common		SH, WO
Pale Grass Blue	<i>Zizeeria maha</i>	酢醬灰蝶	Very common		PL, DA, CA
Papilionidae					
Chinese Peacock	<i>Papilio bianor</i>	碧鳳蝶	Common		DA
Great Mormon	<i>Papilio memnon</i>	美鳳蝶	Very common		WO, DA, MG
Spangle	<i>Papilio protenor</i>	藍鳳蝶	Very common		DA
Common Mine	<i>Chilasa clytia</i>	斑鳳蝶	Common		SH, MA, CA
Paris Peacock	<i>Papilio paris</i>	巴黎翠鳳蝶	Very common		SH, WO, DA, MG
Red Helen	<i>Papilio helenus</i>	玉斑鳳蝶	Very common		WO, MG
Common Mormon	<i>Papilio polytes</i>	玉帶鳳蝶	Very common		PL, SH, ST, MA, WO, DA, MG
Common Bluebottle	<i>Graphium sarpedon</i>	青鳳蝶	Very common		SH, PO, WO, DA, CA, MG
Tailed Jay	<i>Graphium agamemnon</i>	統師青鳳蝶	Common		DA
Common Jay	<i>Graphium doson</i>	木蘭青鳳蝶	Common		WO
Lime Butterfly	<i>Papilio demoleus</i>	達摩鳳蝶	Common		SH, DA
Pieridae					
Indian Cabbage White	<i>Pieris canidia</i>	東方菜粉蝶	Very common		DA, CA
Small Cabbage White	<i>Pieris rapae</i>	菜粉蝶	Rare		CA
Common Gull	<i>Cepora nerissa</i>	黑脈園粉蝶	Common		WO, MG
Great Orange Tip	<i>Hebomoia glaucippe</i>	鶴頂粉蝶	Common		MA, CA
Red-base Jezebel	<i>Delias pasithoe</i>	報喜斑粉蝶	Very common		MA

Annex A5 *Butterfly Species Recorded within the Study Area - Tai O (Species of conservation interest is in bold.)*

Common Name	Scientific Name	Chinese name	Commonness ⁽¹⁾	Fellowes <i>et al.</i> , (2002)	Habitat ⁽²⁾
Common Grass Yellow	<i>Eurema hecabe</i>	寬邊黃粉蝶	Very common		ST, WO, GR, MG
Three-spot Grass Yellow	<i>Eurema blanda</i>	擘黃粉蝶	Common		WO
Lemon Emigrant	<i>Catopsilia pomona</i>	遷粉蝶	Common		SH, WO, GR, DA, CA, MG
Mottled Emigrant	<i>Catopsilia pyranthe</i>	梨花遷粉蝶	Very Common		DA
Nymphalidae					
Black Prince	<i>Rohana parisatis</i>	羅蛺蝶	Common		PL
Angled Castor	<i>Ariadne ariadne</i>	波蛺蝶	Common		MG
Blue Admiral	<i>Kaniska canace</i>	琉璃蛺蝶	Common		SH
Red Lacewing	<i>Cethosia biblis</i>	紅鋸蛺蝶	Uncommon		MA
Danaid Egg-fly	<i>Hypolimnas misippus</i>	金斑蛺蝶	Uncommon	Local Concern	DA
Common Sailer	<i>Neptis hylas</i>	中環蛺蝶	Very common		SH, WO, GR, DA
Short-banded Sailer	<i>Phaedyma columella</i>	柱菲蛺蝶	Common		WO
Rustic	<i>Cupha erymanthis</i>	黃襟蛺蝶	Very common		SH, MA, WO
Colour Sergeant	<i>Athyma nefte</i>	相思帶蛺蝶	Common		DA
Tawny Rajah	<i>Charaxes bernardus</i>	白帶螯蛺蝶	Common		WO
Common Nawab	<i>Polyura athamas</i>	窄斑尾鳳蛺蝶	Uncommon		WO
Common Mapwing	<i>Cyrestis thyodamas</i>	網絲蛺蝶	Common		WO, DA
Red Ring Skirt	<i>Hestina assimilis</i>	黑脈蛺蝶	Common		WO, DA
Lemon Pansy	<i>Junonia leonias</i>	蛇眼蛺蝶	Common		PL
White-edge Blue Baron	<i>Euthalia phemius</i>	尖翅翠蛺蝶	Common		MA, WO, DA
Common Tiger	<i>Danaus genutia</i>	虎斑蝶	Common		GR
Riodinidae					
Plum Judy	<i>Abisara echerius</i>	蛇目褐蛺蝶	Very common		SH, MA, WO, GR, MG, AL
Satyridae					
Dark-band Bush Brown	<i>Mycalesis mineus</i>	小眉眼蝶	Very common		WO, GR
South China Bush Brown	<i>Mycalesis zonata</i>	平頂眉眼蝶	Common		WO
Common Palmfly	<i>Elymnias hypermnestra</i>	翠袖鋸眼蝶	Common		MA, WO, DA
Bamboo Tree Brown	<i>Lethe europa</i>	長紋黛眼蝶	Uncommon		WO
Amathusiidae					
Large Faun	<i>Faunis eumeus</i>	串珠環蝶	Common		WO

Notes:

⁽¹⁾ **Commonness as per AFCD database:** Available at <http://www.afcd.gov.hk/english/conservation/hkbiodiversity/database/search.asp?lang=en>.

⁽²⁾ **Habitat:** WO = Woodland, SH = Shrubland, GR = Grassland mosaic, PL = Plantation, AL = Agricultural Land, MA = Marsh/Reed Bed, DA = Developed Area/Village, CA = Coastal Area, PO = Pond, MG = Mangrove, MU = Mudflat and ST = Stream.

Annex A6 Dragonfly and Damselfly Species Recorded within the Study Area - Tai O

Common Name	Scientific Name	Chinese Name	Family	Distribution in Hong Kong ⁽¹⁾	IUCN Red List ⁽²⁾	Fellowes <i>et al.</i> , (2002)	Habitat ⁽³⁾
Blue Percher	<i>Diplacodes trivialis</i>	紋藍小蜻	Libellulidae	Abundant	LC	-	MA, DA, AL
Crimson Dropwing	<i>Trithemis aurora</i>	曉褐蜻	Libellulidae	Abundant	LC	-	ST, GR
Indigo Dropwing	<i>Trithemis festiva</i>	慶褐蜻	Libellulidae	Abundant	LC	-	DA
Pied Percher	<i>Neurothemis tullia tullia</i>	截斑脈蜻	Libellulidae	Common	LC	-	MA
Marsh Skimmer	<i>Orthetrum luzonicum</i>	呂宋灰蜻	Libellulidae	Abundant	LC	-	PO, MA
Common Blue Skimmer	<i>Orthetrum glaucum</i>	黑尾灰蜻	Libellulidae	Abundant	LC	-	DA, CA
Common Red Skimmer	<i>Orthetrum pruinatum neglectum</i>	赤褐灰蜻	Libellulidae	Abundant	LC	-	DA
Red-faced Skimmer	<i>Orthetrum chrysis</i>	華麗灰蜻	Libellulidae	Abundant	LC	-	MA, DA, AL
Crimson Darter	<i>Crocothemis servilia servilia</i>	紅蜻	Libellulidae	Abundant	LC	-	MA, AL
Saddlebag Glider	<i>Tramea virginia</i>	華斜痣蜻	Libellulidae	Abundant	LC	-	WO
Amber-winged Glider	<i>Hydrobasileus croceus</i>	臀斑楔翅蜻	Libellulidae	Common	LC	-	WO
Wandering Glider	<i>Pantala flavescens</i>	黃蜻	Libellulidae	Abundant	LC	-	SH, MA, WO, GR, DA, CA, MG, AL
Dingy Dusk-darter	<i>Zyxomma petiolatum</i>	細腹綠眼蜻	Libellulidae	Common	LC	-	AL
Orange-tailed Sprite	<i>Ceriatagrion auranticum</i>	琉球橘黃蟳	Coenagrionidae	Abundant	LC	-	PO, DA
Common Blue-tail	<i>Ischnura senegalensis</i>	褐斑異痣蟳	Coenagrionidae	Abundant	LC	-	WO, MG
Marsh Dancer	<i>Onychargia atrocyana</i>	毛面同痣蟳	Coenagrionidae	Common	LC	-	MG
Blue Sprite	<i>Pseudagrion microcephalum</i>	綠斑蟳	Coenagrionidae	Common	LC	LC	MA, PO, ST, MG
Orange-faced Sprite	<i>Pseudagrion rubriceps</i>	丹頂斑蟳	Coenagrionidae	Common	LC	-	MA

Notes:

⁽¹⁾ **Distribution as per AFCD database:** Available at <http://www.afcd.gov.hk/english/conservation/hk biodiversity/database/search.asp?lang=en>.

⁽²⁾ **IUCN Conservation Status Category:**

Critically Endangered: CR; Endangered: EN; Vulnerable: VU; Near Threatened: NT; Least Concern: LC; Data Deficient: DD; Not Assessed: NA

⁽³⁾ **Habitat:** WO = Woodland, SH = Shrubland, GR = Grassland mosaic, PL = Plantation, AL = Agricultural Land, MA = Marsh/Reed Bed, DA = Developed Area/Village, CA = Coastal Area, PO = Pond, MG = Mangrove, MU = Mudflat and ST = Stream.

Annex A7

Freshwater Fauna Recorded within the Study Area - Tai O

Taxa	Species / Family Name	Common Name	Relative Abundance ¹
Shrimps			
	<i>Caridina cantonensis</i>		++
	<i>Macrobrachium hainanense</i>		+
Insects			
Heteroptera	<i>Metrocoris</i> sp. (Gerrinae)		+
Diptera (True flies)	Tipulidae	Craneflies	+
Odonata (Damselflies & Dragonflies)	<i>Zygonyx iris</i> (Libellulidae)		+
	<i>Proctoticta taipokauensis</i> (Platystictidae)		+
	Other spp. in Platycnemididae		+
	<i>Euphaea decorata</i>		+
Ephemeroptera (Mayflies)	<i>Procloeon</i> sp. (Baetidae)		++++
	<i>Isca purpurea</i> (Leptophlebiidae)		++
	<i>Choroterpes</i> sp. (Leptophlebiidae)		+
	<i>Caenodes</i> sp. (Caenidae)		++
Trichoptera (Caddisflies)	Heptageniidae		+
	Philopotamidae		++
	Xiphocentronidae		+
Plecoptera (Stoneflies)	Perlidae		+
Coleoptera (Beetles)	Scirtidae		+
Fishes			
	<i>Eleotris oxycephala</i> (Eleotridae)	Sharphead Sleeper	+
	<i>Xiphophorus variatus</i> (Poeciliidae)	Variable Platyfish	++
	<i>Xiphophorus hellerii</i> (Poeciliidae)	Swordtail	+
	<i>Glossogobius giuris</i> (Gobiidae)	Fork Tongue Goby	+
	<i>Rhinogobius duospilus</i> (Gobiidae)		+
	<i>Hemichromis stellifer</i> (Cichlidae)	Jewelfish	++
	<i>Puntius semifasciolatus</i> (Cyprinidae)	Chinese Barb	+
	<i>Nicholsicypris normalis</i> (Cyprinidae)		+

Note: 1. Relative abundance: +=Rare; ++=Occasional; +++=Common; ++++=Abundant