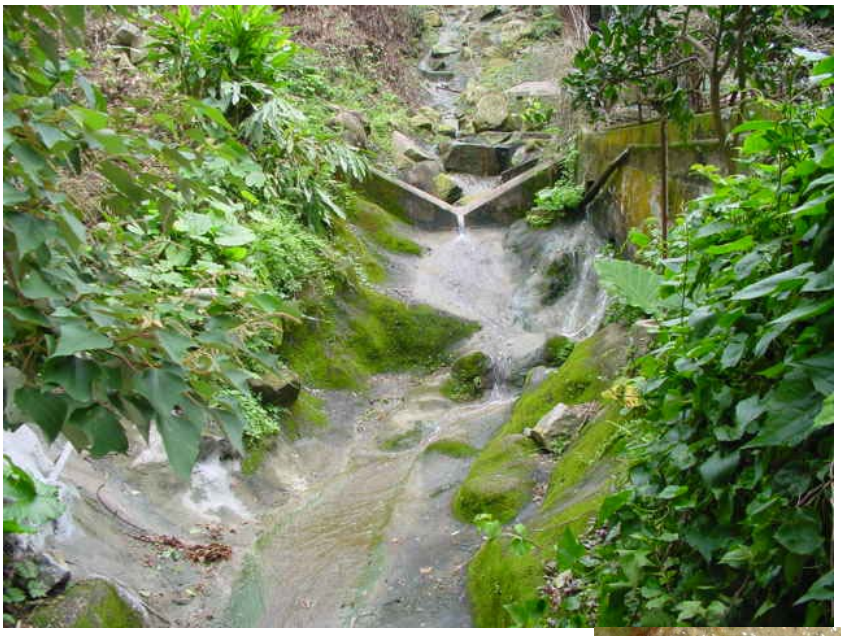
Agreement No. CE 25/2002
Drainage Improvement in Northern Hong Kong Island-
Hong Kong West Drainage Tunnel
Report of Ecological Baseline Survey
September 2005



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ECOLOGY

1 INTRODUCTION

1.1.1 This chapter presents the findings of the ecological baseline surveys for ecological impact assessment (EcoIA) undertaken to fulfil the requirements for the proposed drainage improvement in northern Hong Kong Island as detailed in EIA study brief ESB-070/2001. This includes:

- Literature review of relevant published papers, thesis and reports on ecology in relation with the Study area;
- To carry out field surveys to collected data on habitat feature, flora and fauna which likely to be affected by the proposed project; and Assess the baseline ecological conditions (habitats and species) of the study area (*i.e.* from either side of the catchment point to a buffer zone of 500m beyond).

2 METHODOLOGY

2.1 Description of Study Area, Sites and Transects

2.1.1 The proposed underground drainage channel started from the eastern inlet portal at Tai Hang, Causeway Bay, toward west along northern urban fringe area of Hong Kong island and finally discharged to the sea at the Cyberport through western outlet portal. Along this underground channel, there will be a series of intakes which would divert water from the existing streams, nullah or drainage channels into the channel. All those portals and intakes were generally located on the boundary of the urban area on the lower side and the undeveloped upper hill side covered with natural or semi-natural vegetation.

2.1.2 For the purposes of this study the *'study area'* is referred to as 500m from intake point or outlet portal location of each particular stream on Hong Kong island. The study area was mainly comprised of woodland, shrubland, urban area and as well as streams and drainage channels. In order to collect ecological baseline data from all types of habitats in relation with the proposed drainage channel, a number of survey transects (belt transects) were selected. Each survey transect run through portal or one or a number of intake sites and the adjacent habitats. In total, 12 survey transects (A to L) were planned and followed for ecological field surveys. The locations and distribution of transects were shown in **Figures 1-3.** Total length of survey transects were approximately 12,500m which is considered appropriate for field data collection. As the predicted direct ecological impact are mainly restricted at the specified portal and intake sites, it is necessary to collect qualitative or quantitative data at such sites. Detailed surveys on those sites were undertaken to record the likely affected flora species and concerned faunal species such as amphibians and birds.

2.1.3 Length and code of portal and intake of each transect (A to L) covered was listed below:

A = EASTERN INLET PORTAL : Total length ~500m
B = E5(A)(P), E5(B)(P), MB16 and MBD2 : Total length ~1100m
C = HR1, GL1(P), E7(P) and THR2(P) : Total length ~1500m
D = DG1(P) : Total length ~250m
E = WO(P), BR3(P), BR4(P) and W1 : Total length ~1600m
F = BR5(P), BR6(P), BR7(P) and W3(P) : Total length ~1500m
G = B2(P), MA13(P), MA14(P), MA15(P), MA17(P) and M3(P) : Total length ~1900m
H =TP789(P), TP5(P) and TP4(P) : Total length ~700m
I = P5(P), W10, W11(P) and HKU1(P) : Total length ~1800m
J = PFLR1(P) and W12(P) : Total length ~500m
K= W5(P) : Total length ~300m
L = Western outlet portal : Total length ~600m

2.2 Vegetation and Habitat Survey

2.2.1 Habitat and vegetation surveys of the whole study area was undertaken from the latter half of August 2003 to mid of October 2003. Additional surveys were conducted in March 2005 at two sites (i.e. Eastern inlet portal and THR2(P)) where proposed works boundary changed during the study period. The changed boundary of works area was larger than that of previous one and a larger woodland area was affected at Eastern inlet portal. A longer stream section with riparian habitat was affected at THR2(P). It entailed mapping the boundaries of the different ecological habitats present within the entire study area, i.e. within 500m on all sides of each intake point, onto 1:5000 scale maps. The information was then transposed onto digitised habitat maps of the complete study area (refer to **Figures 7-14)**. The flora species was recorded along each survey transects. In addition, detailed surveys (including vegetation survey) were also carried out at each intake point of works area. Plant species within the proposed works area (Appendix 2) and adjacent area (Appendix 1) was recorded separately.

2.2.2 Baseline Habitat Surveys were undertaken on the followings dates: 28th Aug 2003, 4th Sept 2003, 27th Sept 2003, 14th Oct 2003, 13th and 22nd March 2005.

2.3 Bird Survey

2.3.1 Transect count and point count was performed for bird survey. The transect count aimed to record bird occurred in broad habitat range along the selected survey transects, while, point count method aimed to record quantitative data on birds presented at a site within a fixed period of time. Both day and night survey has been conducted. Detailed methodology was given in the following sub-sections. Bird survey was undertaken on the following dates: 17th Sept 2003 (night), 23-24th Sept 2003, 29th Sept 2003 (night), 9th Oct 2003, 16th Oct 2003 (night), 28th Oct 2003 (night), 1st Nov 2003, 15th Nov 2003 (night), 16th Nov 2003, 20th Nov 2003,.

Transect Counts

Transect counts were undertaken along each of the defined transect belts. The survey belt transect (12 transects) were shown in **Figures 1-3**. All avifauna appear within approximately 50m visible distance along the transect belt were counted. Some bird species, such as Black Kite, has large home range or foraging area, seen within study area (beyond 50m from transect) was also recorded. Otherwise, bird survey was restricted to the survey transect belt. The avi-fauna species and abundance of birds observed, sometimes heard, were recorded.

Point Counts

Point counts (method described by Bibby *et al*; 1992) were undertaken at each of the survey transects. These were undertaken at a fixed location near the proposed outlet portal or intake site, each lasting 15-minutes involving recording any birds seen or heard. The radius of the point count sites were approximately 60m. The locations for each point count are shown in **Figures 1-3.** It is also to record whether there is any bird nest, rare bird or species with conservation concern uses the habitat where the proposed works would occur. All observed birds were identified on site and nomenclatures according to Vincy *et al*. (1994) or species list compiled by Hong Kong Bird Watching Society.

2.4 Mammals

2.4.1 Field mammal survey was undertaken along survey transects offset in the study area to record mammals. This was performed by walking through the habitats during day and night survey. During day survey, sightings of mammals, in addition to evidence of tracks, attention was also paid to animal droppings, footprints and burrows during field surveys. Night survey was conducted by using electric torches for searching and by detection of animal calls. Mammalian species encountered during field surveys were

identified according to Tan (1992).

2.4.2 Mammal Surveys were undertaken on the followings dates: 28th Aug 2003, 4th Sept 2003, 17th Sept 2003 (night), 27th Sept 2003, 29th Sept 2003 (night), 14th Oct 2003, 16th Oct 2003 (night), 28th Oct 2003 (night), 15th Nov 2003(night).

2.5 Reptiles

2.5.1 Potential hiding places and microhabitats for reptiles (such as wood material and metal sheets, old buildings and ruins) were searched during reptile surveys. Night surveys were also conducted to search for reptiles and as well as amphibians.

2.5.2 Reptiles surveys were undertaken on the followings dates: 16th Sept 2003, 17th Sept 2003 (night), 29th Sept 2003 (night), 16th Oct 2003 (night), 28th Oct 2003 (night), 15th Nov 2003(night), 13th and 22nd March 2005(day).

2.6 Amphibians

2.6.1 Amphibians were searched for in suitable breeding habitats such as stream pools, riffles and water ditches or channels to record the species present and abundance. Attention was also made to listening for mating calls and finding tadpoles. All found amphibians were identified according to Karsen (1998).

2.6.2 Reptile surveys were undertaken on the followings dates: 16th Sept 2003, 17th Sept 2003 (night), 29th Sept 2003 (night), 16th Oct 2003 (night), 28th Oct 2003 (night), 15th Nov 2003 (night), 22nd March 2005(day).

2.7 Aquatic Fauna

2.7.1 Selection of aquatic sampling sites was done based on evidence of whether permanent stream flow existed and dimension of habitat which can support aquatic life. Only a few stream sites were suitable to take aquatic samples. Majority of streams or channels was not appropriate for taken samples due to reasons of lack of water, lack of sediments or detritus, partially covered, on steep slope, and etc. At the selected sampling sites, both kick and netting sampling were applied for collecting aquatic fauna. These two methods were described in the following sub-section. Aquatic fauna survey was undertaken on the following dates: 25th August, 16th Sept 2003, 28th Oct 2003, 22nd March 2005. The aquatic fauna surveys undertaken covered both wet and dry season.

Kick Sampling

The macro-benthos was sampled at each of the selected streams by kick sampling (**Photo 01)**. A D-frame mesh net (0.5 mm) was placed on the stream bed with the mouth facing upstream. Upstream the stream bed was kicked to dislodge benthic organisms. This process was performed for three minutes and replicated three times at each sampling site. Netted fauna with detritus were sorted and identified to practical taxonomic levels and relative abundance was recorded, 22nd March 2005.

Netting

An aquatic net was deployed into the watercourse to collect larger organisms *e.g.* fish. Collected organisms were identified to lowest practicable taxonomic level.

2.8 Inter-tidal Fauna

2.8.1 Inter-tidal fauna Survey was undertaken on the 23th Sept 2003. Suitable inter-tidal sampling location is limited at the Western Outlet Portal area due to road engineering works during the survey period and much of the costal zone were either artificial sea wall or deep rocky shore. Three line transects were

established on the rocky shore at the Western Outlet Portal at Cyber Port (**Figure 3**). The transect was run starting at the low tide mark and extended to the high tidal zone and was examined at low tide. The transects run at the rocky shore habitat were approximately 7 m in length. Quadrat samples with a sampling dimension 0.5 m x 0.5 m were taken at 1.5 meter intervals along the transect and used to count and record the surface animals (epi-fauna) encountered. (**Photo 02**). All mobile epi-fauna (e.g. snail and sea slater) and static fauna (e.g. Barnacles and Oysters) were observed and counted during the survey.

2.9 Insect

2.9.1 Butterfly and dragonfly were surveyed by direct observation along various sampling transects. When possible, the observed butterfly and dragonfly were photographed and identified to species level and their status noted according to Yiu (2004) and Wilson (2003).

2.9.2 The surveys on insects were undertaken on the followings dates: 28th Aug 2003, 4th Sept 2003, 24th Sept 2003, 27th Sept 2003, 14th Oct 2003, 28th Oct 2003, 20th Nov 2003.

3 Description of Baseline Ecology

3.1 Literature Review

3.1.1 A literature review was conducted to gather existing information regarding the proposed project site and to identify habitats and species of potential importance. The literature review included theses submitted by the post-graduate students at the University of Hong Kong, as well as other published journals and reports. The following studies were reviewed.

- The Ecology of Exotic Squirrels (Sciuridae) in Hong Kong, with Special Reference to *Callosciurus erythraeus thai* (Kloss), Thesis of M. Phil, The University of Hong Kong (Ho Ching Yee, 1994).
- The Taxonomy and Ecology of Land Snails in Hong Kong, with Particular Reference to Factors Affecting the Distribution and Population Dynamics, Thesis of M. Phil, The University of Hong Kong (Ho Wai Hoong, 1994).
- Distribution of Large Mammals in Hong Kong, Porcupine! No.15; Newsletter of the Dept. of Ecol. And Biodiv., Hong Kong University (Graham Reels, 1996)
- Register of Sites of Special Scientific Interest (SSSIs), Site 24, 50 and 25 ; Loose-leaf document maintained by Planning Department (Anon. 1995).
- Infrastructural works for housing development at Telegraph Bay– Final EIA Report, Engineering Feasibility Study, Enviros (HK) Ltd (March 1999).
- Composition and distribution of Hong Kong Amphibian fauna, Memoirs of The Hong Kong Natural History Society (M.W,N. Lau and D.Dudgeon, December 1999)
- The species composition, distribution and population size of Hong Kong bats, Memoirs of The Hong Kong Natural History Society (G.W.J. Ades December 1999)
- Field Guide to the Dragonflies of Hong Kong, Agriculture, Fisheries and Conservation Department (Wilson, K.D.P. 2003)
- Hong Kong Dragonflies, An Urban Council of Hong Kong (Wilson, K.D.P. 1995)
- Workshop on The Status and Conservation of Hong Kong's Wild Animals and Plants, Wildlife Conservation Foundation (anon 2001)
- Lost mammals, the reportage of Hong Kong wild mammalian (William Suen, 2002).
- The Avifauna of Hong Kong, Hong Kong Bird Watching Society (Carey, G.J. 2001)

3.1.2 The study conducted by Ho Ching Yee (1994) is mainly concerned with the ecology of squirrels in Hong Kong. Behavioural observations had been performed at a vegetated area near the Robert Black College, in the main campus of the University of Hong Kong. During Ho's study, data collections were made by walking around the site and observing the detailed individual behaviour of the squirrels. In addition, traps had been set up at the site to catch the squirrels in order to measure their physical condition such as body size and length. In this study, Ho reported that a single species of squirrel *Callosciurus erthraeus thai* occurs at the site. The study revealed that squirrels are quite common in the study area of the wooded areas.

3.1.3 The terrestrial snail study conducted by Ho Wai Hoong (1994) was undertaken at the forest habitat at the southern slope of the main campus, the University of Hong Kong. Quadrat and Jolly-Seber capture-recapture methods were employed in the study. Surprisingly, Ho found 16 snail species at the study site in the forest near the Robert Black College.

3.1.4 The study on the distribution of large mammals in Hong Kong conducted by Graham Reels (1996) illustrated the distribution of large mammals in Hong Kong including Hong Kong Island. It was based on mammal sightings and records from various sources from mid 1992 to 1996. The nearest mammal sighting location relevant to this Study is Pok Fu Lam Country Park where Chinese Porcupine (*Hystrix brachyura*), Masked palm civet (*Paguma larvata*) and Chinese Ferret Badger (*Melogale moschata*) were reported.

3.1.5 The objective for designation of SSSI by Planning Department (Anon. 1995) is to identify sites of special biological or geological value. The following SSSI sites are adjacent to the study area.

i) Pok Fu Lam Reservoir Catchment Area (SSSI Site 24). It was established on 20 September 1979. The aim of the SSSI site is to protect the woodland which supports *Camellia hongkongensis* a species which is protected in Hong Kong. The woodland provides suitable habitat for birds and animals

ii) Nam Fung Road Woodland (SSSI Site 50). It was established on 22 June 1993. It is the most important stand of *Endospermum* woodland in Hong Kong. It is also rare in the South China area. Within the woodland, the Hong Kong protected species, *Camellia salicifolia*, can be found; and

iii) Tai Tam Reservoir Catchment Area (SSSI Site 25). It was established on 20 September 1979. The aim is to protect the woodland which is floristically rich. The woodland provides a suitable habitat for birds and animals.

3.1.6 A review of the EIA study for the housing development at Telegraph Bay was undertaken (Environ, 1999). There is a stream flowing from the Victoria road, through the village and into Kong Sin Wan Tsuen. The upper stream has relatively dense riparian vegetation. This stream was brackish - 2 marine species, *Ligia exotia* and *Namalycastis aibiuma,* were found and the salinity level reaches 2o/oo during the study period. In total, 8 taxa with 99 individuals were sampled. The species found were pollution tolerant. Species diversity declined towards the lower sections. Fung Shui Woodland merges with semi-natural woodland in the area. The density of woodland is 7 trees per 100m2. Species such as *Leucaena leucocephala*, *Litsea glutinosa* and *Microcos paniculata* are relative dominant. A rare flora species *Ulmus parvifolia* was recorded within Fung Shui Woodland at Kong Sin Wan Tsuen. Pallas squirrels *Callosciurus erythreaus* were the only mammal species found at Telegraph Bay.

3.1.7 The Hong Kong Amphibian survey was conducted by Lau & Dudgeon (1999). The survey was performed by applying auditory detection, direct search for amphibians in appropriate microhabitats and sampling larvae and eggs in aquatic habitats. 12 species were found in Hong Kong Island. Ornate Pigmy Frog (*Microphyla ornata*), Marbled Pigmy Frog (*Microphyla pulchra*) and Hong Kong Newt (*Paramesotriton hongkongensis*) can only be found in few places at the eastern part of Hong Kong island which was outside the current study area. Eight surveyed sites are near to intakes and western outlet portal of this project. Seven of the surveyed sites were located at the western side of the study area. Table 1 showed the amphibian species recorded by Lau & Dudgeon (1999) which were within or near the current study area.

Table 1 : Amphibian species found within study area by Lau *& Dudgeon (1999)*

Common name	**Scientific name**
Short legged toad	*Megophrys brachykolos*
Asian common toad	*Bufo melanostictus*
Hong Kong cascade frog	*Amolops hongkongnesis*

Common name	Scientific name
Gunther's Frog	*Rana guentheri*
Paddy frog	*Rana limnocharis*
Green cascade frog	*Rana livida*
Asiatic painted frog	*Kaloula pulchra pulchra*
Lesser Spiny Frog	*Paa exilispinosa*
Brown Tree Frog	*Polypedate megacephalus*

3.1.8 The status of Hong Kong bats was discussed by Ades (1999). The objective of the paper by Ades was to describe the distribution of bats in Hong Kong. From his survey, 11 species were found or roosting on Hong Kong island. Pipistrellus abramus is probably the most common bats recorded in Hong Kong island. Widespread of P. abramus is due to the fact that they can associate with most forms of building if they can find small crevice or hole to roost in. In some case, they have been found roosting and breeding in air-conditioners (Ades, 1999).

3.1.9 Hong Kong dragonflies have been described by Wilson (1995 & 2003). Currently, 112 species can be found in Hong Kong. 19 species have been recorded from Hong Kong island and a species list is given in the table 2 below. These species were mainly recorded at Aberdeen and Tai Tam country parks.

Table 2 : Dragonfly species found at Hong Kong Island by Wilson in 1995 & 2003

Species	Commonness	1995	2003
Onychargia atrocyana	Common		✓
Pseudagrion rubriceps rubriceps	Common	✓	✓
Calicnemia sinensis	Uncommon		✓
Coeliccia cyanomelas	Abundant		✓
Protosticta beaumonti	Uncommon		✓
Sinosticta ogatai	Uncommon		✓
Protosticta taipokauensis	Common	✓	
Anax guttatus	Abundant	✓	
Anax parthenope julius	Common	✓	
Macromidia ellenae	Uncommon		✓
Orthetrum melania	Uncommon		✓
Anax immaculifrons	Common	✓	
Heliogomphus scorpio	Common	✓	
Leptogomphus elegans hongkongensis	Common	✓	
Ictinogomphus pertinax	Abundant	✓	
Epopthalmia elegans	Common	✓	
Orthetrum triangulare triangulare	Common	✓	
Pseudothemis zonata	Common	✓	
Rhyothemis variegate arria	Common	✓	
Zyxomma petiolatum	Common	✓	

3.1.10 Wildlife Conservation Foundation have performed surveys to investigate the distribution and abundance of wild mammals in Hong Kong. The surveys were done by installing auto-trigger cameras at 24 main country parks and nature reserves to collect field data. Auto-trigger camera has an advantage of recording secretive animals (anon, 2001). In total, 12 species were found at Hong Kong island (anon, 2001). Nine species of mammals were recorded from Pok Fu Lam Country Park, but no species list was given. Nevertheless, William Suen (2002) has mentioned that 7 mammalian species were recorded at Hong Kong island. They were *Muntiacus muntjak*, *Hystrix brachyuran*, *Melogale moschata*, *Paguma larvata, Felis bengalensis*, *Sus scrofa* and *Viverricula indica*. They are mainly located at Pok Fu Lam Country Park and Tai Tam country park (William Suen, 2002).

3.1.11 Hong Kong Bird Watching Society has performed a breeding bird survey. In total, 57 birds were recorded breeding within this study area. The following table 3 shows breeding birds found within study area.

Table 3 : Breeding birds within study area in Hong Kong Island surveyed by HKBWS

Common name	***Scientific name***	**Status***
Striated Heron	*Butorides striatus*	SV
Black-crowned Night Heron	*Nycticorax nycticorax*	R
Yellow Bittern (Chinese Little Vittern)	*Ixobrychus sinensis*	PM&SV
Black Kite	*Milvus lineatus*	R
White Bellied Sea Eagle	*Haliaeetus leucogaster*	R
Crested Goshawk	*Accipiter trivirgatus*	R
Bonelli's Eagle	*Hieraaetus fasciatus*	R
Chinese Francolin	*Francolinus pintadeanus*	R
White-breasted Waterhen	*Amaurornis phoenicurus*	R
Rock Dove	*Columba livia*	R
Spotted Dove	*Streptopelia chinensis*	R
Emerald Dove	*Chalcophaps indica*	R
Yellow-crested Cockatoo	*Cacatua sulphurea*	R
Rose-ringed Parakeet	*Psittacula krameri*	R
Chestnut-winged Cuckoo	*Clamator coromandus*	SV
Large Hawk Cuckoo	*Cuculus sparverioides*	SV
Indian Cuckoo	*Cuculus micropterus*	SV
Common Koel	*Eudynamys scolopacea*	R
Great Coucal	*Centropus sinensis*	R
Lesser Coucal	*Centropus bengalensis*	R
Collared Scops Owl	*Otus bakkamoena*	R
Pacific swift	*Apus pacificus*	R&PM
Little Swift (House Swift)	*Apus nipalensis*	R&PM
Common Kingfisher	*Alcedo atthis*	R
White-throated Kingfisher	*Halcyon smyrnensis*	R
Blue Magpie	*Urocissa erythrorhyncha*	R
Magpie	*Pica pica*	R
Large-billed Crow	*Corvus macrorhynchos*	R
Eurasian Hoopoe	*Upupa epops*	OV
Great Barbet	*Megalaima virens*	R
Barn Swallow	*Hirundo rustica*	PM
Scarlet Minivet	*Pericrocotus flammeus*	R
Red-whiskered Bulbul (Crested bulbul)	*Pycnonotus jocosus*	R
Chinese Bulbul	*Pycnonotus sinensis*	R
Sooty-headed Bulbul	*Pycnonotus aurigaster*	R
Long-tailed Shrike (Rufous-backed Shrike)	*Lanius schach*	R
Oriental Magpie Robin (Magpie Robin)	*Copsychus saularis*	R
Blue Whistling Thrush	*Myophonus caeruleus*	R
Streak-breasted Scimitar Babbler	*Pomatorhinus ruficollis*	R
Masked Laughing thrush (Black faced Laughing Thrush)	*Garrulax perspicillatus*	R
Greater Necklaced Laughingthrush	*Garrulax pectoralis*	R
Black-throated Laughingthrush	*Garrulax chinensis*	R
Hwamei	*Garrulax canorus*	R
White-browed Laughing thrush	*Garrulax sannio*	R
Yellow Bellid Prinia	*Prinia flaviventris*	R
Common Tailorbird	*Orthotomus sutorius*	R

Common name	***Scientific name***	**Status***
Great Tit	*Parus major(commixtus)*	R
Yellow-cheeked Tit	*Parus spilonotus*	R
Fork-tailed Sunbird	*Aethopyga christinae*	R
Japanese White Eye	*Zosterops japonica(simplex)*	R
White-rumped Munia (White Backed Munia)	*Lonchura striata*	R
Black-necked Starling	*Sturnus nigricollis*	R
White-shouldered Starling	*Sturnus sinensis*	R
Crested Myna	*Acridotheres cristatellus*	R
Black Drongo	*Dicrurus macrocercus*	SV
Hair Crested Drongo	*Dicrurus hottentottus*	SV
Red Headed Tit	*Aegithalos concinnus*	R

Note: "R" = Resident; "SV" = Summer visiting; "PM" = Passing Migrant;
"OV" = Ocassionally Visiting;

3.1.12 In addition, the roosting site for Black Kite was shifting from Stonecutters to Magazine Gap. The shifting may due to the reclamation and development of Stonecutters (Carey, G.J., 2001). Moreover, December and January are the peak months for roosting of Black Kites. This may be due to the migrants return from the north (Carey, G.J. 2001).

3.2 Description of Habitats and Flora

Natural Woodlands

3.2.1 Different patches of the natural woodland in the study area are actually interconnected and are likely experienced similar establishing period. Therefore, the habitat characteristics such as age, height and structure for different patches of natural woodland are similar. Generally, the natural woodland on Hong Kong island was gradually re-established after the World War II and therefore, has aged 60 to 70 years. Trees in downhill are generally larger than those grown uphill. Approximately, the height of some mature trees has reached 20 meters at downhill. While, heights of uphill trees were mostly ranged from 5 to 7 meters. As the project area goes along the urban fringe area, the habitat with its vegetation cover were affected during urbanisation history with many introduced tree species such as Ficus spp., Delonix regia and Acacia spp..

3.2.2 Natural woodland is the most common habitat in various stream catchments in the study area. It is concentrated along the southern fringes of the area. The domination of species is different in different region. In total, 133 species was recorded inside the natural woodland. The eastern woodland is dominated by *Ficus microcarpus*, *Litsea monopetala*, *Choerospondias axillaris* and *Gordonia axillaris*. Works area of Eastern Inlet Portal covers about 0.4 ha of woodland where trees are dense with tree canopies almost closed. The habitat was originated from demolished squatter area on the slope terraces. Tree size is generally ranging from 0.2m to 0.8m in diameter. In total, 39 species were recorded. No rare or protected species was recorded within Eastern Inlet Portal woodland. Woodland adjacent to DG1(P) seems to be an old orchard since some fruit trees occur including *Mangifera indica*, *Clausena lansium* and *Litchi chinensis*.

3.2.3 The dominated species at middle region of study area are *Delonix regia*, *Celtis sinensis*, *Cinnamomum camphora* and *Machilus spp*. The woodland at this region is fairly mature with some big trees measured 1.5 meter in diameters. Along Magazine Gap Road, the woodland is dominated by *Delonix regia* and *Celtis sinensis*. However, the dominant tree species become *Cinnamomum camphora* and *Machilus* when approaching Tregunter Path. At intake point TP789(P), a shrub *Pavetta hongkongensis* (Photo 3) was found growing near the stream. *P. hongkongensis* is protected under the Forestry Regulations of the Forests and Countryside Ordinance. *Artocarpus hypargyreus,* plant species protected in China was also found at the works area of MA14(P) and MA13(P).

3.2.4 Woodland in the western region was apparently dominated by *Lophostemon confertus*, *Livistona chinensis* and *Machilus spp.* Some trees such as *Cinnamomum camphora*, *Litsea glutinosa* and *Artocarpus hypargyreus* are large in diameter with diameter up to 0.8m and height up to 20m. *Artocarpus hypargyreus* and *Pavetta hongkongensis,* which also occur within the woodland on south of the Hong Kong University campus (Figure 13).

3.2.5 The woodland adjacent to the western outlet portal was distributed on the hill slopes. Trees in the woodland was more mature in the uphill area where less disturbances occurred. The vegetation near the western outlet portal is mainly dominated by *Pinus massoniana* and *Macaranga tanarius*. However, *Leucaena leucocephala, Litsea glutinosa* and *Microcos paniculata* are the dominant plant species in the wooded area near village houses (Environs 1999).

3.2.6 Species recorded from survey transects in natural woodland was given in Appendix 1. The distribution of the natural woodland was presented in Figures 7-14. Figures 4-6 show the plan map of the whole study area.

Urban Plantation

3.2.7 Trees have been generally planted at available spaces over the urban areas. Therefore, the urban plantation described below included developed site, roadside, construction site, recreation facilities, parks, grave yards and etc. Most trees have been planted more than 20 years. Some of them have reached 20 meters in height. No specific pattern was noticed from the urban plantation. Urban plantation woodlands are typically lower in species diversity and are of simple structure compared to natural woodlands (Dudgeon & Corlett, 1994).

3.2.8 Many trees have been planted in the urban areas and on the woodland fringes for amenity purposes. In total, 68 species were recorded. All species, for example *Chrysalidocarpus lutescens*, Bauhinia sp. and *Casuarina equisetifolia* are common. Generally, *Dolichandrone cauda-felina*, *Chrysalidocarpus lutescens,* Bauhinia sp., *Casuarina equisetifolia* and *Archontophoenix alexandrae* are dominated species planting at Urban plantation woodlands.

3.2.9 At western outlet portal, some trees were planted around the new buildings of Cyber Port. The landscaping trees, Bauhinia sp. and *Swietenia mahagoni* dominates the planting in the area. Generally, species found are typical urban plantation species such as *Delonix regia*, *Ficus microcarpus* and *Melaleuca quinquenervia*. Species recorded from survey transects in urban plantation areas were shown in Appendix 1. The distribution of the urban plantation habitat was presented in Figures 7-14. Figures 4-6 show the plan map of the whole study area.

Shrubland

3.2.10 Two sections of shrubland are distributed uphill at the eastern fringe region (Figures 7 & 8). The number of species is small compared with woodland and urban plantation. There are no rare or protected plant species were recorded from the survey transect of the site.

3.2.11 There are another two pieces of shrubland located at western region of study area (Figures 12 & 13). They are generally distributed on upper hills boarded by natural woodlands on lower hills. Common shrub species recorded in the shrublands included *Litsea glutinosa*, *Litsea rotundifolia* and *Psychotria asiatica.*

3.2.12 At the western outlet portal, there is a small area of shrubland near the rocky shore. The shrubland is fragmented due to urban development. Climbers such as *Calamus tetradactylus*, *Gymnema sylvestre*, *Gnetum lofuense*, *Passiflora foetida* and *Embelia laeta* have covered much of the shrubland.

3.2.13 In total, 33 species were recorded from shrubland. Flora list recorded from shrubland are shown in Appendix 1 The distribution of the shrubland habitat was presented in Figures 7-14. Figures 4-6 show

the plan map of the whole study area.

Fung Shui Woodland:

3.2.14 A piece of Fung Shui Woodland is distributed between the natural woodland and Kong Sin Wan Tsuen at western outlet portal. The boundary between Fung Shui Woodland and natural woodland is difficult to discern. Some 23 species were recorded along survey transects and the woodland is dominated by *Mallotus apelta* and *Microcos paniculata* (Environs, 1999). In addition, a rare flora species *Ulmus parvifolia* has been recorded within Fung Shui Woodland (Environs, 1999).

3.2.15 In summary, 109 and 67 species recorded from the survey transects belongs to native species and exotic species respectively. Species lists recorded from the natural woodlands, Fung Shui woodland, shrubland and urban plantation are shown in Appendix 1. The distribution of the Fung Shui woodland habitat was presented in Figures 14. Figures 4-6 show the plan map of the whole study area.

Stream

3.2.16 All streams and drainage channels which the proposed project affected are fragmented and isolated as their original natural linkage among streams and with coastal water were cut off by past urban development of Hong Kong island. Consequently, lower part of all those stream courses was no longer existed in the history. In addition, water quality of almost all those streams was some what adversely affected by widely and frequently use of pesticides for mosquito control in upper stream catchment on Hong Kong island.

3.2.17 Most of the streams are small with depth of flowing water less than 0.1m and are likely seasonal or temporal (with water flow when raining). Stream flow would dry up during dry season for most of the small streams. The Stream at Eastern Inlet Portal, Tai Hang, which is a medium sized stream with channel width varied from two to five meters, and stream flow is likely permanent. The stream substrate is comprised of rocky and concrete for the section near urban area. The upper stream section becomes natural when further away from the urban developed area. In addition, there is small tributary with high gradient connecting to the stream .

3.2.18 The distribution of the stream habitat was presented in Figures 7-14. Figures 4-6 show the plan map of the whole study area.

3.3 Fauna

Herpetofauna

Amphibians

3.3.1 Table 4 provides a summary of the amphibians that were identified either by observation or their call during the baseline ecological night surveys. All sites of intake and western outlet portal of the proposed drainage works were surveyed. A total of five species were identified at seven intake points. The most common species identified was the Green Cascade Frog (*Rana livida*) (Photo 4). R. livida is an uncommon and nocturnal species in Hong Kong and it is seldom seen in daylight. Habitats with swift or slow flowing mountain stream can find Green Cascade Frog according to Karsen (1998). Hong Kong Cascade Frog (*Amolops hongkongensis*) (Photo 5) was found at PFLR1(P) and W12(P). *A. hongkongensis* were found at about 45m and 60m above the upstream of the proposed intake points of PFLR1(P) and W12(P), the frogs could potentially forage at the proposed works area. The species is a protected species under Hong Kong's Wild Animals Protection Ordinance. These locations seem to be the potential breeding sites for Hong Kong Cascade Frog since several individuals were found at the site. They like to live in streams with cascading water (Photo 6). The tadpole of the species has an enlarged mouth sucker with which it can clings to wet rock (Karsen 1998). In addition, three Lesser Spiny Frog (*Paa exilispinosa*) and its tadpoles were found within the proposed construction area of

P5(P). The species requires the habitat with cool running water as described by Karsen (1998).

3.3.2 Upper stream of the Eastern Inlet Portal is a good habitat supporting a fair population of amphibians. In total, three common species (*Rana livida*, *Rana guentheri* and *Bufo melanostictus*) and eleven individuals of amphibians were found at the survey site at Eastern Portal Inlet. The locations of Hong Kong Cascade Frog and Lesser Spiny Frog were presented in Figures 12-13. In general, the abundance of amphibian is medium in only a few streams which run through natural woodland and with permanent water flow. The other type of stream and drainage channel habitats supported low abundance of the faunal group or no aquatic fauna at all due to urban disturbance or lack of water.

Reptiles

3.3.3 Table 4 illustrates the species of reptiles identified within the study area. Reptiles were searched by direct observation during the baseline ecological day/night surveys. All proposed sites for construction of intake and western outlet portal of the drainage tunnel were surveyed. Only one species of reptiles Chinese Gecko (*Gekko chinensis*) was recorded (Photo 7) which is the most common gecko found in Hong Kong (Karsen 1998). Generally, they are found outside dwellings, on tree and under stones on hillsides (Karsen 1998).

Table 4. Herpetofauna recorded at various survey sites at North Hong Kong Island

	Site Code			Eastern Portal Inlet	W12(P)	BR4(P) BR6(P)	PFR1(P)	MB16	E5(B)(P)	TP789(P)	P5(P)
Amphibian											
Latin name	**Common name**	**Commonness**	**Required Habitat**								
*Amolops hongkongensis**	Hong Kong Cascade Frog	Protected	Steep slippery rocks with cascade running		5		3				
Rana livida	Green Cascade Frog	Uncommon	Swift or slow flowing mountain stream	6			2	1	1	1	
Paa exilispinosa	Lesser Spiny Frog	Uncommon	Stream with cool running water								3
Rana guentheri	Gunther's Frog	Common	Habitat with still or slow flowing water	1							
Bufo melanostictus	Asian Common Toad	Common	Dry habitat	4							
Reptile											
Latin name	**Common name**	**Commonness**	**Required Habitat**								
Gekko chinensis	Chinese Gecko	Common	Outside dwelling, tree and under stones on hillsides	1		5					

Note:
* Wild species were protected under the Wild Animals Protection Ordinance of Hong Kong.
Numerical numbers represent actual observation of species

Terrestrial Invertebrates

Butterflies

3.3.4 Table 5 summarises the species of butterflies identified within the study area. All sites of intake point and western outlet portal of the drainage tunnel were surveyed. A total of seventeen different species were identified, and dominated by the Blue Tiger butterfly (*Tirumala limniace*). The observed species were locally common according to Yiu (2004) and no rare or protected species were found. The abundance of butterfly is relatively higher in woodland than that observed in urban area, shrubland or re-creational park.

3.3.5 Butterflies were commonly seen along Bowen Road (Transect E & F) where secondary woodland was less undisturbed. In total, 13 species were identified along Bowen Road. That may be due to the extended woodland with rich flora which provides food for larvae of various butterflies. The butterfly species including Common sergeant (*Athyma perius*), Lemon migrant (*Catopsilia pomona*), Common mormon (*Papilio polytes*), Straight six ring (*Ypthima lisandra*) were found at both transect E & F in the study area.

3.3.6 Species diversity of butterfly was comparatively low for other transect (i.e., A,D,G,K,I,J). There were one or two common species recorded along each survey transect. Low species diversity may due to the human disturbance and predation by other animals such as birds.

3.3.7 A total of 5 species of butterfly was recorded at western outlet portal area. The surveyed area contains woodland and Fung Shui woodland where provided feeding and foraging habitat for caterpillars and butterflies.

Table 5. Butterfly species recorded at various study sites at North Hong Kong Island

	Transect		A	D	E		F	G	K	I	J	L
	Found location		Eastern Inlet Portal	DG1(P)	W1	BR3-BR4	BR5-BR7	MA13(P)-M3(P)	W5(P)	HKU	PFLR1(P) & W12(P)	Western outlet Portal
Latin Name	**Common Name**	**Commonness**										
Abisara echerius	Plum judy	Very Common					+					
Argyreus hyperbius	Indian Fritillary	Common				+						
Ariadne ariadne	Angled Castor	Common	+									
Athyma perius	Common sergeant	Common				+	+					
Catopsilia pomona	Lemon migrant	Common				+	+					+
Cupha erymanthis	Rustic	Very Common					+					
Euploea midamus	Blue Spotted Crow	Very Common			+							
Faunis eumeus	Common faun	Very Common					+					+
Graphium sarpedon	Common Bluebottle	Very Common										+
Hypolimnas bolina	Great Eggfly	Common	+								+	
Lethe confusa	Banded tree brown	Very Common				+						
Mycalesis mineus	Dark brand bush brown	Very Common				+						
Papilio memnon (Form agenor)	Great mormon	Common										+
Papilio polytes (form mandane)	Common mormon	Very Common				+	+			+		
Papilio protenor	Spangle	Very Common					+					
Tirumala limniace	Blue Tiger	Common		+	+		+	+	+	+		+
Ypthima lisandra	Straight five ring	Common				+	+					
	No. of species		2	1	2	7	9	1	1	2	1	5

Note:"+" represent species occurred in the study area

Dragonflies

3.3.8 Table 6 summarises the dragonfly species identified from various survey transects within the study area. All sites for proposed intake point and western outlet portal of the drainage tunnel were surveyed. In total, 4 and 2 species of dragonflies and damselflies were recorded. Dragonflies were only recorded from five transects in the study area. Eastern Inlet Poral is a breeding site for dragonflies as the stream was relatively large with natural stream substratum, and some dragonfly larvae were presented in stream benthic samples (Table 6). These collected larvae were Euphaea decorate and Zygonyx spp. and, the breeding season for these two species are approximately from April to October. The species is normally occurred in streams throughout Hong Kong (Wilson 2003). The recorded species were classified as either abundant or common in Hong Kong according to Wilson (2003). Wandering Glider (*Pantala flavescens*) is the most common and widespread species having appeared at all five areas of the study area. Their larvae have ability to growth rapidly. P. flavescens normally occur in puddles, tanks, ponds, marshes, swampy areas and reservoirs. Two species of damselfly were recorded at inlet portal Eastern Inlet Portal at Tai Hang namely Chinese Yellow Face (*Agriomorpha fusca*) and Blue Forest Damsel (*Coelicia cyanomelas*) (Photo 8). The habitats used by two damselfly species are mainly stream and woody area. The recorded damselflies are common species in Hong Kong according to Wilson (2003). In general, most libellulids are favouring static water habitat. Moreover, woodland is also the most important habitat for the teneral adult and the animals can find shelter to hide themselves. In general, most odonata were observed in stream habitat, but they were also occasionally seen in woodland, shrubland and urban area.

Table 6. Species of Odonata identified at various survey sites at North Hong Kong Island.

Transect			A	C		D	E	F	J
Site		Commonness*	Eastern Portal	E7(P)	THR2(P)	DG1(P)	W1	BR5-BR7	PFLR1(P) & W12(P)
Latin name									
Dragonflies									
Pantala flavescens	Wandering Glider	*Abundant*	++	+	++	+	+	++	++
Trithemis festiva	Indigo Dropwing	*Abundant*	+						
Orthetrum glaucum	Common Blue Skimmer	*Abundant*	+						
Orthetrum chrysis	Red Faced Skimmer	*Common*	+						
Damselflies									
Agriomorpha fusca	Chinese Yellowface	*Abundant*	+						
Coelicia cyanomelas	Blue Forest Damsel	*Common*	++						
		No. of species	6	1	1	1	1	1	1

*Note:
"+" represent species occurred in the study area
"++" represent species is common in the study area

Inter-tidal Habitat

3.3.9 The intertidal habitat was only comprised of a section of rock shore in adjacent to the outlet of the proposed drainage tunnel. The location of Inter-tidal survey was shown in Figures 3. Appendix 3 shows species identified from the rocky shore (Photo 9) by quadrat method. Table 7 shows statistic information for inter-tidal fauna at western outlet portal. The rocky shore at the western outlet portal has been disturbed by pervious construction works nearby where building materials including sand and rock have been deposited onto the shore. In total, 14 species were identified from the three sampling transects at the site. Number of species varied from nine to 12 and number of individual animals from 100 to 304 among three transects. Species diversity index (Shannon) varied from 1.5 to 2.1. The distribution pattern of individual organisms was dissimilar in the three transects. At transect 3, the number of individual was zero at the upper tidal level. This is probably due to disturbance associated with nearby construction activities. Generally, *Monodonta labio* and *Pollicipes mitella* (Photo 10) are

common species of the rocky shore and were found at all 3 transects. While, *Siphonaria sirius* (Photo 11) is the dominant species at the low tide level of transect 1. Fauna species recorded at the inter-tidal habitat is common species and low in species diversity and abundance.

Table 7 Statistic information for inter-tidal fauna recorded at various survey sites at Western outlet Portal

Transect	**1**	**2**	**3**
Latin name	Abundance		
Saccostrea cucullata	26	1	0
Ligia exotica	23	10	4
Cellana grata	39	13	3
Siphonaria sirius	67	21	0
Liolophura japonica	1	0	0
Telraclita squamosa	5	0	2
Pollicipes mitella	104	22	43
c.f Morula musiva	1	8	5
Septifer bilocularis	0	0	3
Monodonta labio	6	28	35
c.f Euraphia withers	8	0	0
Littoraria pallescens	4	11	3
Nodilittorina pyramidalis	20	23	2
Nerita chamaeleon	0	4	0
Taxa	12	10	9
Individuals	304	141	100
Dominance	0.201	0.1363	0.315
Shannon index	1.884	2.096	1.481

Freshwater Biota

Freshwater Benthos

3.3.10 Five intake points were selected for stream benthos sampling as the number of suitable sampling stream is very limited due to minimal water flow, culverting and concreted substrate. The following intake points have been sampled for stream benthos: Eastern Portal Inlet, TP789(P), THR2(P), W12(P) and PFR1(P). Their locations are shown in Figures 1-3. Appendix 4 lists the benthic invertebrate species identified at each of the sites.

3.3.11 Stream habitat at Eastern Portal Inlet has significant water flow and is relatively natural in substratum. In total, there were three fauna groups with twenty-one taxa of stream benthos recorded from benthic samples taken in October 2003. THR2(P) is another permanent stream with fast running water in deep valley. Though this stream was slightly polluted, 44 individual of 8 species was recorded from the THR2(P) in March 2005. In addition, a brackish water species of polycheate *Namalycastis aibiuma* was recorded in stream benthos. The reason for occurrence of this species is unknown. The other stream sampling sites showed low species abundance and richness probably due to low habitat quality and temporal status of stream water flow. Table 8 summarises the quantitative data for abundance and diversity of aquatic species collected by the kick sampling procedure. Shannon species diversity index at Eastern Portal Inlet was 2.8 and the other three sites was approximately 1.1.

Table 8 Summary of the Quantitative Data for Abundance and Diversity of Aquatic Species collected by Kick Sampling at five selected sampling sites

	Eastern Portal Inlet	**TP789(P)**	**THR2(P)**	**W12(P)**	**PFR1(P)**
Total Abundance (no. of individuals)	64	3	44	13	6
Number of taxa	21	3	8	4	3

3.3.12 No rare or protected species were collected from the stream sampling sites. Except for the sampling site at W12(P) where one tadpole of Hong Kong Cascade Frog was collected. This frog species is protected under the Wild Animals Protection Ordinance.

Freshwater Fish

3.3.13 Only one species of fish was collected and identified at the stream site at Eastern Portal Inlet. There were no other records of fish from any of other study sites. The species identified is *Gambusia affinis* (Photo 12) which is a common species in Hong Kong. G. affinis normally inhabit at slow-flowing water, vegetation ponds and quiet pools of stream. Sometimes, G. affinis even enter brackish water. They are tolerant to poor water quality. Generally, G. affinis feeds on zooplankton, small insects, mosquito larvae, microcrustaceans, plant materials and detritus. G. affinis is an exotic fish which was introduced into Hong Kong as mosquito-control agent (Virginia et al, 2004). Now, it is widespread in local freshwater bodies.

3.3.14 Low diversity of aquatic fauna of the surveyed streams and channels are likely caused by two main factors, i.e. habitat fragmentation and water pollution, which described in Section 3.2.5.

Mammals

3.3.15 Only two species of mammals were encountered during field surveys within the study area:

- Belly-banded Squirrel (*Callosciurus flavimanus thai*) - *C. flavimarus thai* **(Photo 13)** was observed in the woodland habitats adjacent to **BR3(P)-BR4(P), BR5(P)-BR7(P), HKU1(P), W11(P), W10, W12(P) and PFLR1(P)**. *C. flavimarus thai* typically inhabits woodland areas and is protected under the Wild Animals Ordinance. This species is common and occurs in many places in Hong Kong including Hong Kong Park and Pok Fu Lam which is adjacent to the study area (Goodyer, 1992).

- Greater short noised fruit bat (*Cynopterus sphinx sphinx)* – Two individuals **(Photo 14)** were found roosting under one of the palm trees *Livistona chinensis* adjacent to W12(P). This species is widespread and common in Hong Kong and generally roosts in small groups. They normally feed on fruit and nectar (Ades, 1999). This species is protected under the Wild Animals Protection Ordinances. It is unlikely that the proposed works at W12(P) would impact the bat roosting site as it is separated by some trees, buildings and the proposed drainage work site is approximately 60 meters apart from the palm tree. Location of the palm trees (about 20) where the bats being observed was shown in Figure 14. No other mammals were recorded during night surveys except the bats mentioned above which was consistently roosted on the palm tree at the site.

Birds

Transect Counts

3.3.16 Appendix 5 shows the birds identified during the baseline ecological surveys within the study area. A total of 28 species of birds were recorded at all study sites. Appendix 5 lists the species common and

scientific names together with their abundance for each of the 12 transects of the avi-fauna survey.

3.3.17 Black Kite (*Milvus lineatus*) (Photo 15), Chinese Bulbul (*Pycnonotus sinensis*) and Japanese White Eye (*Zosterops japonica* (simplex)) are the most commonly encountered species in in the study area. Black Kite were recorded on all transects while Buzzard on Transect L, which surveyed Western Portal Outlet. Both species are birds of prey, which usually have large home-range. The eastern portal, western portal (Transect A, L), Bowen road (Transect E, F) and Hong Kong University campus (Transect I) had the relatively higher abundance among all survey transects. These sites are adjacent to woodlands, where the habitats possessed higher diversity of flora including fruiting trees and its associated herbivores fauna, such as insects, which in turn support a rich avi-fauna. Number of bird species and individuals varied from 4-17 and 6-78 respectively at various survey transects. The species abundance of birds is generally low to medium. As the length of survey transect varied among sites, the abundance data was standardised by unit length of transect in order to give a comparable data set. The number of birds observed fluctuated from 0.8 to 13.0 per 100 meter transect length along various survey transects with maximum number of birds recorded at transect L (Appendix 5). Shannon species diversity index varied from 1.5 to 2.5 and the calculated dominance value ranged from 0.10 to 0.26 among 12 surveyed transects (from A to L). The dominance value was rather low, while the species diversity index ranged from medium to high. In general, the abundance of avi-fuana is medium in natural woodland but low in shrubland and urban area.

3.3.18 Among the recorded birds, 20 species are Hong Kong resident species, and two belonging to introduced species, i.e., Silver eared mesia (*Leiothrix argentauris*) and Yellow crested cockatoo (*Cacatua sulphurea*). The other species of birds are as seasonal visitors (winter visitors) including:

- Buzzard (*Buteo buteo*)
- Japanese Bush Warbler (*Cettia diphone*)
- Grey Wagtail (*Motacilla cinerea*)
- Rufous Turtle Dove (*Streptopelia orientalis*)
- White Wagtail (*Motacilla alba*)
- Yellow Browed Warbler (*Phylloscopus inormatu*s)

3.3.19 Among the recorded birds, Greater Necklaced Laughing Thrush (*Garrulax pectoralis*) is a rare species and it is the resident bird in Hong Kong. Greater Necklaced Laughing Thrush normally forages at ground level. The species normally inhabit inside the forest in New Territories. Occasionally, they can be found as small group at Hong Kong island (Viney et al., 1994). Black Kite (*Milvus lineatus*) was frequently recorded during survey. It is a common bird in Hong Kong and their population is approx. 200-300 individual. Their population is reducing due to civilization or habitat loss. Buzzard (*Buteo buteo*) is an common winter visiting bird. They are normally visiting Hong Kong from November to March of next years. However, same as Black Kite, their population is falling due to the loss of suitable urban fringe habitat. Both Black Kite and Buzzard are Class II Protected Animal in China. In addition, an uncommon winter visiting bird Japanese Bush Warbler (Cettia diphone) was recorded along the magazine gap road. C. diphone normally visit Hong Kong from October to April of next year. They largely occur below 400m altitude and roosting under dense shrub and woodland.

3.3.20 All recorded bird species are protected under the Wild Animals Protection Ordinance, HKSAR.

Point Counts

3.3.21 Table 9 illustrates the point count location and habitat composition for the relevant study sites. Each of these 12 locations is described in the proceeding text.

Table 9 Location and Habitat Composition of Each of the Point Counts

Point Count (Code)	Location of Project Works Site	Habitat Composition
A	EASTERN INLET PORTAL	• Natural stream • Natural woodland • Urban area
B	MB16	• Natural woodland • Urban area
C	THR2(P)	• Natural woodland • Stream • Urban area
D	DG1(P)	• Natural woodland • Urban area
E	BR4(P)	• Natural woodland
F	BR6(P)	• Natural woodland
G	MA15(P)	• Natural woodland • Urban area
H	TP789(P)	• Natural woodland • Urban area
I	W11(P)	• Natural woodland • Urban area
J	W12(P)	• Natural stream • Natural woodland • Urban area
K	W5(P)	• Park • Urban area
L	Western outlet portal	• Natural woodland • Shrubland • Marine

3.3.22 Appendix 6 shows the birds identified at each Point count location during the baseline ecological surveys within the study area. Point count sites B, C, G and H have the relatively low species diversity and abundance. That may be due to heavy traffic nearby which may have disturbed birds attempting to forage at that location. More birds appear to try to forage at less disturbed locations such as Point count site A, D, E, F, I, J and K. Relatively large number of Japanese White Eyes were observed at the Point K as the site is near Hong Kong Zoological and Botanical Gardens where the vegetation cover is better and flora diversity is higher. The species is quit often foraging in groups in the wooded area including urban fringe habitat in Hong Kong. Point count L is located at coastal area where more food maybe available for birds and with larger open observable space, which may explain more birds were recorded at the site. The birds observed at various points were numbered from three to 13. Shannon species diversity index varied from 0.64 to 1.74 and the dominance value ranged from 0.19 to 0.56 among 12 point count sites (from A to L). The results indicated that the species abundance and diversity of birds was in a range from low to medium at various point count locations. Generally, all those proposed point count sites were located at urban fringe area and exposed to human disturbances such as traffic, construction, utility maintenance activities and etc.

3.4 Description of Study Sites

3.4.1 The study area starts from the middle of the northern part of Hong Kong island and extends toward the Cyber Port, west of Hong Kong island. Surface runoff will be collected at the proposed 37 intake point

and drained through a tunnel to the sea at the western outlet portal. The location and current condition of the 37 intake points and western outlet portal were presented in Figures 7-14. Figures 4-6 showed the plan map of the whole study area.

3.4.2 As all drainage intake points and outlet point are located along the fringe of urbanized area, most proposed works area was more or less disturbed and semi-natural with urban plantation flora species (urbanized area). Only a few works areas are comprised of natural habitats. In addition, most of the intake points have been modified to channel, concrete culvert or underground drains. All those rare or protected faunal species were recorded in a few intake points at western portion of the study area (Figures 7-14). In total, 116 flora species were recorded from all survey transects in the study area (Appendix 2).

3.4.3 The works area for all intake points and western outlet portal are described in Table 10.

Table 10 General description for each works area

Intake Point	Current status
Eastern Inlet Portal E4(P):	General descriptions: The Eastern Portal located at Tai Hang, Causeway Bay is the starting point of the proposed drainage tunnel (Figure 4). It has the largest catchment of all the intake points. In its upper section (Photo 16), there are two natural streams, one is flowing from the east and another is from the south (Photo 17). The eastern stream has a steep gradient and flows through a waterfall while the southern stream is flowing on level ground. The latter has a stream bed which consists of mixture of sand, boulder and rock substratum. When the two streams meet, the water flow to an underground channel (Photo 18). The section (about 20-30 meter in length) of stream course close to the portal location was more or less modified in the past due to urban development. Moreover, Approx. 150 meter in length is natural stream within works area. Habitats: The portal area and its surrounding are covered by woodland and urban developments include school, roads and residential buildings. Works area for Eastern Inlet Portal covers approx. 0.4ha of woodland (Photos 19 & 20). Flora and fauna: No rare or protected species was recorded within works area. Only common flora species was recorded within works area (see Appendix 2). Aquatic fauna survey was conducted at the stream. Some common stream organisms including macrobenthic stream fauna were recorded at the surveyed stream sites (see Appendix 4). In addition, common species of herpetofauna, butterfly and dragonfly were also recorded (see Tables 4 - 6).
E5(A)(P):	General descriptions: It is an underground drain with a small park above (Photo 21) next to Buddist Li Ka Shing Care and Attention Home for The Elderly. Habitats: The works area and its surrounding was covered by urbanized area. Flora and fauna: Common flora species was recorded within works area (see Appendix 2). No fauna was recorded within works area.
E5(B)(P):	General descriptions: E5(B)(P) is located adjacent to E5(A)(P). The stream is a waterfall with concrete bed (Photo 22). The stream was flowing with little water. The stream is probably polluted by dwellings upstream. Habitats: Similar to E5(A)(P), works area and its surrounding was covered by urbanized area. Flora and fauna: Common flora species (See Appendix 2) and one Green Cascade Frog were recorded (Table 4).

Intake Point	Current status
MB16:	General descriptions: A small open concrete culvert (Photo 23). No water flowing in the culvert. Woodland distributed in upstream catchment. The downstream section is piped underground. Habitats: Works area was covered by urbanized area. Woodland was located at southward outside the works area. Flora and fauna: Common flora species (see Appendix 2) and one Green Cascade Frog was recorded (see table 4).
MBD2:	General descriptions: Located to the southeast of MB16. Partly piped underground (Photo 24). Downstream flows beneath dwellings (Photo 25). Habitats: Works area was comprised of urbanized area. Flora and fauna: Common flora species were recorded (see Appendix 2).
THR2(P):	General descriptions: A natural stream (Photo 26) which flows adjacent to the Hong Kong Japanese School. The stream bed consists of rocky substrate. Flow volumes are substantial (Photo 27) and water is slightly polluted (Photo 28). Habitats: Woodland (Photo 29, 30) located at the eastern part grown with small to medium sized trees. The northern part is mainly urban area. Flora and fauna: common flora species was found within works area (see Appendix 2). Brackish water species of polycheate *Namalycastis aibiuma* was recorded in stream benthos (Appendix 4), indicating that the stream maybe influenced by brackish water discharged in the catchment. In addition, a common species of dragonfly Wandering Glider was recorded within works area (see Table 6).
E7(P)	General descriptions: Adjacent to the Marymount Secondary school. The substrate is stone and concrete (Photo 31). Little water is flowing in the stream. The stream is not accessible for sampling. The downhill section is piped underground. Habitats: Consist of channelised drainage. Flora and fauna: The works area is covered by grass and herbs. Common flora species was found within works area (see Appendix 2). In addition, a common species of

Intake Point	Current status
	dragonfly Wandering Glider was recorded within works area (see Table 6).
GL1(P)	General descriptions: At the northern slope of the Blue Pool Road. A patch of woodland (Photo 32) is included inside the works area. The upper stream (Photo 33) is flowing under Blue Pool Road. The stream bed is comprised mainly of stones. (Photo 34). The stream was dry at the time of survey. Habitats: Consist of urbanized area within works area. Small patch of woodland adjacent to the fringe of works area. Flora and fauna: Common flora species was found within works area (see Appendix 2). No other fauna was found inside the works area.
HR1	General descriptions: Located at the end of Ho Tong Road. The stream is channelised and concreted (Photo 35) and polluted. A small amount of polluted water flowing in the channel at the time of survey. Habitats: There is large patch of woodland (Photo 36) on the south of the works area. Other sections are urbanized area. Flora and fauna: Flora recorded were common species in Hong Kong (see Appendix 2). No fauna was recorded within works area.
DG1(P)	General descriptions: A narrow culvert (Photo 37) adjacent to the Villa Monte Rosa. The culvert is covered by concrete block. No water flowing inside the culvert. Habitats: Within the works site it is almost covered with climbers. Outside the works area there is woodland (Photo 38) to the southwest. Other sections are urban (Photo 39). Flora and fauna: Flora recorded were common species in Hong Kong (see Appendix 2). Common species of butterfly and dragonfly were found within works area (see Table 5 and Table 6). A rare bird *Garrulax pectoralis* was recorded near the works area (see Appendix 5)
WO(P)	General descriptions: An underground stream beneath the park (urbanized area) (Photo 40, 41). Habitats: Whole works area is mainly urban. Some trees were planted within works area. A parcel of woodland is located at northern outside of the works area (Photo 42).

Intake Point	Current status
	Flora and fauna: Flora recorded were common species in Hong Kong (Appendix 2). No fauna was recorded at the time of survey.
BR3(P)	General descriptions: The whole works area is almost completely covered by climbers and is inaccessible without site clearance (Photo 44), The stream can only be observed at a distance. No flow was heard, suggesting that the stream was dry. Habitats: The habitat surrounding the works area consists mainly of shrubland (Photo 43). Only small area is covered by woodland. The surrounding habitat outside works area includes woodland and urban areas (Photo 45). Flora and fauna: Flora recorded were common species in Hong Kong (see Appendix 2). Common species of butterfly were found within works area (see Table 5 and Table 6).
BR4(P)	General descriptions: Located at a playground (Photo 46). The stream flows along a small concrete drain and was almost dry during the survey. Habitats: The habitat within works site is a wooded site and woodland is surrounding the works area (Photo 47). Flora and fauna: Common flora species were recorded within works area (see Appendix 2). In addition, common species of butterfly were recorded between BR3 and BR4 (see Table 5). Moreover, a Chinese gecko was recorded at BR4 (see Table 4).
W1	General descriptions: Downstream of Wan Chai Gap Road and located behind some dwellings. (Photo 48). In the works area, the stream flows from a channelised stream into an underground concrete culvert (Photo 49). Habitats: Within the works area, the habitat is comprised of woodland and urbanized area. Flora and fauna: Common species of flora species were recorded within works area (see Appendix 2). In addition, several species of butterfly (see Table 5) and dragonfly (see Table 6) were recorded within works area.
BR5(P)	General descriptions: The works area is to the south of the Bowen Road. The stream has a steep gradient and flows through a series of waterfalls and riffles (Photo 50). The rate of water flow is moderate.

Intake Point	Current status
	Habitats: Woodland dominates both the works area and the surrounding areas. Flora and fauna: Common species of flora species were recorded within works area (see Appendix 2). In addition, several species of butterfly (see Table 5) and dragonfly (see Table 6)were recorded between BR5 and BR7.
BR6(P)	General descriptions: The site is to the west of BR5(P). Works area is located on a steep slope. The stream has dried up during field survey (Photo 51). Habitats: Woodland is the dominant habitat and extends outside of the works area (Photo 52). Flora and fauna: Common species of flora species were recorded within works area (see Appendix 2). Common species of butterfly (Table 5) and dragonfly were recorded between BR5 and BR7 (Table 6).
BR7(P)	General descriptions: The stream is adjacent to BR6(P). The main stream flows in a concrete culvert (Photo 53). The water is polluted and malodorous. Another dried up channel was found joining the main stream (Photo 54). Habitats: The habitat mostly the urbanized area with some planted trees. Small portion of woodland located at southward. Flora and fauna: Common species of flora species were recorded within works area (see Appendix 2). Common species of butterfly (see Table 5) and dragonfly (see Table 6) were recorded between BR5 and BR7.
W3(P)	General descriptions: Located in front of Electricity Supply building in Kennedy Road. It receives flows from two streams. The stream is lined with concrete. (Photo 55). Habitats: The works area is comprised of urbanized area with some planted trees within works area (Photo 56). Flora and fauna: Common species of flora species were recorded within works area (see Appendix 2). No fauna was recorded within works area.
B2(P)	General descriptions: A dry culvert (Photo 57). Its upper section is underground (Photo 58).

Intake Point	Current status
	Habitats: The habitat within and towards northern part of the works area is mainly woodland (Photo 59). Flora and fauna: Common flora species were recorded within works area (see Appendix 2). No fauna was recorded within works area.
MA13(P) and MA14(P)	General descriptions: Both intake points are dry (Photo 60 and 61). Upstream of MA13(P) is an underground culvert (Photo 63) while MA14(P) is an exposed culvert (Photo 64). Habitats: Woodland (Photo 62) is the major habitat within and outside the works area. Flora and fauna: Common flora species were recorded within works area (see Appendix 2). A common species of butterfly was recorded between MA13(P) and M3(P) (see Table 5).
MA15(P)	General descriptions: This intake point is adjacent to the MA14(P). The works area includes a small garden (Photo 65). The stream water flows under the garden and across Magazine Gap Road. At the south of the works area, the stream is flowing through a culvert (Photo 66) which has a steep gradient. Habitats: The habitats inside the works area are mainly woodland and a small garden (urbanized area). Outside the works area, the dominant habitats are woodland (Photo 67) and urbanized area. Flora and fauna: Common flora species were recorded within works area (see Appendix 2). A common species of butterfly was recorded between MA13(P) and M3(P) (Table 5).
MA17(P)	General descriptions: Located at the junction of May Road and Magazine Gap Road. The stream at this intake point is an artificial channel (Photo 68). It flows fast along a steep ravine. Habitats: The works area is mainly urbanized area with some plantation. Flora and fauna: Common flora species were recorded within works area (see Appendix 2). A common species of butterfly was recorded between MA13(P) and M3(P) (Table 5).
M3(P)	General descriptions:

Intake Point	Current status
	This intake point is on the slope by May Road. The stream substrate is concrete (Photo 69). Habitats: The eastern part of the works area is an artificial slope (urbanized area). Woodland is the dominant habitat at the southward outside the works area. Flora and fauna: Common flora species were recorded within works area (see Appendix 2). A common species of butterfly was recorded between MA13(P) and M3(P) (Table 5).
TP789(P)	General descriptions: This is a natural stream at eastern end of Tregunter Path. The stream is flowing along a series of waterfalls and riffles (Photo 70). The substrate consists of rock. Downstream of this intake point flows in a concrete culvert. (Photo 72). Habitats: Urbanized area with some plantation (Photo 71) is the dominant habitat within works area and along the Tregunter Path. A large woodland is located at southward outside the works area. Flora and fauna: Some flora species were recorded within works area (see Appendix 2). A protected flora species *Pavetta hongkongensis* was recorded within works area. In addition, A Green Cascade Frog (see Table 4) and Some common stream organisms including macrobenthic stream fauna (see Appendix 4) were recorded within works area.
TP5(P)	General descriptions: This intake point is adjacent to TP789(P). This section is natural (Photo 73) but downstream been culverted (Photo 74). Habitats: Urbanized area with some plantation (Photo 71) is the dominant habitat within works area and along the Tregunter Path. A large woodland is located at southward outside the works area. Flora and fauna: Common flora species were recorded within works area (see Appendix 2). No other fauna was recorded within works area.
TP4(P)	General descriptions: This is a narrow culvert (Photo 75). Stream water is flowing along the culvert and then under Tegunter Path. The condition of the downstream area (Photo 76) is the same as the works area. Habitats: Similar to TP789(P) and TP5(P), most area of TP4(P) is urbanized area with some planted trees. Only small area covered by woodland. (Photo 77). Flora and fauna:

Intake Point	Current status
	Common flora species were recorded within works area (see Appendix 2). No fauna was recorded within works area.
W5(P)	General descriptions: The works area is between Raimandi College and the Hong Kong Zoological & Botanical Garden. The stream at this intake point (Photo 78) runs underground. Habitats: The works area is currently a small garden (urbanized area) (Photo 79). Little vegetation is growing on it. Its upper stream is an artificial channel. The water is polluted (probably by dwellings nearby). The surrounding habitat is mainly recreation park (urbanized area). Flora and fauna: Common flora species were recorded within works area (see Appendix 2). However, There are two protected plant species recorded adjacent to the works area. They are *Sphaeropteris lepifera* (Photo 80) and *Angiopteris fokiensis* (Photo 81). They are protected under the Forestry Regulations of the Forests and Countryside Ordinance. No fauna was recorded within works area.
W8	General descriptions: This intake point is located inside an urban area. (**Photo 82**) There is an underground culvert and a toilet in the works area. Habitats: The works area is urbanized area. Flora and fauna: Common flora species was recorded (see Appendix 2). No fauna was recorded.
RR1(P)	General descriptions: Both the up and down-stream sections are underground culverts. (**Photo 83**). Habitats: The works area is currently a car park. Little vegetation is growing on it. Flora and fauna: Common flora species was recorded (see Appendix 2). No fauna was recorded.
P5(P)	General descriptions: The intake point is located at the Po Shan Road. The stream inside the works area is flowing along a concrete channel (**Photo 84**). The volume of flowing water is small. Habitats: Habitats are mostly shrubland (**Photo 85**) and some urbanized areas Flora and fauna:

Intake Point	Current status
	Common flora species was recorded (see Appendix 2). There are 3 Lesser Spiny Frog recorded within works area (see Table 4). The species is considered with conservation value.
W11(P)	General descriptions: The works area is in front of a fire station. The stream is channelised (**Photo 86**). Only small amount of water flowing in the stream at the time of survey. Habitats: The habitat within and outside the works area consists of woodland **(Photo 87)**. The western side of the works area is urbanized. Flora and fauna: Common flora species was recorded (see Appendix 2). No fauna was recorded.
W10	General descriptions: Located adjacent to The Hong Kong University Lodge. The stream flows underground through the works area (**Photo 88**). The works area itself is currently a small garden. Downstream is also channelised (**Photo 89**). Habitats: The works area is entirely comprised of urbanized areas with some planted vegetation. Flora and fauna: Common flora species was recorded (see Appendix 2). No fauna was recorded.
HKU1(P)	General descriptions: A channelised stream (**Photo 90**) adjacent to Chow Yei Chiang Building. Constant water was flowing though the channel at the time of survey. Habitats: Works area is mainly comprised of urbanized area with some planted trees. A small portion of woodland located at the southern part of works area. Southward outside the works area is mainly woodland area. Flora and fauna: Common flora species was recorded within works area (Appendix 2). However, *Artocarpus hypargyreus* and *Pavetta hongkongensis* were recorded near the works area. They are protected species in China and in Hong Kong respectively. In addition, common species of butterfly was recorded within the works area (see Table 2).
PFLR1(P)	General descriptions: Adjacent to the northern part of the Pokfulam playground. The natural stream flows through a series of waterfalls and riffles until it enters an underground drain (**Photo 91**). The stream bed consists of a rocky and sandy substrate. Habitats: The habitat within the works area is comprised of urban areas (**Photo 92, 93**) with some planted trees.

Intake Point	Current status
	Flora and fauna: Common flora species was recorded within works area (Appendix 2). Butterfly and dragonfly was recorded within works area (see Table 5 and 6). Aquatic fauna survey was conducted at the stream. Some common stream organisms including a few macrobenthos were recorded at the surveyed stream sites (see Appendix 4). At the upstream outside works area, both Hong Kong Cascade Frog and Green Cascade Frog was recorded and the former is a protected species in Hong Kong (Table 4).
W12(P)	General descriptions: This intake point is located to the south of the Pokfulam playground. The stream with fast flowing water (**Photo 94**) and its upper part is a cascading stream. Habitats: The habitat is urbanized area (**Photo 94**). Flora and fauna: Common flora species was recorded within works area (see Appendix 2). Butterfly and dragonfly was also recorded (Table 5 and 6). Some macrobenthic stream fauna were also recorded (see Appendix 4) from aquatic fauna survey. Hong Kong Cascade Frog was recorded. It is a protected species in Hong Kong (see Table 4). In addition, Two individuals of Greater Short Noised Fruit Bat (*Cynopterus sphinx sphinx)* were found roosting under one of the palm trees *Livistona chinensis* about 60 meters away from the works area.
Western outlet portal	General descriptions: This area is located at the Cyber Port, west of the Hong Kong Island. It is the only outlet of the proposed drainage system. There are two streams adjacent but outside the works area (**Photo 95, 96**). Both streams are modified and were dry during the survey. Habitats: The works area is located outside of the woodland **(Photo 97**). The works area was partially artificial shore and partially hydroseeded slope as well as urbanized area. The construction activities (road works) in the outlet area were completed as noticed during recent site visit in March 2005. Flora and fauna: Common flora species was recorded within works area (Appendix 2). In addition, common species of butterfly and inter-tidal fauna (Table 5 and Appendix 3) were recorded at the time of survey.

3.5 Evaluation of Species and Habitat of Conservation Importance

3.5.1 Based on criteria set in Annex 8 in Technical Memorandum of Hong Kong EIA Ordinance, ecological evaluation of various habitats and some flora and fauna species with ecological interests was performed and presented in Tables 11 – 17.

3.5.2 The overall evaluation of ecological value for stream/channel habitat is given in Table 11.

Table 11 Evaluation of ecological value of stream/channel.

Naturalness	Streams where the proposed drainage works would be take place are generally disturbed or totally or partially modified due to urban development, drainage or road works done in the history. Down streams are generally channelised or covered as result of urban development on the northern Hong Kong island. While upper streams are generally unmodified. Therefore, the likely affected stream sections are generally low in naturalness.
Size	Most of the streams are small with depth of flowing water less than 0.1m and are likely seasonal or temporal. Stream flow would dry up during dry season for most of the small streams. Stream Eastern Portal Inlet at Tai Hang is a medium sized stream with channel width varied from two to five meters, and stream flow is likely permanent. The stream section (approx. 60m in length) at the portal site was semi-natural in nature and was partially channelised and old dams built in the past for water diversion purpose were still remained on the stream bed.
Diversity	Species diversity of the stream/channel is low due to small size, seasonal feature (most of streams) and pest control chemicals used in the stream catchment areas with residential buildings. Results of fauna surveys indicated that a few sites at Eastern Portal Inlet, THR2(P) and W12 was relatively higher in species diversity when compared with the other surveyed streams.
Rarity	The streams found within study area are common in Hong Kong.
Re-creatability	Natural stream is difficult to be re-created.
Fragmentation	Lower reaches of stream/channel are highly fragmented due to drainage, road works and other urban developments. All lower streams were channelised and covered before discharge to Victoria Harbour.
Ecological linkage	Ecological linkage at the likely affected stream sections are low because habitat fragmentation in the lower stream course mentioned above.
Potential value (breeding habitat and aquatic life)	● High for streams at PFLR1 and W12 as these streams inhabited by protected species Cascade Frog (*Amolops hongkongensis*). They are also breeding sites for the frog species. ● Medium for streams at Eastern Portal Inlet, P5 where aquatic fauna including fish, dragonfly larvae were found. Lesser Spiny Frog (*Paa exilispinosa*) was recorded at P5. ● Low for other streams since they are either temporal in water flow or scarce for aquatic life.
Nursery/breeding ground	● Streams at PFLR1 and W12: nursery/ breeding ground for the amphibian (Cascade Frog (*Amolops hongkongensis*). ● P5: Lesser Spiny Frog (*Paa exilispinosa*) breeding site. ● Eastern Inlet Portal, THR2(P) and W12: potential nursery and breeding sites for some invertebrates.
Age and species composition.	Age is not determined. Generally, the species composition is low for most streams.
Abundance/Richness of wildlife	Low to medium; varied among sites. Fauna groups: Medium in stream benthos at Eastern Inlet Portal , THR2(P) and W12;

	Medium in Amphibian and dragonfly Low in fish and butterfly
Overall Ecological value	Low to Medium

3.5.3 Table 12 to 16 showed the evaluation of ecological importance for natural woodland, fung shui woodland, shrubland, urban plantation and inter-tidal habitat. In addition, Table 17 shows the evaluation of floral species with ecological interest within the study area.

Table 12 Evaluation of ecological value of natural woodland.

Naturalness	Medium to high: The woodland is generally natural secondary woodland and dominated by native species. However, some fringe area of the woodland (where the proposed drainage intakes located) are generally disturbed and some localities at the Cyberport and area along Bowen road was disturbed by construction works.
Size	Approximate 266 ha in total within the study area
Diversity	Species diversity for flora is high within study area.
Rarity	Medium: secondary woodland in Hong Kong is limited and decreasing due to urban development. *Artocarpus hypargyreus* and *Pavetta hongkongensis* was found inside the natural woodland. They are protected in mainland china and in Hong Kong respectively. They are distributed occasionally inside the natural woodland.
Re-creatability	Difficult.
Fragmentation	Fragmented by urban development including roads, drainage and residential buildings.
Ecological linkage	Linked with urban green areas, shrubland and other habitats including streams.
Potential value	The potential value is high because relatively higher in biodiversity for vegetation community with dominated native plant species and it also supported a richer associated fauna including birds.
Nursery/breeding ground	The woodland provides nursery and breeding ground for fauna species such as bird, mammal and various of invertebrates.
Age and species composition.	The woodland in Hong Kong island has being developed since 1940s after the World War II and hence it aged about 60 years. While, the affected habitats were generally disturbed by construction activities of various urban developments such as channelisation and slope works. Therefore, age of those habitats was much younger and variable. The species composition is generally high within study area and with many planted species.
Abundance/Richness of wildlife	Medium to high species richness/abundance for flora. Medium in bird, amphibian and butterfly Low in dragonfly
Overall Ecological value	The woodland within the study area is evaluated as medium to high ecological importance.

Table 13 Evaluation of ecological value of Fung Shui woodland.

Naturalness	Semi-Natural habitat.
Size	Approximate 28 ha in total within the study area
Diversity	Diversity of the flora species is medium.
Rarity	Fung Shui woodland in Hong Kong is rare.
Re-creatability	The fung shui woodland has established at least 100 years. It is difficult to be re-created.
Fragmentation	The surrounding area was fragmented by urban development.
Ecological linkage	The fung shui woodland is linked to natural woodland and stream course.
Potential value	The potential value is high because relatively higher in biodiversity for vegetation community with dominated native plant species and it also

	supported a richer associated fauna, in addition to its ethic value.
Nursery/breeding ground	The fung shui woodland provides nursery and breeding ground for fauna species such as bird, mammal and various invertebrates.
Age and species composition.	The fung shui woodland at cyberport was established by villager at least 100 years. The habitat is Semi-natural and dominated by native species. The plant *Ulmus parvifolia* recorded is a rare species in Hong Kong.
Abundance/Richness of wildlife	Medium in avi-bird and flora; Low in dragonfly, amphibian and butterfly
Overall Ecological value	High

Table 14 Evaluation of ecological value of urban plantation including road, village, construction site, grave site and recreational park).

Naturalness	Low.
Size	Approximate 570 ha in total within the study area
Diversity	The species diversity is low to medium.
Rarity	Low: All species found for urban plantation are widespread in Hong Kong.
Re-creatability	Plantation habitat is easy to be re-created generally.
Fragmentation	Highly fragmented habitat due to urban developments.
Ecological linkage	Linked with other habitats including woodland.
Potential value	Low.
Nursery/breeding ground	Low.
Age and species composition.	Age varied depend on land use history. Plant species composition was dominated by exotic species
Abundance/Richness of wildlife	Abundance/Richness of wildlife is low.
Overall Ecological value	Overall Ecological value is low.

Table 15 Evaluation of ecological value of shrubland.

Naturalness	Most area of the shrubland is natural except one near intake point (P5) which is an engineered slope.
Size	Approximate 47 ha in total within the study area.
Diversity	The diversity is low to medium for flora
Rarity	Shrubland is common habitat in Hong Kong.
Re-creatability	The shubland could be re-created.
Fragmentation	Some areas were fragmented by road or other urban developments.
Ecological linkage	Generally, most area of shrubland is linked with the woodland area.
Potential value	Low to medium.
Nursery/breeding ground	The shrubland provides potential nursery/breeding ground for some animals such as birds and invertebrates.
Age and species composition.	Young and flora species composition was mainly native.
Abundance/Richness of wildlife	Low
Overall Ecological value	Low to medium

Table 16 Evaluation of ecological value of inter-tidal habitat.

Naturalness	Low. Large proportion of of the tidal area was disturbed by land reclamation and construction works nearby.
Size	Approximate 0.3 ha in total within the study area.
Diversity	The diversity is low for fauna
Rarity	Common habitat in Hong Kong.
Re-creatability	Re-creatable, but constraint by land availability.
Fragmentation	Unfragmented.
Ecological linkage	Generally, it is linked with open sea and upper shore shrubland.
Potential value	Low to medium.
Nursery/breeding ground	The habitat provides potential nursery/breeding ground for some inter-tidal animals such as snails, crustaceans and other invertebrates.
Age and species composition.	Young for reclaimed section, old for natural shore section. The species composition is low at inter-tidal habitat due to human disturbance.
Abundance/Richness of wildlife	Low.
Overall Ecological value	Low.

Table 17 Evaluation of flora and fauna species with ecological interest recorded within the study area during ecological baseline surveys in 2003.

Species	Growth Form	Location	Protection status	Distribution	Rarity
Pavetta hongkongensis	Shrub	TP789, HKU1	Forestry Regulations (Cap. 96 sub. Leg.)	Widely distributed in Hong Kong	Occasionally seen in Hong Kong
Artocarpus hypargyreus	Tree	HKU1 (and other woodland)	1) China 3rd Class Protected 2) 'Vulnerable' in the China Plant Red Data Book.	Widely distributed in Hong Kong	Occasionally seen in Hong Kong
Sphaeropteris lepifera	Tree Fern	W5	Forestry Regulations (Cap. 96 sub. Leg.)	Hong Kong Island	Rare
Angiopteris fokiensis	Fern	W5	Forestry Regulations (Cap. 96 sub. Leg.)	Hong Kong Island and Tai Mo Shan	Rare
Amolops hongkongensis	Amphibian	PFLR1(P), W12(P)	Wild Animals Protection Ordinance (Cap 170)	Hong Kong Island and New Territories	Common
Paa exilispinosa	Amphibian	P5(P)	Not protected	Widespread in swift-flowing hill and mountain streams, particularly those with cascading water	Fairly common in Hong Kong, considered potential global concern
Garrulax pectoralis	Bird	DG1(P)	Wild Animals Protection Ordinance (Cap 170)	Hong Kong Island and New Territories	Rare
Buteo buteo	Bird	Western outlet portal	1) Wild Animals Protection Ordinance (Cap 170) 2) Class II Protected Animal in PRC CITES Appendix II	Distribute widely in Hong Kong, can be in many types of habitats.	Common/uncommon
Milvus lineatus	Bird	Everywhere within study area	1) Wild Animals Protection Ordinance (Cap 170) 2) Class II Protected Animal in PRC CITES Appendix II	Distribute widely in Hong Kong, can be in many types of habitats.	Common
Cynopterus sphinx sphinx	Mammal	Two individuals roosted at	Wild Animals Protection Ordinance	Widespread localities in the New	Uncommon to common

Species	Growth Form	Location	Protection status	Distribution	Rarity
		a Chinese Fan Palm near W12(P)	(Cap 170)	Territories and Hong Kong Island	
Callosciurus erythraeus styani	Mammal	Found in the woodland habitats adjacent to BR3(P)-BR4(P), BR5(P)-BR7(P), HKU1(P), W11(P), W10, W12(P) and PFLR1(P)	Wild Animals Protection Ordinance (Cap 170)	Scattered localities in the New Territories and Hong Kong Island	Uncommon
Ulmus parvifolia	Tree	Western Outlet Portal (recorded in EIA report, Environs 1999)	Not protected	(The species is not listed in Hong Kong Plant Check List, published in 2004)	Rare in Hong Kong

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Appendix

Appendix 6. Avi-fauna recorded in North Hong Kong Island at varous Point Count locations.

				Point	A	B	C	D	E	F	G	H	I	J	K	L
Common Name	**Scientific Name**	**Chinese Name**	**Status***	**Commonness**												
Black faced Laughing Thrush	*Garrulax perspicillatus*	黑臉噪鶇	R	Common											**1**	
Black Kite	*Milvus lineatus*	麻鷹	R	Common	**2**			**2**		**2**	**1**	**2**	**2**	**1**		**2**
Chinese Bulbul	*Pycnonotus sinensis*	白頭鵐	R	Common	**2**			**1**	**1**	**2**	**1**	**1**	**2**	**3**	**1**	**2**
Crested bulbul	*Pycnonotus jocosus*	紅耳鵐	R	Common	**1**			**2**	**2**	**2**	**1**		**4**	**3**	**1**	**4**
Grey Wagtail	*Motacilla cinerea*	灰鶺鴒	WV	Common												**2**
Japanese White Eye	*Zosterops japonica(simplex)*	暗綠繡眼鳥(相思)	R	Common		**1**		**1**	**4**	**2**			**2**	**1**	**4**	**1**
Jungle Crow	*Corvus macrorhynchus*	大咀烏鴉	R	Common												**2**
Spotted Dove	*Streptopelia chinensis*	珠頸斑鳩	R	Common		**1**	**2**	**2**								
Spotted Munia	*Lonchura punctulata*	斑文鳥	R	Uncommon	**1**											
Tree Sparrow	*Passer montanus*	麻鵲	R	Common	**2**	**3**	**2**	**1**	**2**							
Yellow crested cockatoo	*Cacatua sulphurea*	鳳頭鸚鵡	I	Uncommon	**1**											
			No of individual		**9**	**5**	**4**	**9**	**9**	**8**	**3**	**3**	**10**	**8**	**7**	**13**
			No of species		**6**	**3**	**2**	**6**	**4**	**4**	**3**	**2**	**4**	**4**	**4**	**6**
			Shannon index		**1.735**	**0.95**	**0.693**	**1.74**	**1.273**	**1.39**	**1.1**	**0.64**	**1.332**	**1.26**	**1.15**	**1.712**
			Dominance		**0.185**	**0.44**	**0.5**	**0.19**	**0.309**	**0.25**	**0.33**	**0.56**	**0.28**	**0.31**	**0.39**	**0.195**

Note:
"R" represent Resident bird
"WV" represent Winter visiting bird
"I" represent immigrant bird
Numerical numbers represent actual observation of species

Appendix 2. Flora species recorded at various works area in North Hong Kong Island in 2003.

				Survey Site	Eastern Inlet Portal E4(P)	E7(P)	WO(P)	W11(P)	W12(P)	MBD2	THR2(P)	HR1	GL1(P)	DG1(P)	BR3(P)	BR4(P)	MA13(P) & MA14(P)	MA15(P)	MA17(P)	M3(P)	TP789(P)	TP5(P)	RR1(P)	P5(P)	HKU1(P)	PFLR1(P)	E5(A)(P)	E5(B)(P)	MB16	W1	BR(5)	BR6(P)	BR7(P)	W3(P)	B2(P)	TP4(P)	W5(P)	W8	W10	W11(P)	Outer portal
Family 科名	Species 种名	Chinese name 中文名	Tree form	status(N/E)																																				
Agavaceae	*Cordyline fruticosa*	朱蕉(鐵樹)	*SH*	*E*	1																																1		
Alangiaceae	*Alangium chinense*	八角楓	*T*	*N*		1					1				1	1											1												
Anacardiaceae	*Choerospondias axillaris*	酸枣	*T*	*N*		1							1						1						1				1	1									
Anacardiaceae	*Rhus hypoleuca*	白背漆	*SH/T*	*N*																																			1
Anacardiaceae	*Rhus succedanea*	野漆树	*SH/T*	*N*		1				1												1						1											1
Anacardiaceae	*Mangifera indica*	杧果	*T*	*E*																													1						
Annonaceae	*Desmos chinensis*	假鹰爪	*SH*	*N*																		1		1	1														
Annonaceae	*Uvaria macrophylla*	紫玉盘	*C*	*N*							1																					1							
Apocynaceae	*Nerium oleander*	夹竹桃	*SH*	*E*		1																																	
Araceae	*Alocasia macrorrhiza*	海芋	*SH*	*N*	1	1		1			1				1	1	1	1		1	1			1	1	1	1	1	1	1		1		1	2	1	1		1	1	
Araliaceae	*Schefflera heptaphylla*	鴨腳木	*SH/T*	*N*						1	1		1			1	1		1													1							
Arecaceae	*Archontophoenix alexandrae*	假槟榔	*T*	*E*														1																					
Arecaceae	*Caryota ochlandra*	鱼尾葵	*T*	*E*			1											2					1																
Arecaceae	*Chrysalidocarpus lutescens*	散尾葵	*T*	*E*			1																1				1											1		
Arecaceae	*Daemonorops margaritae*	黃藤	*C*	*N*											1																								
Arecaceae	*Livistona chinensis*	蒲葵	*T*	*E*			1																											1					
Arecaceae	*Phoenix hanceana*	刺葵(风凰棕)	*SH*	*N*																														1					
Asteraceae	*Mikania micrantha*	薇甘菊	*C*	*E*	1			1			1				3		1							1			1	1											1	
Asteraceae	*Wedelia chinensis*	蟛蜞菊	*C*	*N*																																	1			
Asteraceae	*Erechtites hieracifolia*	梁子菜(革命菜)	*SH*	*E*							1																													
Blechnaceae	*Blechnum orientale*	烏毛蕨	*F*	*N*																									1										
Bombacaceae	*Bombax ceiba*	木棉	*T*	*E*			1																			1													
Caesalpiniaceae	*Bauhinia championi*	缺茎藤	*C*	*N*		1									2																								
Caesalpiniaceae	*Bauhinia sp.*	羊蹄甲	*SH/T*	--															1						1	1													1	
Caesalpiniaceae	*Bauhinia purpurea*	紅花羊蹄甲　紫花	*SH/T*	*E*			1	1																															
Caesalpiniaceae	*Delonix regia*	鳳凰木	*T*	*E*	1		1																																
Caricaceae	*Carica papaya*	番木瓜（万寿果）	*SH*	*E*	1	1																	1	1													1			
Casuarinaceae	*Casuarina equisetifolia*	木麻黄	*T*	*E*						1																														
Convolvulaceae	*Ipomoea cairica*	五爪金龍	*C*	*N*																						1													
Cyperaceae	*Cyperus flabelliformis*	風車草	*SH*	*E*																										1									
Cyperaceae	*Kyllinga brevifolia*	水蜈蚣	*SH*	*N*																																		1	
Euphorbiaceae	*Aleurites moluccana*	石栗	*T*	*E*	1		1						1										1			1													
Euphorbiaceae	*Aporusa dioica*	銀柴	*SH*	*N*																1				1									1		1					1
Euphorbiaceae	*Bridelia tomentosa*	土密樹(逼迫仔)	*SH*	*N*							1					1														1		1		1					
Euphorbiaceae	*Macaranga tanarius*	血桐	*T*	*N*	1	1			1	1	1			1										1	1	1	2	1			2	1							2
Euphorbiaceae	*Mallotus paniculatus*	白楸	*SH/T*	*N*	1	1		1		1	1	1	1	1	1				1	1			1	1				1				1						1	1
Euphorbiaceae	*Sapium discolor*	山乌桕	*SH/T*	*N*																																			1
Euphorbiaceae	*Bischofia polycarpa*	重陽木	*T*	*E*																1																1			
Fabaceae	*Ormosia emarginata*	凹葉紅豆	*T*	*N*							1																												
Fabaceae	*Pueraria lobata*	野葛	*C*	*N*				1																														1	
Fagaceae	*Cyclobalanopsis neglecta*	竹葉青剛(竹葉櫟)	*T*	*N*							1																												
Fagaceae	*Cyclobalanopsis glauca*	青剛(青剛櫟)	*T*	*N*																																			1
Gnetaceae	*Gnetum lofuense*	買麻藤（山白果）	*C*	*N*																				1	1			1				1							
Gramineae	*Lophatherum gracile*	淡竹叶	*SH*	*N*	1																			1															
Gramineae	*Microstegium ciliatum*	刚秀竹	*G*	*N*																													1						
Gramineae	*Panicum maximum*	大黍	*G*	*E*																						1													
Gramineae	*Bambusa sp.*	竹	*SH*		1								1			1						1																	
Gramineae	*Bambusa tuldoides*	青竿竹	SH		1																																		
Guttiferae	*Cratoxylum cochinchinense*	黃牛木	*SH/T*	*N*																											1			1					1
Lauraceae	*Cinnamomum burmanni*	陰香	*SH/T*	*N*																1																			
Lauraceae	*Cinnamomum camphora*	樟樹	*T*	*N*			1	1																1													1		1
Lauraceae	*Litsea glutinosa*	潺槁樹	*SH/T*	*N*	1																			1				1											1
Lauraceae	*Litsea monopetala*	假柿樹	*T*	*N*	1			1			1	1	1				2	1			1			1				2	1			1	1	2			1	1	
Lauraceae	*Litsea rotundifolia*	豺皮樟	*SH*	*N*							1																												1
Lauraceae	*Machilus chinensis*	華潤楠(香港楠)	*SH/T*	*N*						1	1		1																			1							
Lauraceae	*Machilus velutina*	絨毛潤楠	*SH/T*	*N*																1												1		1	1				
Lythraceae	*Lagerstroemia speciosa*	洋紫薇(大花紫薇)	*T*	*E*																																			
Magnoliaceae	*Michelia alba*	白蘭	*T*	*E*	1																															1			
Mimosaceae	*Acacia confusa*	台灣相思	*T*	*E*						1	1																												
Mimosaceae	*Albizia lebbeck*	大葉合歡	*SH*	*E*			1																		1														
Mimosaceae	*Leucaena leucocephala*	銀合歡	*SH*	*E*	1	1				1	1		1														1		1										
Moraceae	*Artocarpus hypargyreus*	白桂木	*T*	*N*									1				1																						
Moraceae	*Broussonetia papyrifera*	構樹	*SH*	*N*	1							2						1	1	1			1	1									1		1		1	1		
Moraceae	*Ficus simplicissima*	五指毛桃	*SH*		1																																		
Moraceae	*Ficus elastica*	印度橡樹	*T*	*E*	1				1					2																									
Moraceae	*Ficus hispida*	對葉榕	*SH*	*N*	1			1			1		1			1	1								1		1	1	1					1				1		
Moraceae	*Ficus microcarpus*	細葉榕	*SH/T*	*N*	1													1								1		1				1					1	1	
Moraceae	*Ficus superba*	筆管榕	*SH/T*	*N*	1					1																													
Moraceae	*Ficus tinctoria*	斜葉榕(水榕)	*SH*	*N*	1																																		

Appendix 2. Flora species recorded at various works area in North Hong Kong Island in 2003.

				Survey Site	Eastern Inlet Portal E4(P)	E7(P)	WO(P)	W11(P)	W12(P)	MBD2	THR2(P)	HR1	GL1(P)	DG1(P)	BR3(P)	BR4(P)	MA13(P) & MA14(P)	MA15(P)	MA17(P)	M3(P)	TP789(P)	TP5(P)	RR1(P)	P5(P)	HKU1(P)	PFLR1(P)	E5(A)(P)	E5(B)(P)	MB16	W1	BR(5)	BR6(P)	BR7(P)	W3(P)	B2(P)	TP4(P)	W5(P)	W8	W10	W11(P)	Outer portal
Moraceae	*Ficus variegata*	青果榕	*SH/T*	*N*					1		1		1													1			1				1	1	1				1		
Moraceae	*Ficus virens*	大葉榕	*SH/T*	*N*																			1							2										
Musaceae	*Musa paradisiaca*	大蕉（甘蕉）	*SH*	*E*							1	3	1															1	1											
Myrsinaceae	*Maesa perlarius*	鱧魚胆	*SH*	*N*							1																													
Myrtaceae	*Syzygium cumini*	海南蒲桃（毒狗药）	*SH*	*E*																										1										
Myrtaceae	*Syzygium jambos*	蒲桃	*SH*	*E*																									1						1					
Nyctaginaceae	*Bougainvillea spectabilis*	勒杜鹃	*SH*	*E*																																				1
Oleaceae	*Ligustrum sinense*	山指甲	*SH*	*N*	1				1		1																								1					
Pinaceae	*Pinus massoniana*	馬尾松	*T*	*N*																																				2
Podocarpaceae	*Podocarpus macrophyllus*	羅漢松	*T*	*E*																																				
Polygonaceae	*Polygonum chinense*	火炭母(五毒草)	*SH*	*N*																														1						
Rosaceae	*Raphiolepis indica*	車輪梅（春花）	*SH*	*N*							1																													1
Rosaceae	*Rubus reflexus*	锈毛莓(蛇泡筋)	*C*	*N*							1																													
Rubiaceae	*Antirhea chinensis*	毛茶	*SH*	*N*		1					1																		1											
Rubiaceae	*Diplospora dubia*	狗骨柴	*SH*	*N*																																1					
Rubiaceae	*Pavetta hongkongensis*	香港大沙茉（茜木）	*SH*	*N*																	1																			
Rubiaceae	*Psychotria asiatica*	九節（山大刀）	*SH*	*N*				1																	1					1				1					1	
Rutaceae	*Acronychia pedunculata*	降真香	*SH*	*N*																									1		1									
Rutaceae	*Citrus maxima*	柚	*SH*	*E*																				1																
Rutaceae	*Clausena lansium*	黃皮	*SH*	*E*																									1											
Sapindaceae	*Dimocarpus longan*	龍眼	*SH*	*E*	1												1												1											
Solanaceae	*Solanum nigrum*	龍葵	*SH*	*N*							1																													
Sterculiaceae	*Helicteres angustifolia*	山芝麻	*SH*	*N*																																				1
Sterculiaceae	*Sterculia lanceolata*	假蘋婆（七姐果）	*SH*	*N*	1	1		1		1	1		1					1		1					1					1	1	1	1	1					1	
Sterculiaceae	*Sterculia nobilis*	蘋婆（鳳眼果）	SH	*N*	1						1																													1
Theaceae	*Gordonia axillaris*	大頭茶	*SH*	*N*		1				1																														1
Thelypteridaceae	*Cyclosorus parasiticus*	華南毛蕨	*F*	*N*	1				1																1		1			1	1		1							
Thelypteridaceae	*Macrothelypteris torresiana*	普通针毛蕨	*F*	*N*	1																																			
Begoniaceae	*Begonia palmata*	秋海棠	*SH*	*E*	1																																			
Asteraceae	*Youngia japonica*	黃鹌菜	*SH*	*N*	1																																			
Oxalidaceae	*Oxalis corniculata*	酢浆草	*SH*	*N*	1						1																													
Urticaceae	*Pilea microphylla*	小叶冷水花	*SH*	*E*	1																																			
Athyriaceae	*Athyriopsis japonica*	假蹄盖蕨	*F*	*N*	1																																			
Commelinaceae	*Tradescantia zebrina*	水竹草	*SH*	*E*	1																																			
Apiaceae	*Hydrocotyle sibthorpioides*	天胡荽	*SH*	*N*	1																																			
Balsaminaceae	*Impatiens walleriana*	非洲凤仙	*SH*	*E*	1																																			
Pteridaceae	*Pteris ensiformis*	劍葉鳳尾蕨	*F*	*N*	1																																			
Thymelaeaceae	*Aquilaria sinensis*	牙香樹(土沉香)	*SH/T*	*N*																													1							
Tiliaceae	*Microcos paniculata*	布渣葉	*SH*	*N*		1				1																				1					1					1
Ulmaceae	*Celtis sinensis*	朴樹	*SH/T*	*N*	1	1		1	1	1	1		1			1		1			1				1			1	1	1	1			1	1			1	1	
Ulmaceae	*Celtis timorensis*	樟葉朴（假玉桂）	*SH/T*	*N*							1				1																									
Ulmaceae	*Trema tomentosa*	山黃麻	*SH*	*N*	1																																			
Urticaceae	*Boehmeria nivea*	苧麻	*SH*	*E*													1	1																1	1	1					
Urticaceae	*Boehmeria penduliflora*	密花苧麻	*SH*	*N*							1																														
Verbenaceae	*Lantana camara*	馬纓丹（如意草）	*SH*	*E*																										1					1					
Zingiberaceae	*Alpinia zerumbet*	艷山姜	*SH*	*N*				1												1				1									1	1	1				1	
Zingiberaceae	*Hedychium coronarium*	薑花	*SH*	*E*												1		1																						
	No. of species				39	15	9	12	6	13	31	4	14	3	7	8	8	10	5	9	4	3	6	8	12	10	11	9	17	10	9	7	13	12	16	8	5	2	9	11	18

Remark :

N = Native

E = Exotic

SH=Shrub

T=Tree

F=Fern

FT=Tree Fren

G=Grass

C=Climber

"1" represent species occurred in the study area

"2" represent species is common in the study area

"3" represent species very common in the study area

Appendix 3. Inter-tidal fauna recorded at various survey sites at Outlet Portal

Transect	1															2									
Location	Low tide					Middle tide					High tide					Low tide					Middle tide				
Section	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
Date	23sept,2003																								
Latin name																									
Saccostrea cucullata					15		3	2	1	2	3													1	
Ligia exotica				3		5	5	4		4				2							1	3	2		
Cellana grata	11	5	8	5	10											13									
Siphonaria sirius			25	20	20		2									6	3	2			4			2	3
Liolophura japonica				1																					
Telraclita squamosa				2	2					1															
Pollicipes mitella					13	16	8	15	28	24														5	12
c.f Morula musiva					1													1				4		2	1
Septifer bilocularis																									
Monodonta labio							4			1	1					5	3	6	4	6			2		2
c.f Euraphia withers									5		3														
Littoraria pallescens									2	1	1														
Nodilittorina pyramidalis									2	4	6	7	1												
Nerita chamaeleon																								4	

Appendix 3. Inter-tidal fauna recorded at various survey sites at Outlet Portal (cont')

Transect	2					3														
Location	High tide					Low tide					Middle tide					High tide				
Section	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
Date	23sept,2003																			
Latin name																				
Saccostrea cucullata																				
Ligia exotica					4					2	2									
Cellana grata						3														
Siphonaria sirius	1																			
Liolophura japonica																				
Telraclita squamosa						2														
Pollicipes mitella	5						15	12	16											
c.f Morula musiva							3			2										
Septifer bilocularis								3												
Monodonta labio						5	14	5	3	5	3									
c.f Euraphia withers																				
Littoraria pallescens	5	5	1								3									
Nodilittorina pyramidalis		14	3	6							2									
Nerita chamaeleon																				

Note:
Numerical numbers represent actual observation of species

Appendix 4. Macrobenthic stream fauna recorded at various survey sites at North Hong Kong Island

Faunal Group	Taxa	W12p	THR2(P)	TP789(P)	PFLR1 (P)	E4 (P)
Mollusk	*Sinotaia quadrata*					
	Biomphalaria straminea		5			
	Physella acuta		14			
	Melanoides tuberculata		11			
	Assiminea brevicula		2			
Crustacea	*Caridina cantonensis*				2	7
	Neocaridina serrata					3
Annelida	*Namalycastis aibiuma*		4			
Insecta						
Ephemeroptera	*Choroterpes sp.*					2
	Baetis sp.	5			1	5
	Indobaetis sp.					4
	Electrogena sp.					3
	Caenis sp.					1
Megaloptera	*Neochauliodes sp.*					1
Odonata	*Euphaea decorata*					4
	Zygonyx spp.	1				9
	Crocothemis sp.		1			
Trichoptera	*Cheumatopsyche sp.*			1		2
	Hydropsyche sp.					1
	Anisocentropus sp.					4
	Micrasema sp.					2
	Pseudoneureclipsis sp.					3
Hemiptera	*Gerris sp.*					2
Coleoptera	*Elmidae*					1
Diptera	*Orthorcladinae*				3	5
	Tanipodinae	6				3
	c.f. Limnophila sp. (Tipulidae)			1		
	Chironominae		5			
Heteroptera	*Enithares sp.*		2			
Amphibian (tadpole)	HK cascade Frog	1				
	Gunther's Forg					1
	Short Legged Toad					1
	Common Toad			1		
	No. of species	4	8	3	3	21
	No. of individual	13	44	3	6	64
	Dominance	0.3728	0.2025	0.3333	0.3889	0.06982
	Shannon index	1.119	1.79	1.099	1.011	2.833

Note:
Numerical numbers represent actual observation of species

Appendix 5. Avi-fauna recorded in North Hong Kong Island at varous Survey Transects.

				Transect Code	A	B	C	D	E	F	G	H	I	J	K	L	Total
Common Name	**Scientific Name**	**Status***	**Commonness**	**Chinese Name**													Number
Black faced Laughing Thrush	*Garrulax perspicillatus*	*R*	*Common*	黑臉噪鶥					3				3		3	3	12
Black Kite	*Milvus lineatus*	*R*	*Common*	麻鷹	2	2	1	3	3	6	3	2	3	1	2	3	31
Buzzaed	*Buteo buteo*	*WV*	*Common*	普通鵟												2	2
Chinese Bulbul	*Pycnonotus sinensis*	*R*	*Common*	白頭鵯	5	2	1	3	2	5	2	1	9	3	3	4	40
Japanese Bush Warbler	*Cettia diphone*	*WV*	*Uncommon*	日本樹鶯							1						1
Common Koel	*Eudynamis scolopacea*	*R*	*Common*	噪鵑											2	15	17
Common Tailorbird	*Orthotomus sutorius*	*R*	*Common*	長尾縫葉鶯	1		1	2	2	2	2		1				11
Crested bulbul	*Pycnonotus jocosus*	*R*	*Common*	紅耳鵯	4			4	3	5	3	1	12	1	2	8	43
Crested Myna	*Acridotheres cristatellus*	*R*	*Common*	八哥												14	14
Domestic pigeon	*Columba sp.*	*R*	*Common*	鴿	2			5									7
Great Tit	*Parus major(commixtus)*	*R*	*Common*	大山雀	2		1		2	2	1		2		2		12
Greater necklaced laughing thrush	*Garrulax pectoralis*	*R*	*Rare*	黑領噪鶥				5									5
Grey Wagtail	*Motacilla cinerea*	*WV*	*Common*	灰鶺鴒	1			1	1								3
House swift	*Apus nipalensis*	*R*	*Common*	小白腰雨燕						1			4			7	12
Japanese White Eye	*Zosterops japonica(simplex)*	*R*	*Common*	暗綠繡眼鳥(相思)	2	3	3	6	7	6	2	1	8	4	12	3	57
Jungle Crow	*Corvus macrorhynchus*	*R*	*Common*	大嘴烏鴉						1			2			6	9
Magpie Robin	*Copsychus saularis*	*R*	*Common*	鵲鴝	1			1	1	1	1		1	1	1		8
Rufous Turtle Dove	*Streptopelia orientalis*	*WV*	*Common*	山斑鳩				3									3
Rufous-backed Shrike	*Lanius schach*	*R*	*Common*	棕背伯勞												1	1
Silver eared mesia	*Leiothrix argentauris*	*I*	*Common*	銀耳相思鳥									3				3
Spotted Dove	*Streptopelia chinensis*	*R*	*Common*	珠頸斑鳩	2		4	3	2	2			2		1		16
Spotted Munia	*Lonchura punctulata*	*R*	*Common*	斑文鳥	3	3										5	11
Tree Sparrow	*Passer montanus*	*R*	*Common*	麻鵲	7		8	4	7				5	2		4	37
Violet Whistling Thrush	*Myiophoneus caeruleus (caeruleus)*	*R*	*Common*	紫嘯鶇				1		2		1				1	5
White Wagtail	*Motacilla alba*	*WV*	*Common*	白鶺鴒	2				2				2			2	8
White Backed Munia	*Lonchura striata*	*R*	*Common*	白腰文鳥					1				6				7
Yellow Browed Warbler	*Phylloscopus inormatus*	*WV*	*Common*	黃眉柳鶯									2				2
Yellow crested cockatoo	*Cacatua sulphurea*	*I*	*Common*	鳳頭鸚鵡	3					3	1		2		2		11
				No of species	14	4	7	13	13	12	9	5	17	6	10	15	28
				No of individual	37	10	19	41	36	36	16	6	67	12	30	78	388
				Length of transect	500	1100	1500	250	1600	1500	1900	700	1800	500	300	600	12250
				No of individual per 100 meter	7.4	0.9	1.3	16.4	2.3	2.4	0.8	0.9	3.7	2.4	10.0	13.0	3.2
				Shannon index	2.472	1.366	1.604	2.433	2.36	2.284	2.101	1.561	2.581	1.633	1.956	2.429	
				Dominance	0.0986	0.26	0.2576	0.0958	0.1142	0.1152	0.1328	0.2222	0.0933	0.2222	0.2044	0.1091	

Note:
"R" represent Resident bird
"WV" represent Winter visiting bird
"I" represent immigrant bird
Numerical numbers represent actual observation of species

Appendix 6. Avi-fauna recorded in North Hong Kong Island at varous Point Count locations.

				Point	A	B	C	D	E	F	G	H	I	J	K	L
Common Name	**Scientific Name**	**Chinese Name**	**Status***	**Commonness**												
Black faced Laughing Thrush	*Garrulax perspicillatus*	黑臉噪鶇	R	Common											**1**	
Black Kite	*Milvus lineatus*	麻鷹	R	Common	**2**			**2**		**2**	**1**	**2**	**2**	**1**		**2**
Chinese Bulbul	*Pycnonotus sinensis*	白頭鵐	R	Common	**2**			**1**	**1**	**2**	**1**	**1**	**2**	**3**	**1**	**2**
Crested bulbul	*Pycnonotus jocosus*	紅耳鵐	R	Common	**1**			**2**	**2**	**2**	**1**		**4**	**3**	**1**	**4**
Grey Wagtail	*Motacilla cinerea*	灰鶺鴒	WV	Common												**2**
Japanese White Eye	*Zosterops japonica(simplex)*	暗綠繡眼鳥(相思)	R	Common		**1**		**1**	**4**	**2**			**2**	**1**	**4**	**1**
Jungle Crow	*Corvus macrorhynchus*	大咀烏鴉	R	Common												**2**
Spotted Dove	*Streptopelia chinensis*	珠頸斑鳩	R	Common		**1**	**2**	**2**								
Spotted Munia	*Lonchura punctulata*	斑文鳥	R	Uncommon	**1**											
Tree Sparrow	*Passer montanus*	麻鵲	R	Common	**2**	**3**	**2**	**1**	**2**							
Yellow crested cockatoo	*Cacatua sulphurea*	鳳頭鸚鵡	I	Uncommon	**1**											
			No of individual		**9**	**5**	**4**	**9**	**9**	**8**	**3**	**3**	**10**	**8**	**7**	**13**
			No of species		**6**	**3**	**2**	**6**	**4**	**4**	**3**	**2**	**4**	**4**	**4**	**6**
			Shannon index		**1.735**	**0.95**	**0.693**	**1.74**	**1.273**	**1.39**	**1.1**	**0.64**	**1.332**	**1.26**	**1.15**	**1.712**
			Dominance		**0.185**	**0.44**	**0.5**	**0.19**	**0.309**	**0.25**	**0.33**	**0.56**	**0.28**	**0.31**	**0.39**	**0.195**

Note:
"R" represent Resident bird
"WV" represent Winter visiting bird
"I" represent immigrant bird
Numerical numbers represent actual observation of species

Photos

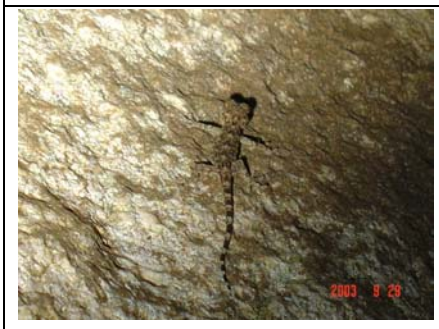
 Photo 1	 Photo 2	 Photo 3
 Photo 4	 Photo 5	 Photo 6
 Photo 7	 Photo 8	 Photo 9
 Photo 10	 Photo 11	 Photo 12

Photo 13

Photo 14

Photo 15

Photo 16

Photo 17

Photo 18

Photo 19

Photo 20

Photo 21

Photo 22

Photo 23

Photo 24


Photo 25


Photo 26

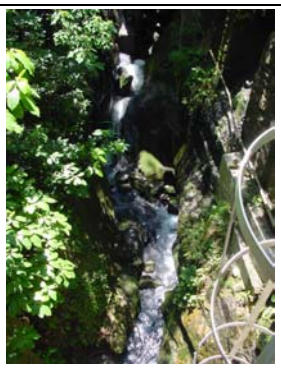


Photo 27


Photo 28


Photo 29


Photo 30


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Photo 32


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Photo 34


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Photo 41

Photo 42

Photo 43

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Photo 89


Photo 90

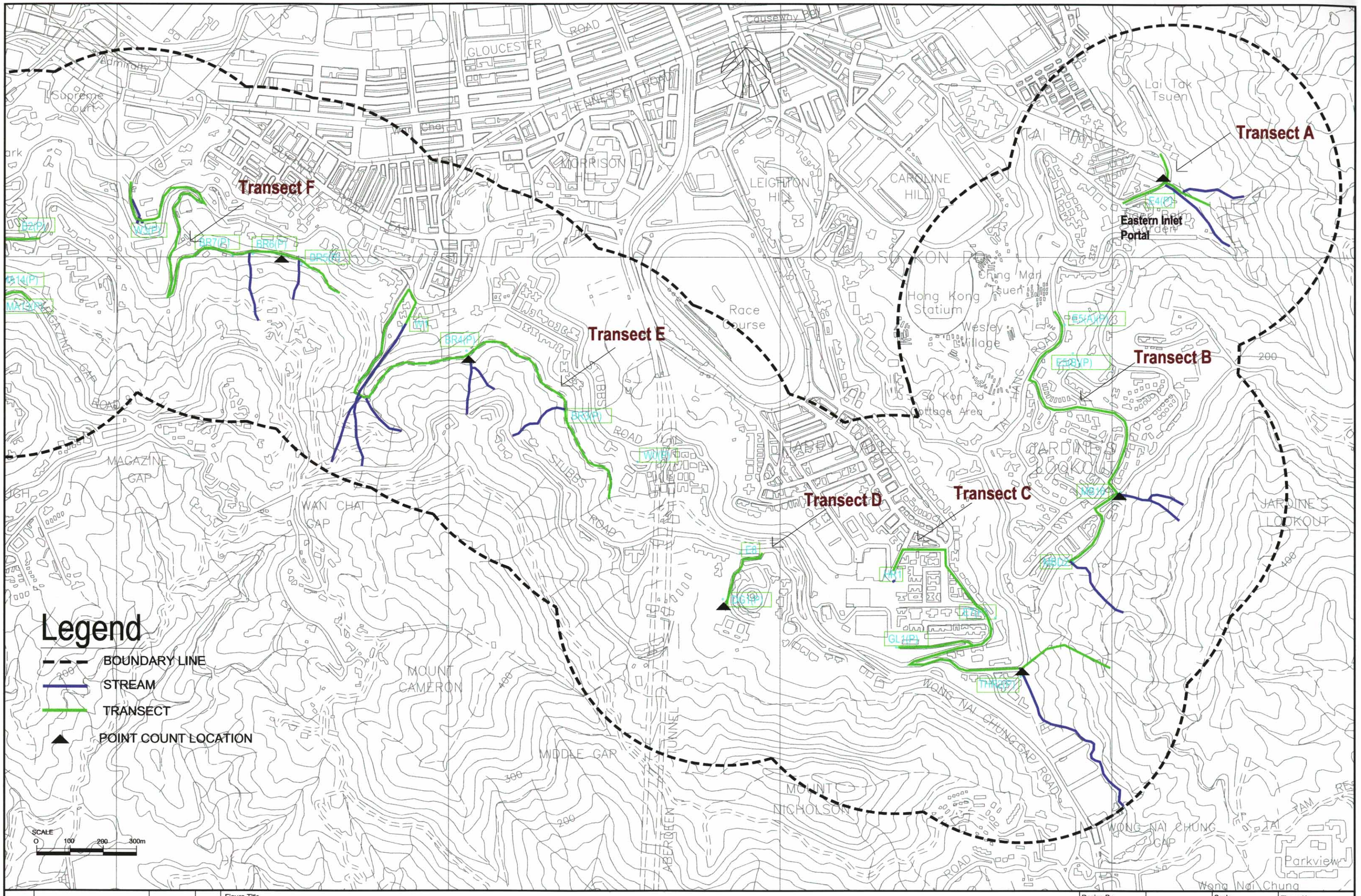

Photo 91


Photo 92


Photo 93

 Photo 94	 Photo 95	 Photo 96
 Photo 97		

Figures



Rev.	Description	Approved	Date

Figure Title

Figure 1: Transects and Sampling Locations on North Hong Kong Island

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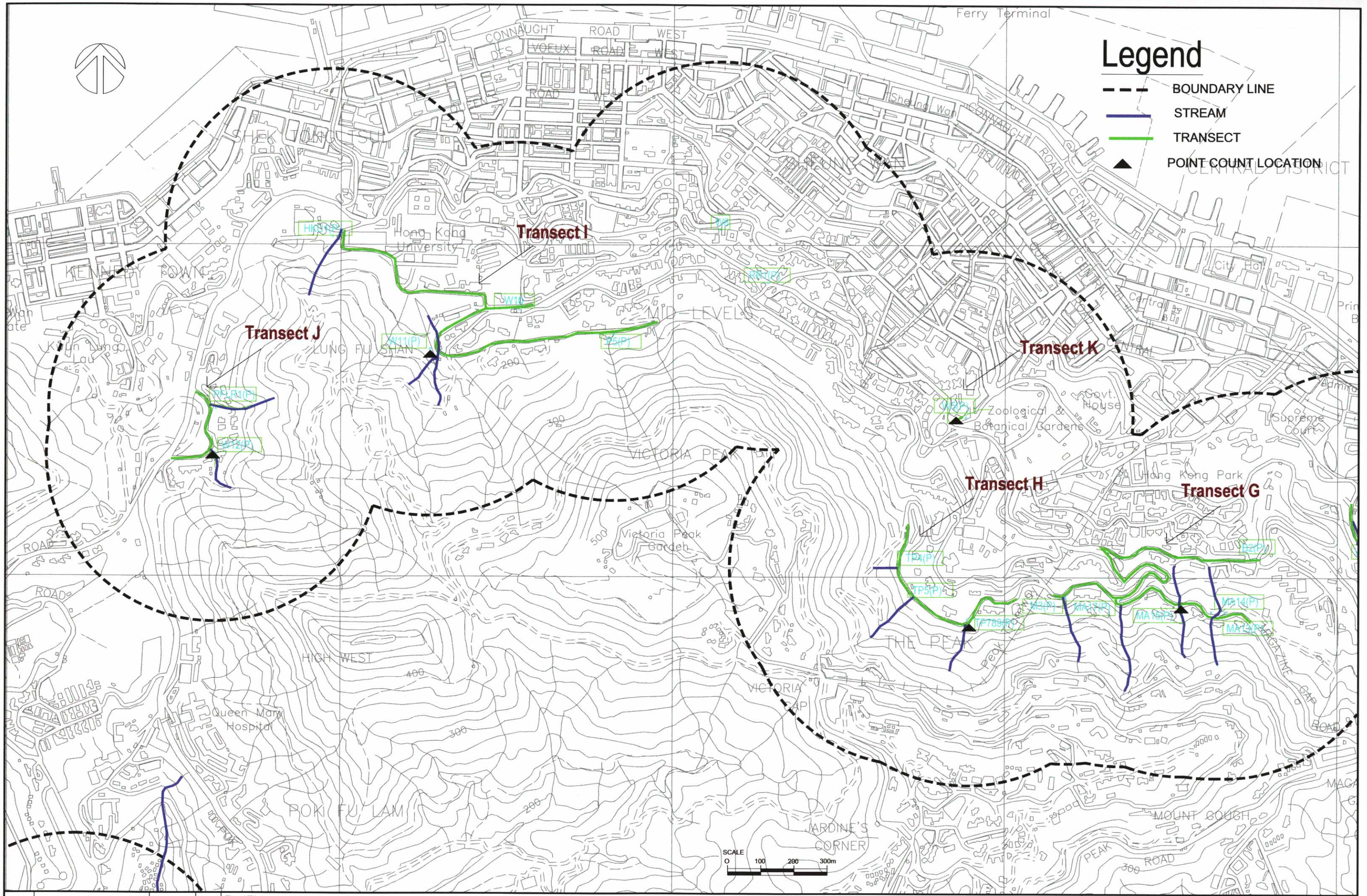

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Figure Title

Figure 2: Transects and Sampling Locations on North Hong Kong Island

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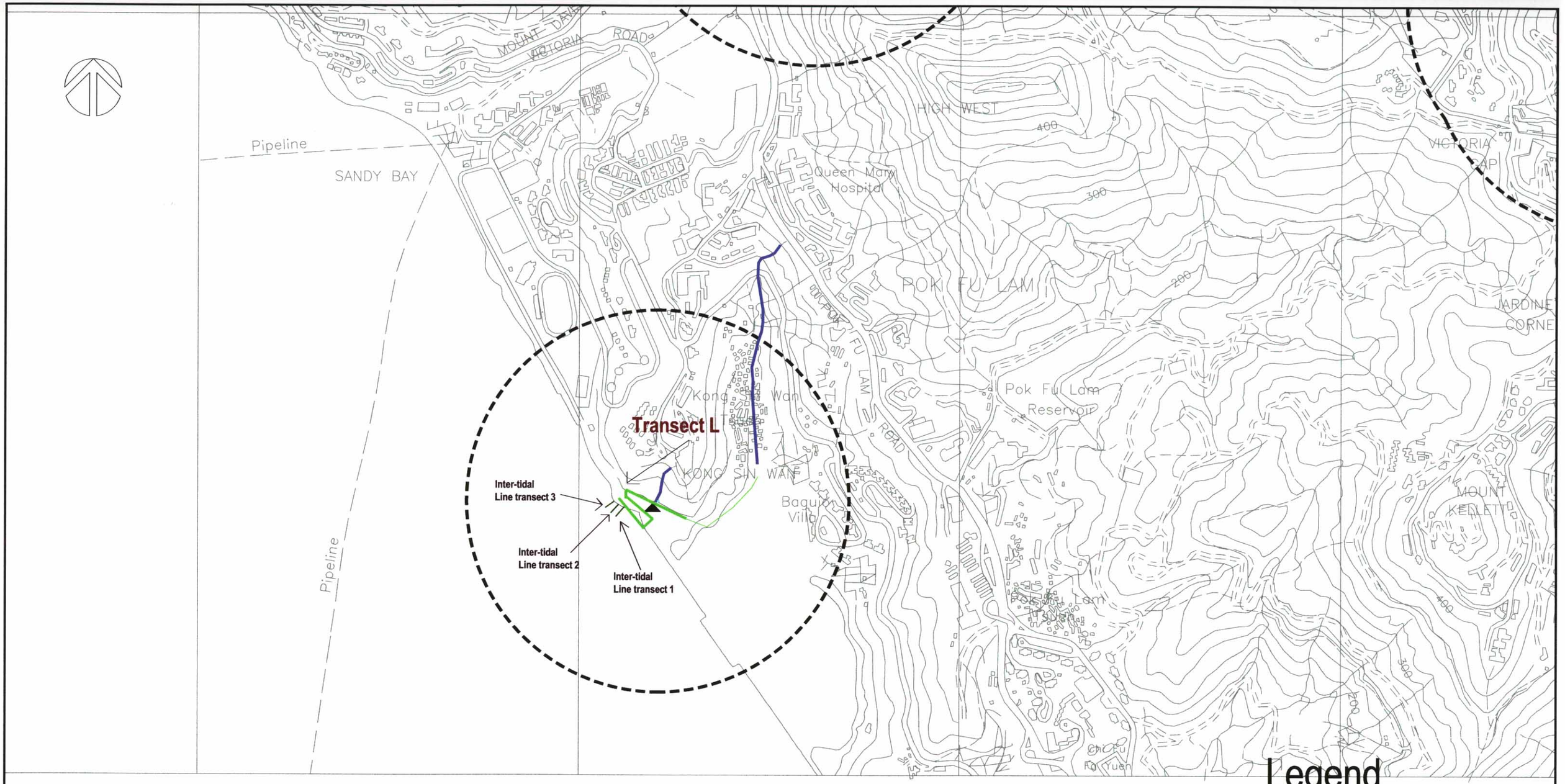

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Figure Title

Figure 3: Transects and Sampling Locations on North Hong Kong Island

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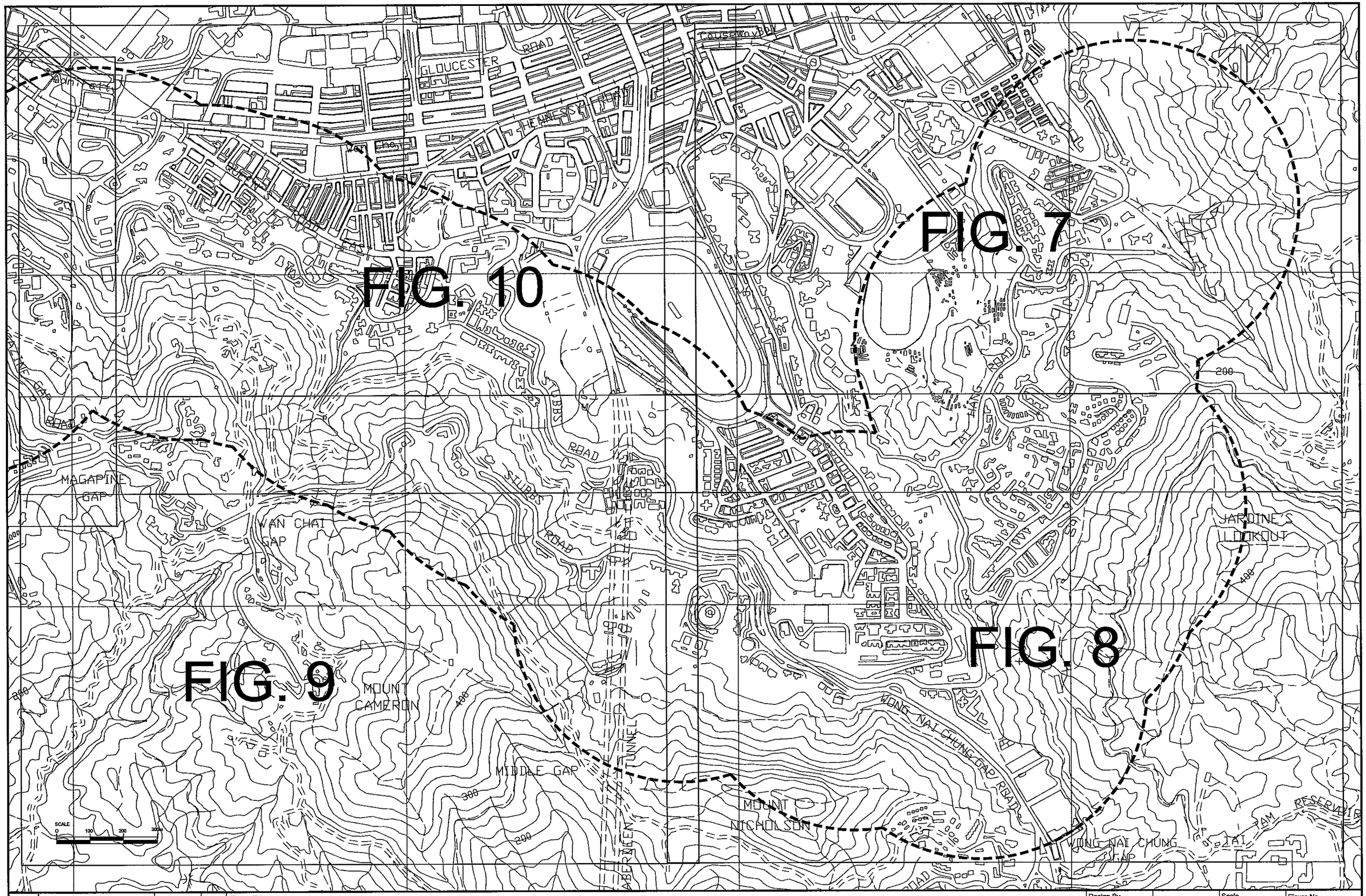

FIG. 10

FIG. 7

FIG. 9

FIG. 8

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Figure Title

Fig. 4 Map plan for Habitats Map of Hong Kong Drainage Project

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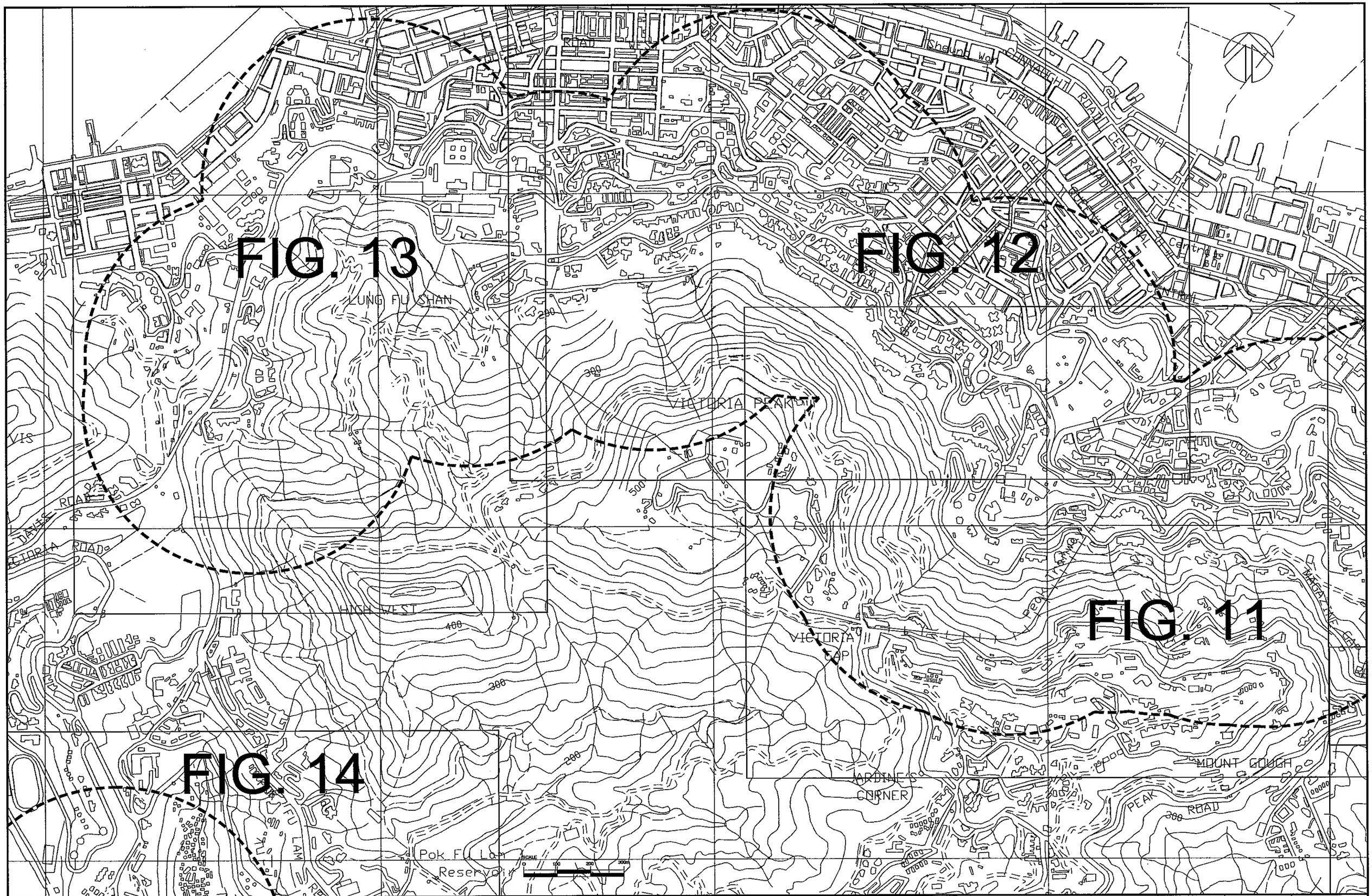

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Figure Title

Fig. 5 Map plan for Habitats Map of Hong Kong Drainage Project

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Checked By		Date NOV., 2003	

FIG. 13

FIG.

FIG. 14

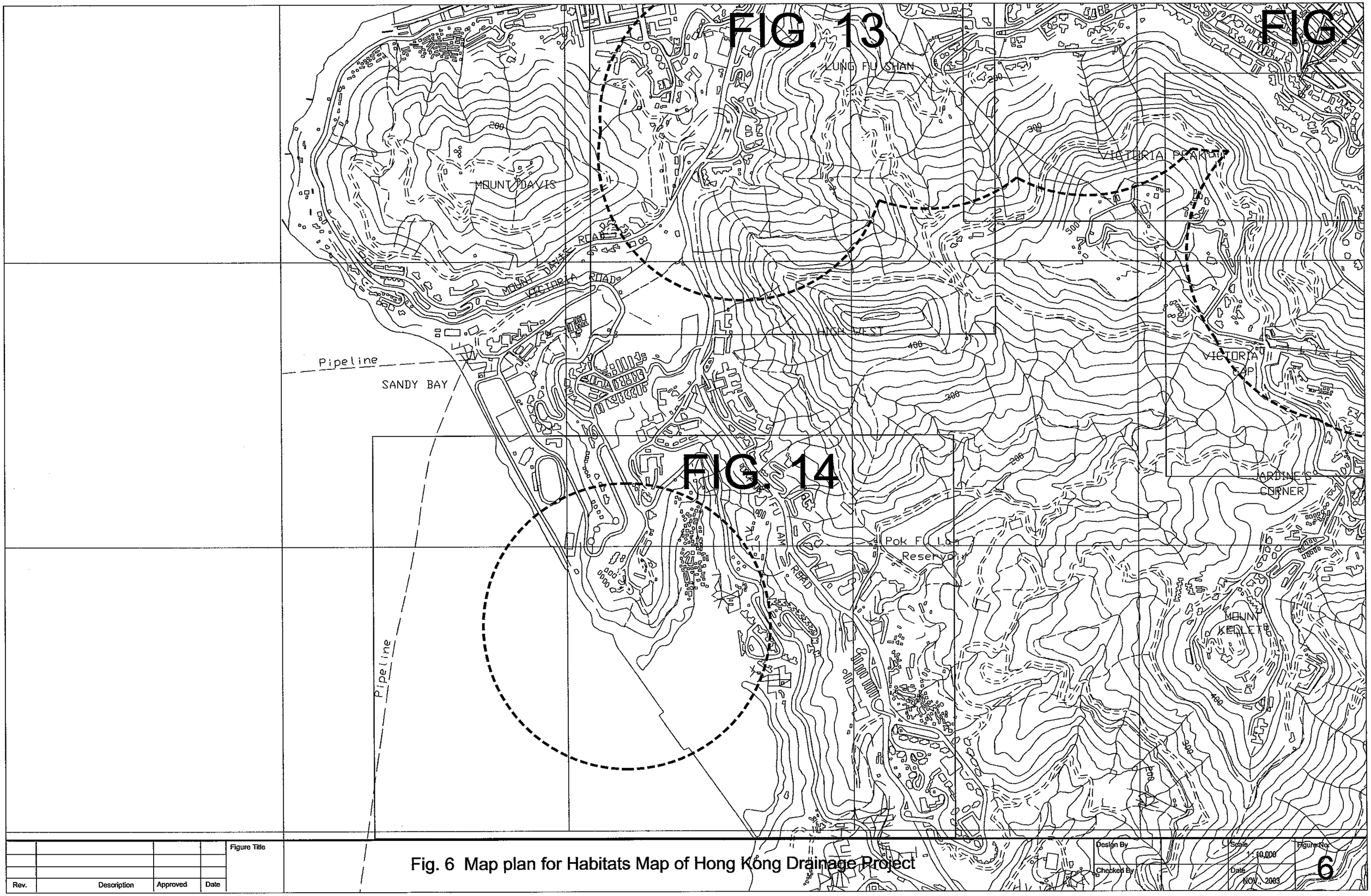

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Figure Title

Fig. 6 Map plan for Habitats Map of Hong Kong Drainage Project

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Checked By	
Scale	1:10,000
Date	NOV., 2003
Figure No.	6

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Figure Title

Fig 7 : Habitats Map of North Hong Kong Island

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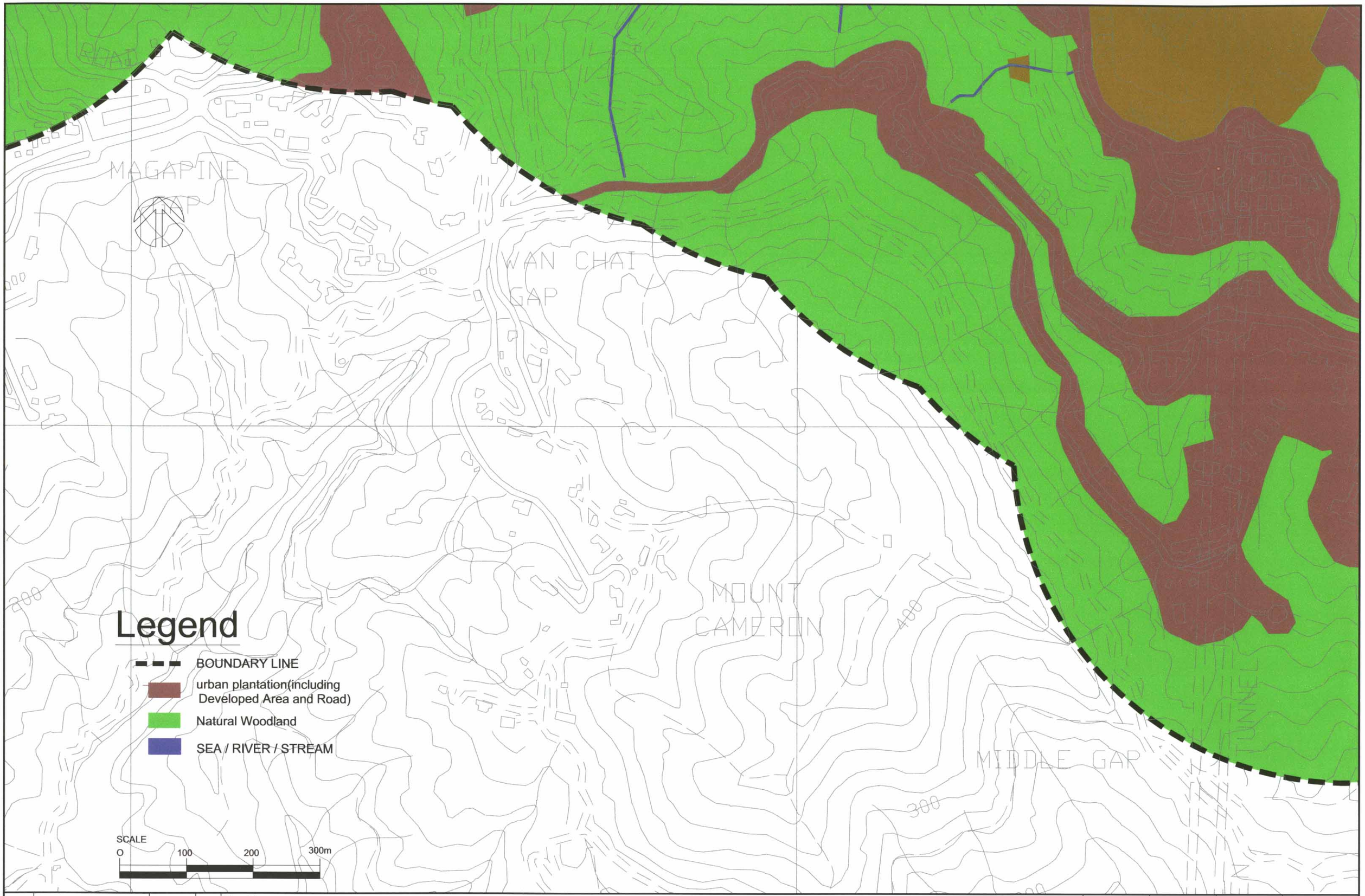

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Figure Title

Fig 9 : Habitats Map of North Hong Kong Island

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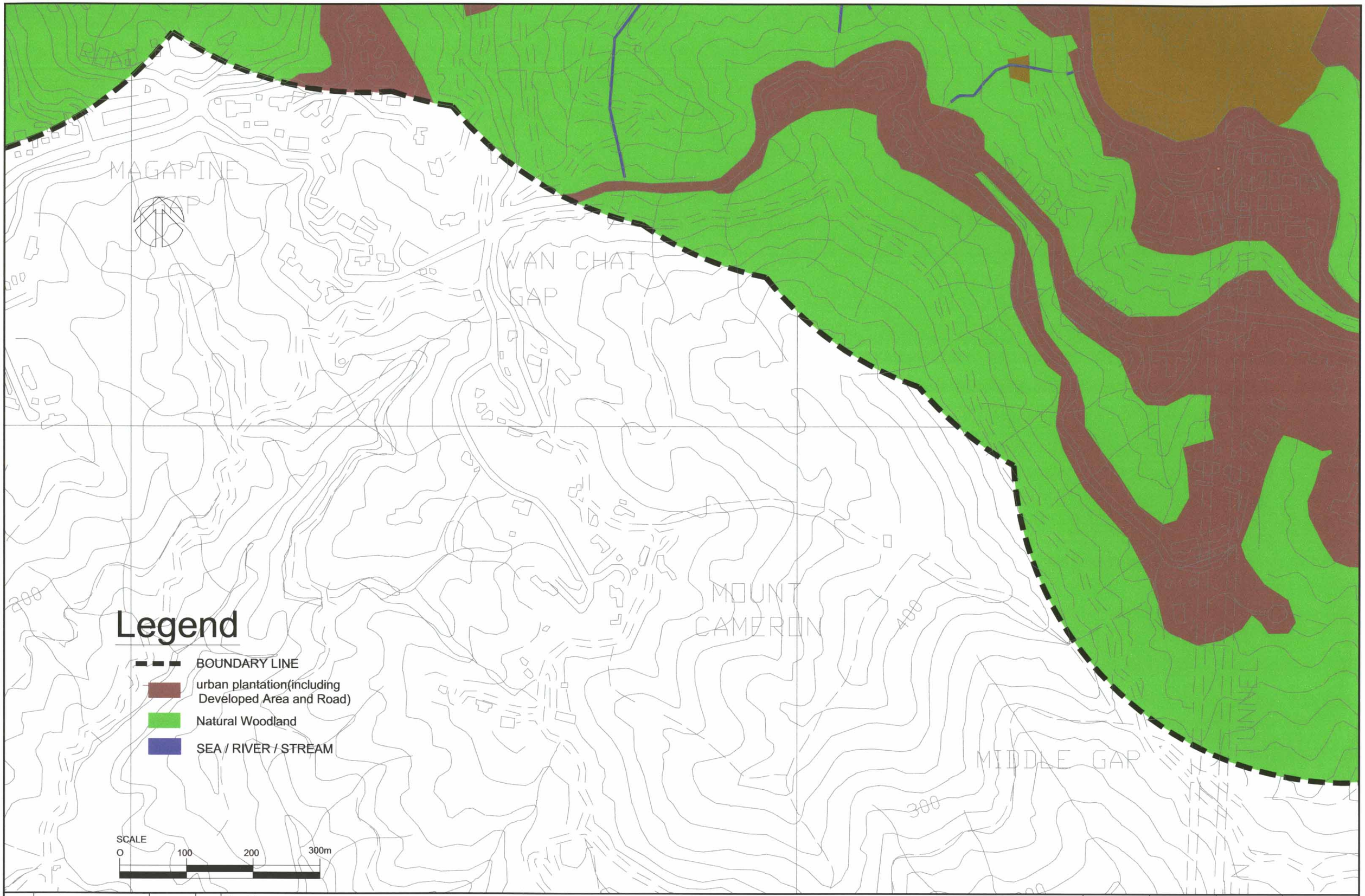

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Figure Title

Fig 9 : Habitats Map of North Hong Kong Island

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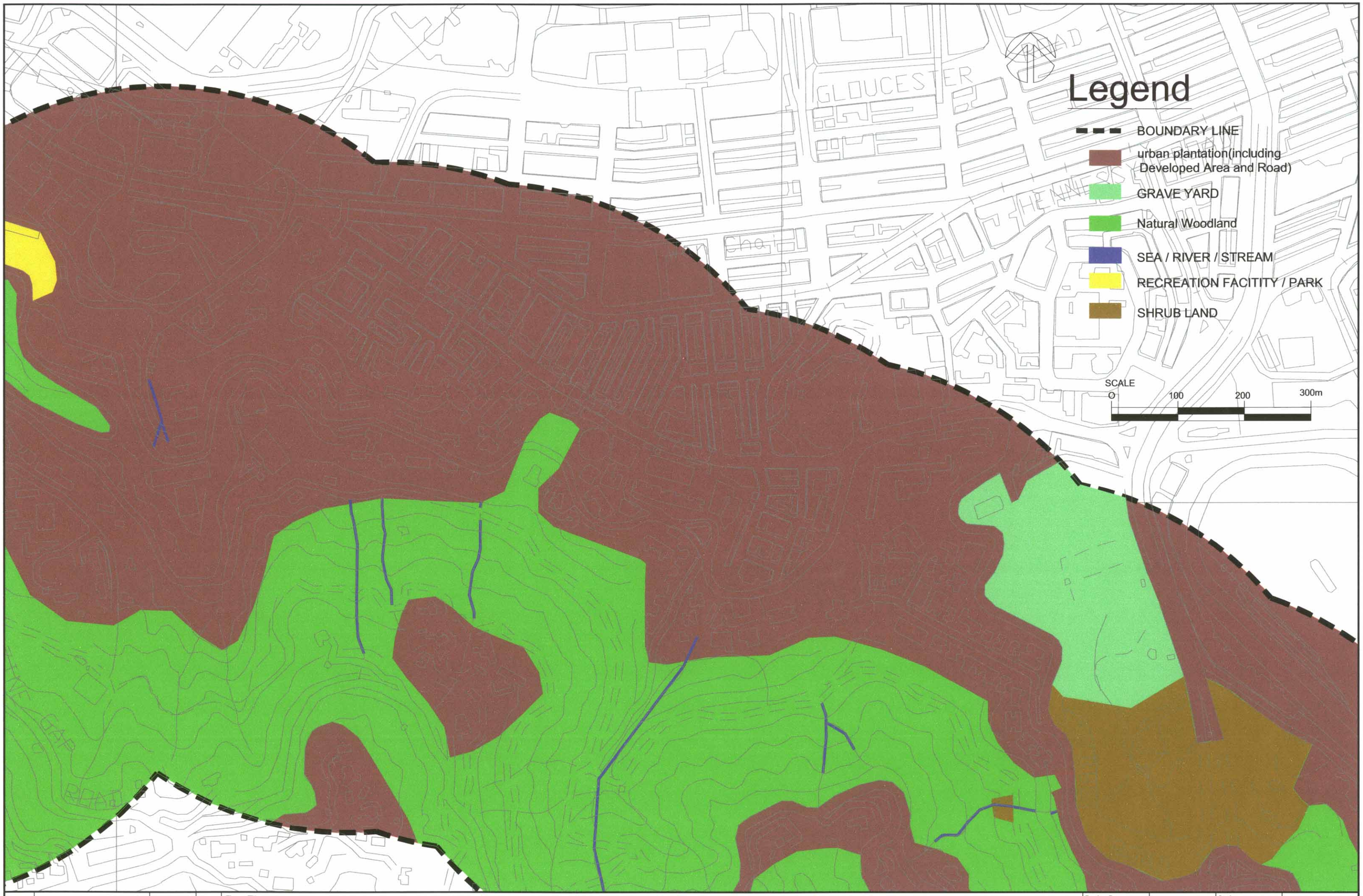

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Figure Title

Fig 10 : Habitats Map of North Hong Kong Island

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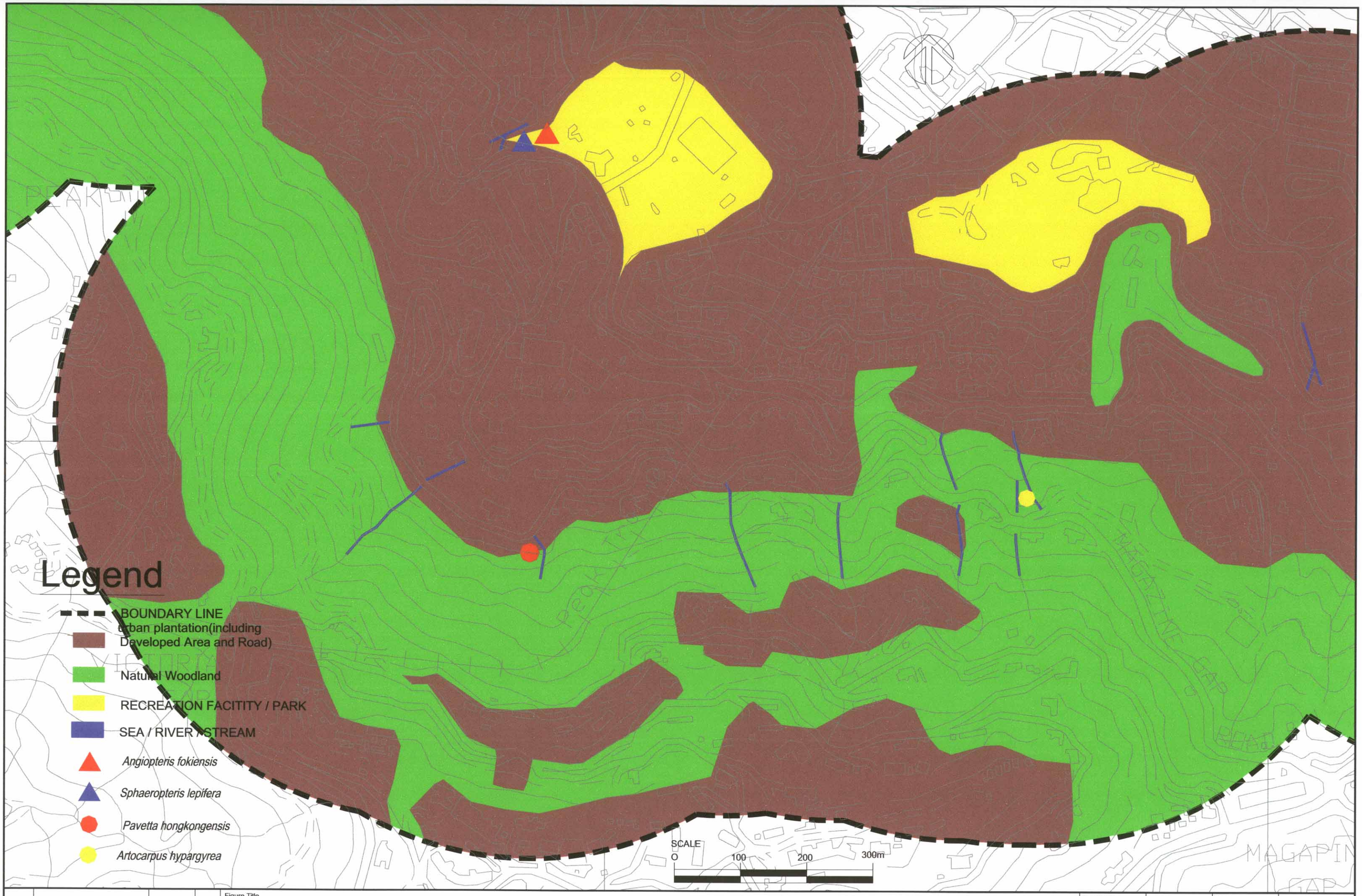

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Figure Title

Fig 11 : Habitats Map of North Hong Kong Island

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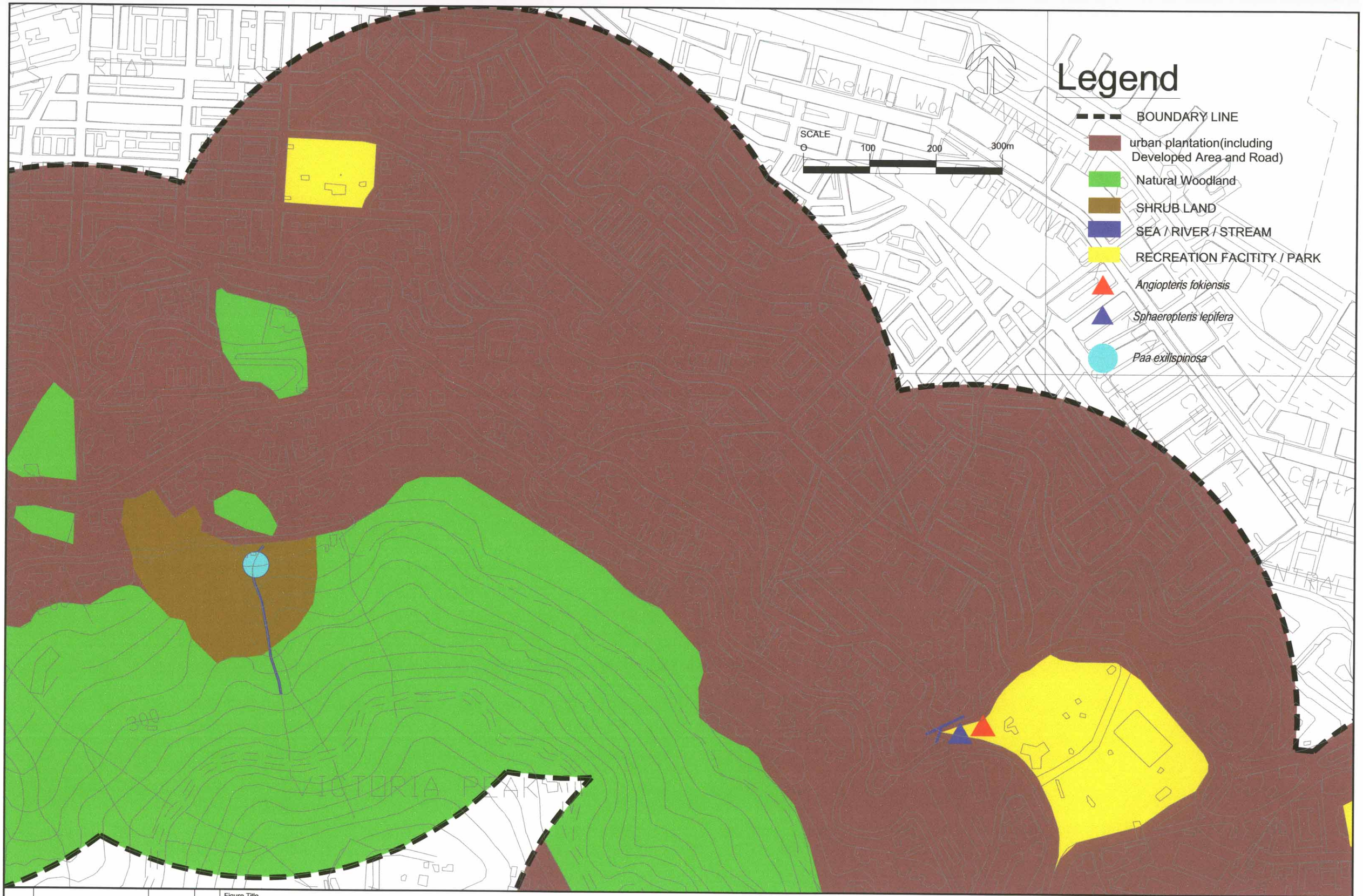

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Figure Title

Fig 12 : Habitats Map of North Hong Kong Island

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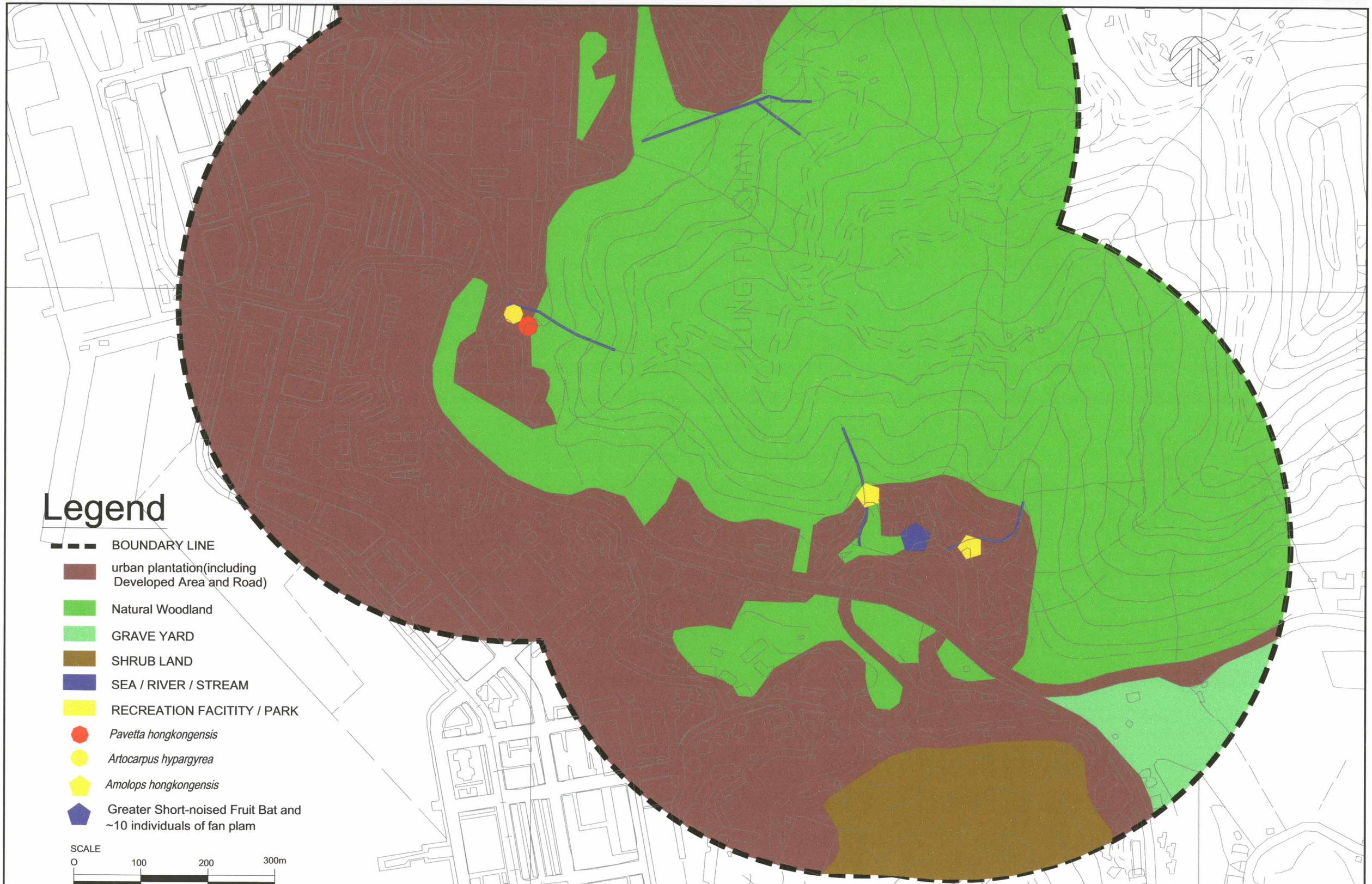

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Figure Title

Fig 13 : Habitats Map of North Hong Kong Island

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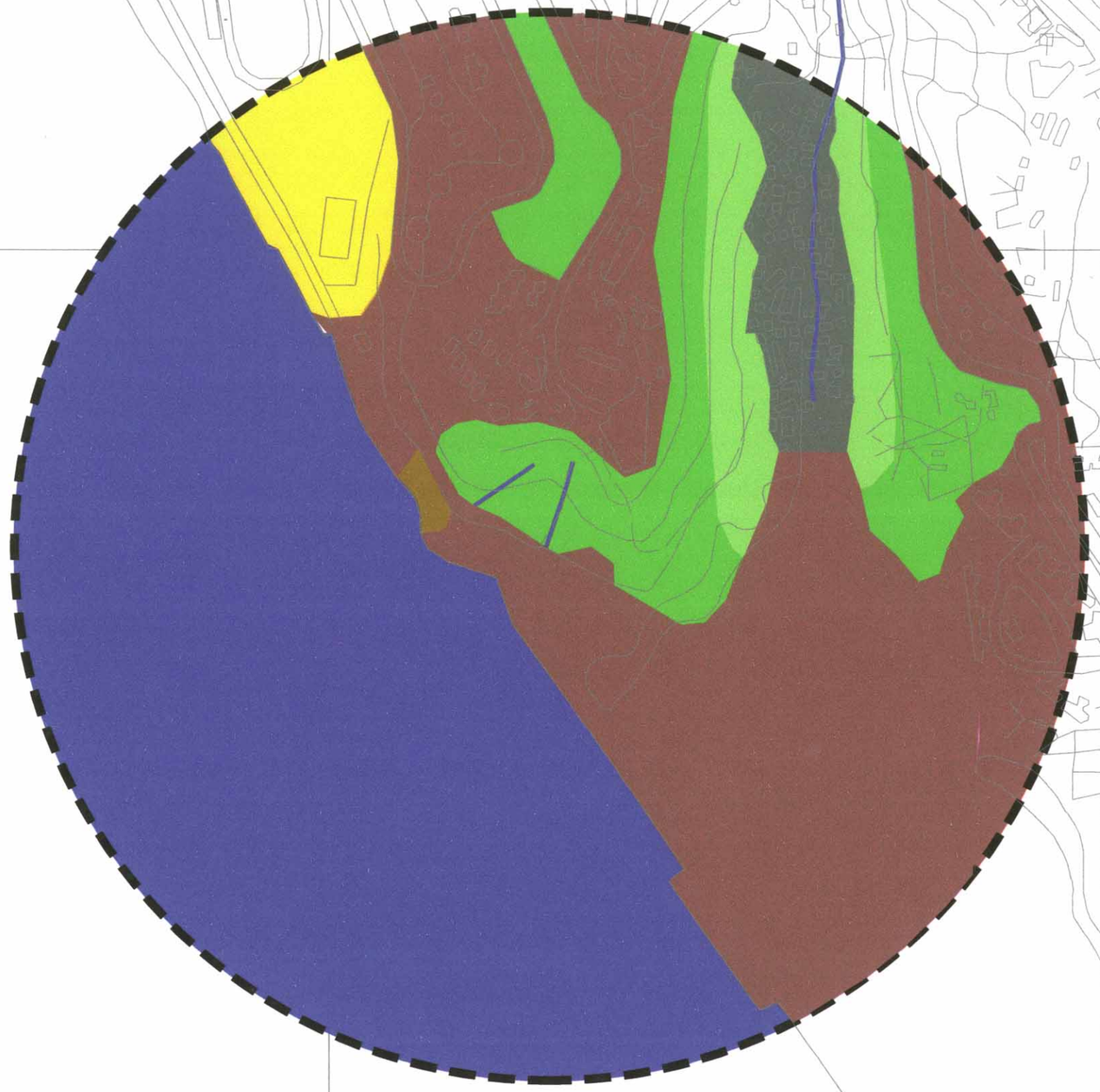

Legend

- BOUNDARY LINE
- urban plantation(including Developed Area and Road)
- VILLAGE
- FUNG SHUI WOODLAND
- Natural Woodland
- SHRUB LAND
- SEA / RIVER / STREAM
- RECREATION FACITITY / PARK

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Figure Title

Fig 14 : Habitats Map of North Hong Kong Island

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Checked By		Date NOV., 2003	