

7a. ECOLOGICAL IMPACT (BOTH TERRESTRIAL AND AQUATIC) (TTAL SITE)

7a.1 Introduction

7a.1.1.1 This section presents the baseline ecological resource conditions within the study area, and the results of assessment of the potential ecological impacts resulting from the construction and operation of the proposed Project at the TTAL site. Baseline conditions for ecological components of the terrestrial and associated aquatic environment were evaluated based on information from available literatures and field surveys conducted for the purposes of this EIA. Measures required to mitigate any identified adverse impacts are recommended, where appropriate.

7a.2 Environmental Legislation, Policies, Plans, Standards and Criteria

7a.2.1.1 Guidelines, standards, documents and ordinances / regulations listed in the following sections were referred to during the course of the ecological impact assessment.

- The Forests and Countryside Ordinance (Cap. 96) prohibits felling, cutting, burning or destroying of trees and growing plants in forests and plantations on government land. Related subsidiary regulations prohibit the selling or possession of listed restricted and protected plant species.
- Under the Wild Animals Protection Ordinance (Cap. 170), designated wild animals are protected from being hunted, whilst their nests and eggs are protected from injury, destruction and removal. All birds and most mammals, including marine cetaceans, are protected under this Ordinance.
- The Protection of Endangered Species of Animals and Plants Ordinance (Cap. 586) provides protection for certain plant and animal species through controlling or prohibiting trade in the species. Certain types of corals are listed in Schedule 1 of the Ordinance, including Blue coral (*Heliopora coerulea*), Organ pipe corals (family Tubiporidae), Black corals (order Antipatharia), Stony corals (order Scleractinia), Fire corals (family Milleporidae) and Lace corals (family Styleridae). Cetacean including whales, dolphins, porpoises, and rorquals are also listed under Schedules 1 & 2 of the Ordinance. The import, export and possession of scheduled corals, no matter dead or living, is restricted.
- The Town Planning Ordinance (Cap. 131) provides for the designation of coastal protection areas, Sites of Special Scientific Interest (SSSIs), Conservation Area, Country Park, Green Belt or other specified uses that promote conservation or protection of the environment.
- Chapter 10 of the Hong Kong Planning Standard and Guidelines (HKPSG) covers planning considerations relevant to conservation. This chapter details the principles of conservation, the conservation of natural landscape and habitats, historic buildings, archaeological sites and other antiquities. It also describes enforcement issues. The appendices list the legislation and administrative controls for conservation, other conservation related measures in Hong Kong and government departments involved in conservation.
- Annex 16 of the Environmental Impact Assessment Ordinance – Technical Memorandum on Environmental Impact Assessment Process (EIAO-TM) sets out the general approach and methodology for assessment of ecological impacts arising from a project or proposal, to allow a complete and objective identification, prediction and evaluation of the potential ecological impacts. Annex 8 recommends the criteria that can be used for evaluating habitat and ecological impact.
- Environmental Impact Assessment Ordinance (EIAO) Guidance Note No. 3/2010 provides general guidelines for assessing the recommended environmental mitigation

measures in Environmental Impact Assessment reports.

- EIAO Guidance Note No. 6/2010 clarifies the requirements of ecological assessments under the EIAO.
- EIAO Guidance Note No. 7/2010 provides general guidelines for conducting ecological baseline surveys in order to fulfill requirements stipulated in the EIAO-TM.
- EIAO Guidance Note No. 10/2010 introduces general methodologies for conducting terrestrial and freshwater ecological baseline surveys.
- EIAO Guidance Note No. 11/2010 introduces general methodologies for conducting marine ecological baseline surveys.
- The IUCN Red List of Threatened Species provides taxonomic, conservation status and distribution information on taxa that have been evaluated using the IUCN Red List Categories and Criteria. This system is designed to determine the relative risk of extinction, and the main purpose of the IUCN Red List is to catalogue and highlight those taxa that are facing a higher risk of global extinction. The IUCN Red List also includes information on taxa that are either close to meeting the threatened thresholds or that would be threatened were it not for an ongoing taxon-specific conservation programme.
- The Key Protected Wildlife Species List details Category I and Category II protected animal species under the PRC's Wild Animal Protection Law.

7a.3 Assessment Methodology

7a.3.1 Study Area

7a.3.1.1 In accordance with Clause 3.4.5.2 of the EIAO Study Brief, the study area for the purpose of terrestrial ecological assessment includes all areas within 500 metres from the Project site boundary of the land based works areas or the area likely to be impacted by the Project. For aquatic ecology, the study area would be the same as the water quality impact assessment, which cover an area within 300 metres of the Project site boundary.

7a.3.2 Literature Review

7a.3.2.1 In accordance with Clause 3.4.5.4(i) of the EIAO Study Brief, relevant studies and information regarding the ecological character of the study area were collated and reviewed. The information collected was evaluated to identify any information gaps relating to the assessment of potential ecological impacts to the terrestrial and aquatic environment.

7a.3.3 Ecological Surveys

7a.3.3.1 Based on the findings of literature review, field surveys were carried out to fill information gaps identified and verify the information collected, to fulfill the objectives of this EIA according to Clause 3.4.5.4 (iii) of the EIAO Study Brief. The methodologies for ecological surveys and impact assessment presented below were prepared in accordance with the criteria and guidelines in Annexes 8 and 16 of the EIAO-TM, EIAO Guidance Note No. 7/2010, 10/2010 and 11/2010.

Ecological Survey Programme

7a.3.3.2 A six-month ecological survey was conducted from January to June 2009 covering both dry and wet seasons. An additional survey for avifauna and terrestrial mammals was conducted in August 2009. The details of the survey programme are summarized in **Table 7a.1**.

Table 7a.1 Ecological Survey Programme

Ecological Survey	Dry Season			Wet Season				
	Jan 2009	Feb 2009	Mar 2009	Apr 2009	May 2009	Jun 2009	Jul 2009	Aug 2009
Habitat Mapping and Vegetation	√		√			√		
Avifauna (Day)	√		√			√		√
Avifauna (Night)		√				√		
Terrestrial Mammal (Day)	√		√			√		√
Terrestrial Mammal (Night)		√				√		
Herpetofauna (Day)	√		√			√		
Herpetofauna (Night)		√				√		
Butterfly, Dragonfly and Damselfly	√		√			√		
Freshwater Communities		√				√		
Intertidal Fauna		√				√		
Coral		√						

Habitat Mapping and Vegetation Survey

7a.3.3.3 Habitats within the study area for terrestrial ecological impact assessment were identified, sized and mapped. Ecological characteristics of each habitat type including size, vegetation type, and species present, dominant species found, species diversity and abundance, community structure, seasonal patterns and inter-dependence of the habitats and species, and presence of any features of ecological importance were defined and characterized. Representative photographs of the habitat types and of important ecological features identified were taken. A desktop review of aerial photographs developed habitat maps of a suitable scale (1:1000 to 1:5000) showing the types and locations of habitats in the study area. The habitat maps were then verified during ground truthing.

7a.3.3.4 Vegetation surveys were conducted throughout dry and wet seasons, by direct observation to record diversity and dominance of plant species present in different habitat types. The location of any plant species of conservation interest was recorded. Identification of flora species and status in Hong Kong was made with reference to Hong Kong Herbarium (2004) and Corlett *et al.* (2000).

Avifauna Survey

7a.3.3.5 Avifauna species present and relative abundance of species in different habitats were surveyed visually and aurally by transects counts (**Figure 7a.2**). The location of any avifauna species of conservation interest encountered was recorded, along with notable behaviour (e.g. breeding behaviour such as nesting and presence of recently fledged juveniles, roosting, and feeding activities). Night surveys were also conducted to record nocturnal avifauna. Ornithological nomenclature in this report follows Carey *et al.* (2001).

Dragonfly, Damselfly and Butterfly Survey

7a.3.3.6 Dragonflies, damselflies and butterflies within the study area were surveyed along the transect adopted in avifauna survey (**Figure 7a.2**). Relative abundance of dragonfly, damselfly and butterfly encountered was recorded. Nomenclature of dragonfly and damselfly follows Wilson (2004), and nomenclature of butterfly follows Lo and Hui (2004).

Herpetofauna Survey

7a.3.3.7 Herpetofauna (amphibian and reptile) within the study area were surveyed qualitatively during both daytime and night-time. Potential microhabitats (e.g., leaf litter, underneath of

rotten logs) were actively searched. All reptiles and amphibians sighted or heard were recorded, supplemented by observation of eggs and tadpoles of frogs and toads. Nomenclature of amphibian follows Chan *et al.* (2005), and reptile follows Karsen *et al.* (1998).

Mammal Survey

- 7a.3.3.8 Mammal surveys were conducted in areas which may potentially be utilized by terrestrial mammals during day and night time. The surveys focused on searching for field signs such as droppings, footprints, diggings or burrows left by larger terrestrial mammals. Mammal identification was made to the lowest possible taxon from the field signs. In addition, any mammal directly observed was also identified. Locations of mammal species of conservation interest were recorded. Nomenclature of mammal follows Shek (2006).

Freshwater Communities Survey

- 7a.3.3.9 Freshwater fish and invertebrate communities were surveyed via active searching and direct observation at watercourse sections within the study area during dry and wet seasons. The sampling locations of freshwater community survey are shown in **Figure 7a.2**. Boulders within the watercourse were turned over to locate any aquatic animals beneath. Hand net was used to collect organisms along the streams. Organisms encountered were recorded and identified to the lowest possible taxon level.

Intertidal Fauna Survey

- 7a.3.3.10 Survey on intertidal communities were conducted at the two survey locations shown in **Figure 7a.2** in order to establish an ecological profile on the intertidal habitats located in the vicinity of the Project site. At each survey location, a walk-through survey was conducted to actively search for any intertidal flora and epifauna along the shore, with the survey time of approximately an hour by 3 surveyors. It helped assess whether the sampling exercise in the later quantitative survey has collected representative data (e.g. the number and type of species encountered) and whether the sampling effort is deemed adequate. A general database on species composition and their relative occurrence in the survey location was established.

- 7a.3.3.11 After the walk-through survey, quantitative surveys were conducted using line transect method. One line transect was deployed at each of the two survey locations. The transect was deployed perpendicular to shoreline from high water mark down to low water mark during the low tide period when tide level was below 1 m. Along each transect, standard ecological sampling quadrats (0.5m x 0.5m) were laid at 1 m intervals. Intertidal epifauna and flora within each quadrat were identified and enumerated. In general, mobile fauna were counted in terms of abundance per unit area. Sessile organisms such as barnacles, oysters and algae were estimated in terms of percentage cover per fixed area.

Coral Survey

- 7a.3.3.12 Six spot-check dive routes (**Figure 7a.2**) covering the coastal areas along the seawall of the Tsang Tsui site and its nearby areas were conducted to locate the presence of corals. Subtidal substrata (hard substratum seabed and seawall etc.) along the proposed spot-check dive routes were surveyed for any presence of coral communities, including hard corals (order Scleractinia), octocorals (sub-class Octocorallia) and black corals (order Antipatharia).
- 7a.3.3.13 The coastline was further surveyed by a more detailed Rapid Ecological Assessment (REA). Five 100 m REA transects were laid according to the contour of seabed (**Figure 7a.2**). Benthic cover, taxon abundance and ecological attributes within a swathe of 2 m

wide, with 1 m of each side of the transects, were recorded following the REA technique as described in DeVantier *et al.* (1998) (see **Appendix 7a.1** for details).

7a.4 Description of the Environment

7a.4.1 Areas of Conservation Interest

- 7a.4.1.1 There are no areas of recognized conservation interest (such as Country Parks, Sites of Special Scientific Interest, Coastal Protection Area or Conservation Area) in the study area.

7a.4.2 Habitat and Vegetation

Literature Review

- 7a.4.2.1 There are numbers of surveys conducted within the study area between 2000 and 2008 (EPD, 2003a, 2003b, 2006, 2008a, 2008b, 2009). Six to nine habitat types were previously identified in the study area of the Project and its vicinity, including grassland/shrubland, secondary woodland, plantation woodland, orchard, urbanized/disturbed area, wasteland, ash lagoons, watercourse, mangrove, marsh, and seawall.
- 7a.4.2.2 Two floral species of conservation interest, Pitcher Plant (*Nepenthes mirabilis*) and Bamboo Orchid (*Arundina chinensis*), were previously recorded within the study area of the Project. Pitcher Plant was recorded from the East Lagoon and along the stream, while small patch of Bamboo Orchid was recorded on a cut-slope above Nim Wan Road (EPD, 2003a, 2003b). Moreover, these two flora species were also found co-currently along the upstream section of the stream passing through the WENT Landfill site (stream W2, **Figure 7a.3**) outside the study area of the Project (EPD, 2008, 2009).
- 7a.4.2.3 Another plant species of conservation interest, Indian Orchid (*Zeuxine strateumatica*) was recorded at the ash lagoons in 1998 during a vegetation study (reviewed by Chau and Siu 1998). The species is restricted in Hong Kong and largely limited to disturbed sites such as landfills, urban parks, cut slopes and open grassland (Xing *et al.*, 2000). Indian Orchid is protected by Cap. 96 and Cap. 586.

Recent Survey Results

- 7a.4.2.4 Nine terrestrial habitat types were identified, namely ash lagoon, secondary woodland, grassland/shrubland, plantation, developed area/disturbed area, orchard, watercourse, seawall and coastal waters during the ecological surveys conducted under the Project.
- 7a.4.2.5 Habitat maps of the study area are illustrated in **Figure 7a.3**. Representative photographs of habitats are given in **Appendix 7a.2**. Photographs of plant species of conservation interest are presented in **Appendix 7a.6**. Vegetation recorded within the study area is listed in **Appendix 7a.5**. **Table 7a.2** summarises the size of each habitat type within the study area.

Table 7a.2 Habitats Recorded within the Study Area

Habitat Type	Area (ha)
Ash Lagoon	44.20
Grassland/Shrubland	33.05
Secondary Woodland	3.31
Plantation	4.90
Developed Area/Disturbed Area	9.49
Orchard	0.79
Watercourse	3.70
Length of W1: 1450 m; W2: 206 m	

Habitat Type	Area (ha)
Seawall	1.51
Coastal Waters	56.50

Ash Lagoon

- 7a.4.2.6 Three ash lagoons, namely East Lagoon, Middle Lagoon and West Lagoon, of area of 9.39 ha, 21.28 ha and 13.53 ha respectively were recorded within the study area. The IWMF would be located at the northern part of Middle Lagoon.
- 7a.4.2.7 Habitat conditions of the East and Middle Lagoons varied throughout the year and were governed by two major factors: the CLP's pulverised fuel ash (PFA) filling activities and rainfall. The habitat in the Middle Lagoon was less volatile than that in the East Lagoon.
- 7a.4.2.8 The water level in the Middle Lagoon varied considerably with rainfall. During the course of survey period, the water level in the Lagoon fluctuated from approximately 20% to 50% flooded mainly covering the southern portion. *Phragmites* sp. was the dominant plant found on small islands formed among the open water. About 80% area of the northern part was a bare ground with scarce vegetation. No noticeable PFA filling activities were observed during the survey.
- 7a.4.2.9 In the East Lagoon, vegetation including grasses and shrubs covered the northern portion. Shrubs at the edge of the Lagoon were dominated by pioneer species of *Macaranga tanarius* and salt-tolerant ruderal species, including *Sesbania javanica* and *Spergularia marina*. Several small shallow pools were formed in the northern portion, covering less than 10% of the total lagoon area during dry season, to approximately 20% flooded during the wet season (**Appendix 7a.4** refers). The southern part of the Lagoon was occupied by dunes of PFA during the course of survey. Photographs showing the water level at the East and Middle Lagoons during survey period are presented in **Appendix 7a.3** and **7a.4**.
- 7a.4.2.10 In the West Lagoon, three permanent water ponds occupying approximately 50% of the total lagoon area were found. The lagoon was disturbed by fairly active PFA dredging activities. Trucks transporting PFA were observed entering and leaving the West Lagoon through the southern and western access roads next to the Middle Lagoon. The vegetation was dense at the lagoon edge and around the water ponds. Vegetation commonly recorded included herb species such as *Bidens alba*, *Conyza bonariensis* and *Spergularia marina*, and a pioneer species, *Macaranga tanarius*.
- 7a.4.2.11 Species diversity in this habitat was low, and no plant species of conservation interest was recorded within the ash lagoons during the surveys.

Grassland/Shrubland

- 7a.4.2.12 Grassland/shrubland habitat in the study area was identified on the hillsides south of Nim Wan Road and the West Lagoon, the periphery of the ash lagoons, the hillside behind the plantation of WENT Landfill site, as well as small patch of land located at the mouth of the tidal channel and adjacent to the entrance of the WENT Landfill site. These areas were typical uplands, highly erode with numerous patches of bare earth and rocky outcrops, and subject to frequent hill-fires. Vegetation was generally sparse and dominated by grasses (e.g. *Cyclosorus acuminatus*), shrubs (e.g. *Hibiscus tiliaceus*, *Litsea rotundifolia*, *Lantana camara*, *Vitex rotundifolia*, *Celtis sinensis*, *Macaranga tanarius* and *Rhus* spp.) and species capable of tolerating the relatively harsh conditions. Species diversity in this habitat was low.
- 7a.4.2.13 An individual of plant species of conservation interest, Incense Tree (*Aquilaria sinensis*), was found at the edge of grassland/shrubland habitat near the mouth of watercourse W1. Incense Tree is common in Hong Kong and is usually found in lowland forest and fung

shui woods (Xing *et al.*, 2000). However, it is classified as Vulnerable (VU) in the IUCN Red List of Threatened Species (IUCN, 2009). In China, Incense Tree is also categorized as Endangered (EN) and Class II protected plant (Near Threatened) in the List of Wild Plants under State Protection (Hu *et al.*, 2003). It is also locally protected under Cap. 586 in Hong Kong.

Secondary Woodland

- 7a.4.2.14 Secondary woodland habitats were largely confined to a thin strip of land between Nim Wan Road and the East and Middle Lagoons within the study area. The woodland habitats were relatively young, with pioneer species such as *Ficus hirta*, *Celtis sinensis*, *Leucaena leucocephala*, *Microcos paniculatus*, *Rhus* spp. and *Sterculia lanceolata* commonly recorded. No plant species of conservation interest were recorded from this habitat and species diversity was considered to be low to moderate.

Plantation

- 7a.4.2.15 Plantation habitat within the study area was found on engineering slopes south to Nim Wan Road and the West Lagoon, as well as the roadside plantation along Nim Wan Road and access roads in the WENT Landfill site. These areas were dominated by commonly planted exotic tree species (e.g. *Acacia confusa* and *Eucalyptus* sp.), with some native pioneer species, such as *Celtis sinensis*, *Ficus virens* and *Sterculia lanceolata*.
- 7a.4.2.16 The roadside plantation was limited to trees and other amenity planting, with occasionally patches of weedy herbaceous and woody plant species such as *Bidens pilosa*, *Lantana camera*, *Ageratum conyzoides*, *Cyclosorus acuminatus*, *Leucaena leucocephala*, *Macroranga tanarius* and *Mikania micrantha*.
- 7a.4.2.17 Species diversity in this habitat was low and no plant species of conservation interest was recorded from this habitat.

Developed Area/Disturbed Area

- 7a.4.2.18 Developed/disturbed habitat refers to highly disturbed wasteland formed as a result of intensive human activities and either wholly or partly covered by weedy or ephemeral vegetation. Developed/disturbed habitat in the study area included WENT Landfill site, paved/unpaved road around the ash lagoons and the access road along Nim Wan Road. Most of the areas were disturbed and some were found to be devoid of vegetation. The vegetative area was dominant by herbs (e.g. *Panicum repens*) and shrubs (e.g. *Sesbania javanica*). No plant species of conservation interest was recorded in this habitat.

Orchard

- 7a.4.2.19 Small patches of orchard were identified at the south-western part of the study area. Vegetative species recorded from this habitat included common fruit trees such as *Musa x paradisiaca*, *Dimocarpus longan* and *Syzygium jambos*. Species diversity in this habitat was low and no plant species of conservation interest was recorded.

Watercourse

- 7a.4.2.20 There were two watercourses recorded in the study area. These two moderate-sized watercourses discharged into a tidal channel east of the ash lagoons. Shrubby riparian vegetation such as *Clerodendrum inerme*, *Lantana camara* and *Manihot esculenta* with occasional trees (e.g. *Hibiscus tiliaceus*, *Casuarina equisetifolia*, *Celtis sinensis* and *Macaranga tanarius*) was established along the stream banks.
- 7a.4.2.21 Watercourse W1 was formed from several small tributaries that run through grassland/shrubland and woodland habitat at the west of the study area. The tributaries

in these upper reaches were out of the study area, and basically more natural with a bank comprised of fine sand deposits. The lower reaches were channelized with geo-textile matting at the bank and directed to the south of the ash lagoons. Linking to the tidal channel, the watercourse portion south of the ash lagoons was subjected to influence from seawater (i.e. flooded with seawater during high tide).

- 7a.4.2.22 Watercourse W2 drained into the tidal channel from the southeast. While the upper reach of watercourse W2 was natural, the lower reach flowed through the WENT Landfill site and was channelized with concrete.

- 7a.4.2.23 Species diversity in this habitat was low and no plant species of conservation interest was recorded from this habitat.

Seawall

- 7a.4.2.24 Artificial seawall was found surrounding the ash lagoons and WENT Landfill site. It is in forms of sloping boulder and of typical of other man-made exposed seawalls in Hong Kong. The maritime zone was colonized by a few plant species, e.g. *Celtis sinensis*, *Lantana camara* and *Ficus virens*. Whilst, at the base of the seawall, some boulders were covered with algae *Hapalospongion gelatinosum*, *Hildenbrandia rubra* and *Gelidium pusillum*.

Coastal Waters

- 7a.4.2.25 Marine environment of coastal waters was identified at the north of the study area. It falls within the Deep Bay Water Control Zone and belongs to the Outer Deep Bay area. Subjected to the influence of freshwater discharge from the Pearl River, the Deep Bay area is characterized by lower salinity and high level of suspended solids. In 2008, the Water Quality Objectives (WQO) compliance in the Deep Bay WCZ was at 40% which was considered to be lowest within the territory (EPD, 2009).

7a.4.3 Avifauna

Literature Review

- 7a.4.3.1 A number of the previous studies were conducted within and in the vicinity of the study area of the Project. A total of 31 to 85 avifaunal species were recorded in the previous surveys (EPD, 2003a, 2003b, 2006, 2008, 2009). Among these, 58 avifaunal species recorded were considered of conservation interest. Bird species of conservation interest recorded in previous studies are summarized in **Table 7a.3**.

Table 7a.3 Avifauna of Conservation Interest Previously Recorded from the Ash Lagoons and its Vicinity.

Common Name ¹	Distribution in Hong Kong	Level of Concern ²	Protection Status in China ³	China Red Data Book ⁴	IUCN Red List	WEF EIA ⁵	Add WEF EIA ⁵	ACTF ⁵	STF ES ⁵	STF EIA ⁵	WENT Ex EIA ⁵
Little Grebe	Common	LC	-	-	-	√	√	√	√	√	√
Great Cormorant	Common	PRC	-	-	-	√	√	√	√		
Grey Heron	Common	PRC	-	-	-	√	√	√	√	√	√
Purple Heron	Uncommon	RC	-	-	-			√			
Great Egret	Common	PRC (RC)	-	-	-	√	√	√	√	√	√
Intermediate Egret	Common	RC	-	-	-	√	√				
Little Egret	Common	PRC (RC)	-	-	-	√	√	√	√	√	√
Pacific Reef Egret	Uncommon	(LC)	Class II	Rare	-					√	
Cattle Egret	Common	(LC)	-	-	-	√		√	√	√	
Chinese Pond Heron	Common	PRC (RC)	-	-	-	√	√	√	√	√	√
Striated Heron	Uncommon in summer, Scarce in winter	(LC)	-	-	-				√		
Black-crowned Night Heron	Common	(LC)	-	-	-					√	
Yellow Bittern	Uncommon	(LC)	-	-	-			√			
Common Teal	Common	RC	-	-	-	√	√				
Spot-billed Duck	Resident	RC	-	-	-		√				
Northern Pintail	Abundant	RC	-	-	-				√		
Red-breasted Merganser	Scarce	LC	-	-	-			√			
Osprey ⁶	Common	RC	Class II	Rare	-			√		√	
Black Kite ⁶	Common	(RC)	Class II	-	-	√	√	√	√	√	√
White-bellied Sea Eagle ⁶	Uncommon	(RC)	Class II	-	-						√
Crested Serpent Eagle ⁶	Uncommon	(LC)	Class II	-	-				√		
Eastern Marsh Harrier ⁶	Common	LC	Class II	-	-			√			
Crested Goshawk ⁶	Uncommon	-	Class II	Rare	-				√		
Common Buzzard ⁶	Common	-	Class II	-	-					√	
Greater Spotted Eagle ⁶	Scarce	GC	Class II	-	Vulnerable				√		
Imperial Eagle ⁶	Common	GC	Class II	-	Vulnerable		√				
Common Kestrel ⁶	Common	-	Class II	-	-			√	√		
Peregrine Falcon ⁶	Scarce	(LC)	Class II	-	-	√					
Eurasian Coot	Common	RC	-	-	-	√	√				√

Common Name ¹	Distribution in Hong Kong	Level of Concern ²	Protection Status in China ³	China Red Data Book ⁴	IUCN Red List	WEF EIA ⁵	Add WEF EIA ⁵	ACTF ⁵	STF ES ⁵	STF EIA ⁵	WENT Ex EIA ⁵
Black-winged Stilt	Common	RC	-	-	-	√	√		√		
Grey-headed Lapwing	Scarce	LC	-	-	-				√		
Little Ringed Plover	Common	(LC)	-	-	-	√	√	√	√	√	
Kentish Plover	Abundant	RC	-	-	-		√				
Common Redshank	Common	RC	-	-	-						√
Marsh Sandpiper	Common	RC	-	-	-				√		
Common Greenshank	Abundant	RC	-	-	-		√				
Wood Sandpiper	Common	LC	-	-	-	√	√	√		√	
Pintail/Swinhoe's Snipe	Common/ Uncommon	LC	-	-	-			√			
Common Snipe	Common	-	-	-	-		√	√			
Caspian Tern	Passage migrant	RC	-	-	-		√				
Greater Coucal	Common	-	Class II	Vulnerable	-	√		√		√	√
Lesser Coucal	Common	-	Class II	Vulnerable	-	√		√			
Pacific Swift	Common	(LC)	-	-	-						√
Pied Kingfisher	Uncommon	(LC)	-	-	-				√	√	√
White-throated Kingfisher	Common	(LC)	-	-	-	√	√	√	√	√	√
Black-capped Kingfisher	Common	(LC)	-	-	-			√	√	√	
Blue-tailed Bee-eater	Scarce	-	-	-	-						√
Red-throated Pipit	Common	LC	-	-	-	√	√				
Black-winged Cuckoo-shrike	Scarce	-	-	-	-						√
Bluethroat	Common	LC	-	-	-			√			
Hwamei	Common	-	-	-	-	√					
Zitting Cisticola	Common	LC	-	-	-		√	√	√	√	
Chinese Penduline Tit	Common	RC	-	-	-			√			
Yellow-breasted Bunting	Common	RC	-	-	Vulnerable			√			
Red-billed Starling	Common	GC	-	-	-			√	√		
White-cheeked Starling	PRC	-	-	-	-	√					

Common Name ¹	Distribution in Hong Kong	Level of Concern ²	Protection Status in China ³	China Red Data Book ⁴	IUCN Red List	WEF EIA ⁵	Add WEF EIA ⁵	ACTF ⁵	STF ES ⁵	STF EIA ⁵	WENT Ex EIA ⁵
White-shouldered Starling	Common	(LC)	-	-	-	✓		✓		✓	
Black-naped Oriole	Scarce	LC	-	-	-			✓			
Number of Species of Conservation Interest						22	22	29	23	21	12

Notes:

1. All wild birds are Protected under Wild Animal Protection Ordinance (Cap. 170)
2. Fellowes *et al.* (2002); GC=Global concern; RC=Regional Concern; LC=Local Concern; PGC=Potential Global Concern; PRC=Potential Regional Concern. Letter in parentheses indicate that the assessment is on the basis of restrictedness in breeding and/or roosting sites rather than in general occurrence.
3. List of Wild Animals under State Protection (promulgated by State Forestry Administration and Ministry of Agriculture on 14 January, 1989).
4. Zheng and Wang (1998).
5. WEF EIA = Feasibility Study of Waste-to-Energy Facilities EIA; Add WEF EIA = Additional Waste-to-Energy Facilities EIA; ACTF = Animal Carcass Treatment Facilities EIA; STF ES = Sludge Treatment Facilities Environmental Study; STF EIA = Sludge Treatment Facilities Feasibility Study EIA; WENT Ex EIA = West New Territories Landfill Extensions Feasibility Study EIA.
6. Protected under Protection of Endangered Species of Animals and Plants Ordinance (Cap. 586)

7a.4.3.2 Breeding activities of Little Grebe were noted from the study area in previous studies (**Table 7a.4**). **Figure 7a.4** shows the locations where breeding activities of Little Grebe previously recorded from the ash lagoons. It should be noted that the ash lagoon population contributed to about 6% and 10% of the total breeding population in Hong Kong in 2000 and 2001 respectively (EPD, 2003a).

Table 7a.4 Breeding Activities of Little Grebes Previously Recorded from Ash Lagoons

Literature	Date	Location	Breeding Activities	Abundance
Additional Waste-to-Energy Facilities EIA (EPD, 2003a).	August – September 2000	East Lagoon	Full grown immature birds Recently hatched young birds Nest	4 3 1
	June 2001	East Lagoon Middle Lagoon West Lagoon	Breeding pairs Breeding pairs Breeding pairs	5 pairs 3 pairs At least 1 pairs
Animal Carcass Treatment Facilities EIA (EPD, 2003b)	August-December 2001	Open water of lagoon	Birds foraging and loafing	Up to 11
Sludge Treatment Facilities Environmental Study (EPD, 2006)	September-October 2004	Middle Lagoon	Juvenile birds	3
Sludge Treatment Facilities Feasibility Study EIA (EPD, 2008)	September 2008	East Lagoon	Juvenile birds	2
		Middle Lagoon	Breeding pair Recently hatched chicks	1 4
West New Territories Landfill Extensions Feasibility Study EIA (EPD, 2009)	Wet season 2007	Middle Lagoon	Nests	3
		West Lagoon	Juvenile birds	Not available

Recent Survey Results

7a.4.3.3 A total of 66 avifaunal species were found from the study area in the current study. Relatively high diversity and abundance were recorded at the ash lagoon and grassland/shrubland habitats. Chinese Bulbul (*Pycnonotus sinensis*) and Crested Myna (*Aridotheres cristalleus*) were the most common species. Wetland species, such as Little Grebe, Little Egret, Little Ringed Plover and Kentish Plover were also dominated at the ash lagoon. In which, the northern part of the Middle Lagoon, where was often dry and supported scarce vegetation, was scarce in avifaunal richness and diversity. A full list of avifaunal species recorded is given in **Appendix 7a.7**. Of which, 21 species are considered of conservation interest and listed in **Table 7a.5**. Photographic records of avifauna species of conservation interest are provided in **Appendix 7a.8**.

Table 7a.5 Avifaunal Species of Conservation Interest Recorded within the Study Area

Common Name ¹	Scientific Name	Distribution in HK	Level of Concern ²	Protection Status in China ³	China Red Data Book ⁴	IUCN Red List
Little Grebe	<i>Tachybaptus ruficollis</i>	Common	LC	-	-	-
Grey Heron	<i>Ardea cinerea</i>	Common	PRC	-	-	-

Common Name ¹	Scientific Name	Distribution in HK	Level of Concern ²	Protection Status in China ³	China Red Data Book ⁴	IUCN Red List
Great Egret	<i>Egretta alba</i>	Common	PRC (RC)	-	-	-
Little Egret	<i>Egretta garzetta</i>	Common	PRC (RC)	-	-	-
Pacific Reef Egret	<i>Egretta sacra</i>	Uncommon	(LC)	Class II	Rare	-
Chinese Pond Heron	<i>Ardeola bacchus</i>	Common	PRC (RC)	-	-	-
Eurasian Wigeon	<i>Anas penelope</i>	Winter Visitor	RC	-	-	-
Osprey ⁵	<i>Pandion haliaetus</i>	Common	RC	Class II	Rare	-
Black Kite ⁵	<i>Milvus migrans</i>	Common	(RC)	Class II	-	-
Crested Goshawk ⁵	<i>Accipiter trivirgatus</i>	Uncommon	-	Class II	Rare	-
Common Buzzard ⁵	<i>Buteo buteo</i>	Common	-	Class II	-	-
Common Kestrel ⁵	<i>Falco tinnunculus</i>	Common	-	Class II	-	-
Peregrine Falcon ⁵	<i>Falco peregrinus</i>	Scarce	(LC)	Class II	Rare	-
Little Ringed Plover	<i>Charadrius dubius</i>	Common	(LC)	-	-	-
Kentish Plover	<i>Charadrius alexandrinus</i>	Abundant	RC	-	-	-
Greater Coucal	<i>Centropus sinensis</i>	Common	-	Class II	Vulnerable	-
Lesser Coucal	<i>Centropus bengalensis</i>	Common	-	Class II	Vulnerable	-
Pacific Swift	<i>Apus pacificus</i>	Common	(LC)	-	-	-
Pied Kingfisher	<i>Ceryle rudis</i>	Uncommon	(LC)	-	-	-
White-throated Kingfisher	<i>Halcyon Smyrnensis</i>	Common	(LC)	-	-	-
Zitting Cisticola	<i>Cisticola juncidis</i>	Common	LC	-	-	-

Notes:

1. All wild birds are Protected under Wild Animal Protection Ordinance (Cap. 170)
2. Fellowes *et al.* (2002); GC=Global concern; RC=Regional Concern; LC=Local Concern; PGC=Potential Global Concern; PRC=Potential Regional Concern. Letter in parentheses indicate that the assessment is on the basis of restrictedness in breeding and/or roosting sites rather than in general occurrence.
3. List of Wild Animals under State Protection (promulgated by State Forestry Administration and Ministry of Agriculture on 14 January, 1989).
4. Zheng and Wang (1998).
5. Protected under Protection of Endangered Species of Animals and Plants Ordinance (Cap. 586)

Little Grebe

- 7a.4.3.4 A peak count of 5, 8 and 20 individuals of Little Grebe (*Tachybaptus ruficollis*) was recorded from the open water of the East, Middle and West Lagoons respectively during an additional survey conducted in August 2009. The species is locally common in Deep Bay and present throughout the year (Carey *et al.*, 2001). It is considered of local conservation concern by Fellowes *et al.* (2002) due to the limited number of known breeding sites in Hong Kong.
- 7a.4.3.5 Little Grebe favours habitats with open water and emergent vegetation which support a relatively high abundance of aquatic invertebrates (EPD, 2003a). They utilize a wide range of wetland areas including gei wais in Mai Po, and also elsewhere in fishponds and reservoirs.

7a.4.3.6 The lagoon habitat was used by the species for breeding. One individual was recorded incubating the eggs in the Middle Lagoon in August 2009. Seven recently hatched chicks from two broods were found in the West Lagoon, and one breeding pairs with one recently hatched chicks were observed in the East Lagoon.

7a.4.3.7 Though the West Lagoon is subjected to active dredging of fly ash, Little Grebe seems to adapt to the disturbed environment and prefer breeding there. It is probably because of relatively stable water level of the ponds compared to the condition in the East and Middle Lagoons. The breeding season of this opportunist breeder can be long and varies with the amount of rainfall during the year. Heavy rainfall in the summer floods out some nests and birds may re-build and lay again during the early autumn (Carey *et al.*, 2001). The nesting density of Little Grebes has a broad variation, depending mainly on the emergent vegetation cover. The nest distance could be ranged from 13 m to 465 m (EPD, 2003a).

Ardeids

7a.4.3.8 Five species of ardeids were recorded from the study area during recent surveys, including Grey Heron (*Ardea cinerea*), Great Egret (*Egretta alba*), Little Egret (*Egretta garzetta*), Pacific Reef Egret (*Egretta sacra*) and Chinese Pond Heron (*Ardeola bacchus*). The large, secure populations of Great Egret, Little Egret, Chinese Pond Heron and Grey Heron in Hong Kong are considered important in a regional context (Fellowes *et al.*, 2002). In spite of their decline numbers in Hong Kong, the local population is still large enough to be of regional significance (Carey *et al.*, 2001). Pacific Reef Egret is considered of local concern due to the restricted number of breeding sites in Hong Kong.

7a.4.3.9 Most of Little Egrets were recorded from the watercourse habitat and the Middle Lagoon. A peak count of 11 and 6 individuals was recorded in June 2009 respectively. Other records from one to five individuals were made in the West Lagoon, grassland/shrubland, seawall and coastal waters. However, the number of Little Egret recorded only constituted a very small portion of the species' peak count of 2076 in Deep Bay Area (Anon, 2009) and hence Little Egret was not considered of conservation importance in the study area.

7a.4.3.10 The numbers of Grey Heron, Great Egret and Chinese Pond Heron within the study area were relatively low in compared to the total population of the species in Hong Kong. Peak counts of one Grey Heron, 2 Great Egret and 5 Chinese Pond Heron were reported. When compared to the peak counts of 1085 Grey Herons, 1167 Great Egrets and 260 Chinese Pond Herons between 2008-09 in Deep Bay Area (Anon, 2009). The study area was not considered of conservation importance for these species.

7a.4.3.11 Only a single individual of Pacific Reef Egret was recorded in the coastal waters off the Middle Lagoon in January 2009. The local population of the species are considered of conservation interest in view of the restricted breeding range in Hong Kong. The study area was therefore not considered of conservation importance to this species.

Raptors

7a.4.3.12 Six species of raptors were recorded from the study area during the surveys: Osprey (*Pandion haliaetus*), Black Kite (*Milvus migrans*), Crested Goshawk (*Accipiter trivirgatus*), Common Buzzard (*Buteo buteo*), Common Kestrel (*Falco tinnunculus*) and Peregrine Falcon (*Falco peregrinus*). However, not all of them were recorded utilizing the study area. Crested Goshawk and Common Kestrel were recorded on passage over the study area. All these raptors are listed as Class II under PRC's Wild Animal Protection Law.

7a.4.3.13 A single individual of Osprey was recorded bathing in the open water of the Middle Lagoon in January 2009. Fellowes *et al.* (2002) considered the species as of regional conservation concern due to its restricted population in both regional and local context.

The species is locally common winter visitor with occasional summer records (Carey *et al.*, 2001). Most records are from Inner Deep Bay, but it is also widespread in coastal areas (*ibid*). The highest number of 26 Osprey was recorded in Deep Bay Area in November 2005 (Anon, 2006).

- 7a.4.3.14 A single individual of Peregrine Falcon was also recorded in the open water of the Middle Lagoon in January 2009. The species is a scarce resident, but was recorded at widespread localities (Carey *et al.*, 2001). It is regarded as of local conservation interest due to its restricted number of breeding and/or roosting localities. The study area is therefore not considered of conservation importance to the species.
- 7a.4.3.15 Black Kites are abundant winter visitors and occur in the urban areas and over Victoria Harbour (Carey *et al.*, 2001). A Black Kite was recorded sitting at the seawall in January 2009. They are considered of conservation interest in Hong Kong due to the restricted nesting and roosting ranges (Fellowes *et al.*, 2002). The current breeding population is thought to be around 30 pairs (Carey *et al.*, 2001).
- 7a.4.3.16 Common Buzzard is common winter visitor and scarce passage migrant in Hong Kong (Carey *et al.*, 2001). They inhabit in a wide range of habitats at all altitudes (*ibid*). They are not considered of conservation interest by Fellowes *et al.* (2002). An individual was recorded at the seawall in the study area.

Waders

- 7a.4.3.17 Two species of waders recorded in the study area were of conservation interest, including Little Ringed Plover (*Charadrius dubius*) and Kentish Plover (*Charadrius alexandrinus*).
- 7a.4.3.18 A peak count of 21 and 31 individuals of Little Ringed Plover and Kentish Plover were recorded from the Middle Lagoon in March 2009. Little Ringed Plover is considered of local concern by Fellowes *et al.* (2002) due to the restricted breeding range in Hong Kong. In Hong Kong, breeding usually occurs on reclaimed, infilled or temporarily cleared land (Carey *et al.*, 2001). The species was first recorded breeding in the ash lagoons by the Breeding Bird Survey conducted by the Hong Kong Bird Watching Society (HKBWS) (Carey *et al.*, 2001). Chicks or newly fledged young were also recorded in *Additional Waste-to-Energy Facilities EIA* (EPD, 2003a). However, no breeding evidence was recorded during recent surveys.
- 7a.4.3.19 Kentish Plover is primarily a winter visitor but small numbers are also spring and autumn migrants (Carey *et al.*, 2001). It is regarded as of regional concern due to its restricted locality in both regional and local context and its highly concentrated regional population (Fellowes *et al.*, 2002). The number recorded is small (about 1%) compared to the peak count of 2094 within Deep Bay in 2008-09 (Anon, 2009).

Kingfishers

- 7a.4.3.20 Two species of kingfishers recorded in the study area were of local conservation interest: Pied Kingfisher (*Ceryle rudis*) and White-breasted Kingfisher (*Halcyon smyrnensis*). All of them are considered of conservation concern due to the restricted breeding population in Hong Kong (Fellowes *et al.*, 2002).
- 7a.4.3.21 A peak count of two individuals of Pied Kingfisher was reported from the East Lagoon in January 2009 and the seawall in June 2009. The species is uncommon, localized resident in Hong Kong (Carey *et al.*, 2001). Nests were reported in tunnels excavated in banks near waters from *Sludge Treatment Facilities Environmental Study* (EPD, 2006). However, no breeding evidence was recorded during recent surveys.
- 7a.4.3.22 A peak count of four White-breasted Kingfishers was recorded from the East, Middle and West Lagoons in June 2009. White-breasted Kingfishers are locally common residents in

autumn and winter (Carey *et al.*, 2001). Nest holes on the eroded slopes above Nim Wan Road recorded in *Animal Carcass Treatment Facilities EIA* (EPD, 2003b) was considered of be made by the species. However, no breeding evidence was observed during recent survey.

Other birds

- 7a.4.3.23 Eurasian Wigeon (*Anas penelope*) is an abundant winter visitor to Deep Bay (Carey *et al.*, 2001). It was considered as of regional conservation concern due to its highly concentrated population and the marked decline in the regional context (Fellowes *et al.*, 2002). Eight birds were recorded in the East Lagoon in January 2009. The number is small compared to peak winter count of 4439 in 2008-09 in Deep Bay (Anon, 2009).
- 7a.4.3.24 A peak count of 4 Greater Coucals (*Centropus sinensis*) was recorded from the watercourse W1 and secondary woodland habitat in June 2009. Whilst, a Lesser Coucal (*Centropus bengalensis*) was found flying over the study area in March 2009. Although they are listed as Class II protected animal species under PRC's Wild Animal Protection Law, both are common and widespread in Hong Kong.
- 7a.4.3.25 A peak count of 8 Pacific Swifts (*Apus pacificus*) was recorded flying over the East Lagoon in March 2009. Pacific Swift is considered of local concern due to the restricted breeding site in Hong Kong (Fellowes *et al.*, 2002). Breeding probably occurs on only two offshore islands in southeastern waters. There are no previous confirmed and suspected breeding records at Nim Wan.
- 7a.4.3.26 Record of one Zitting Cisticola (*Cisticola juncidis*) was made from Middle and East Lagoons in January and March 2009 respectively. The species is a common winter visitor and passage migrant (Carey *et al.*, 2001). It is widespread in open areas of long grass, but is most abundant at places such as Long Valley, fish ponds and filled-in fish ponds (*ibid*). It is considered as local concern by Fellowes *et al.* (2002) due to its restricted locality in Hong Kong. But the number recorded in the study area is too small compared to the peak count of 800 in 1998 in Hong Kong (Carey *et al.*, 2001).

7a.4.4 Terrestrial Mammals

Literature Review

- 7a.4.4.1 Terrestrial mammals including Chiroptera, Rodentia, Carnivora and Artiodactyla were previously recorded within or in the vicinity of the study area of the Project (EPD, 2003a, 2003b, 2006, 2008, 2009). In which, three bat species consisting of Leschenault's Rousette (*Rousettus leschenaultia*), Short-nosed Fruit Bat (*Cynopterus sphinx*) and Japanese Pipistrelle (*Pipistrellus abramus*) were recorded by direct observation in the lagoons and the adjacent WENT Landfill site (EPD, 2006, 2008, 2009). All three bat species are abundant and widespread in Hong Kong, although protected under Cap. 170.
- 7a.4.4.2 Several rodent species were previously recorded within and adjacent to the lagoons by direction observation and indirect evidence such as burrows. Surveys for the *Additional Waste-to-Energy Facilities EIA* (EPD, 2003a) recorded Ryukyu Mouse (*Mus caroli*) trapped in the ash lagoons. Burrow entrances of rats (*Rattus* spp. or *Niviventer fulvescens*) were also found beside the lagoons, and rodent burrows were seen in the East and Middle Lagoons. Ryukyu Mouse has a restricted distribution in Hong Kong (Shek, 2006). It was first recorded in Mai Po area in 1992 (Goodyer, 1992; Chandrasekhar-Rao, 1994). It usually occurs from grassland, upland stream valley surrounded by secondary forest, and agricultural land from several widely separated areas in the New Territories (Anon, 1995; Ecosystem 2000; GVLL, 1996; Ades and Reels, 1998).

- 7a.4.4.3 Direct observation of Small Asian Mongoose (*Herpestes javanicus*) was also sighted on the access road of the ash lagoons (EPD, 2009). Moreover, indirect evidence such as footprints or scats of Small Asian Mongoose, Masked Palm Civet (*Paguma larvata*), Leopard Cat (*Prionailurus bengalensis*) and Small Indian Civet (*Viverricula indica*) was previously recorded. Footprints or scats of the former three species were found in areas of wet, exposed fly ash in the Middle Lagoon (EPD, 2006), while scats of Small Indian Civet were found on a grassy hillside above Nim Wan Road, on a concrete path around the East Lagoon and seawall of the lagoon (EPD, 2003b, 2009). Masked Palm Civet, Leopard Cat and Small Asian Mongoose are locally uncommon, while Small Indian Civet is abundant in Hong Kong. Apart from Small Asian Mongoose with distribution mainly in countryside, other species mentioned above are widespread in Hong Kong, but all are protected under Cap. 170. Amongst these species, Masked Palm Civet is considered of potential regional concern by Fellowes *et al.* (2002) due to its declining regional population.
- 7a.4.4.4 In addition, footprints of Chinese Muntjac (*Muntiacus reevesii*) or Red Muntjac (*M. muntjak*) were recorded on the hillside near watercourse W2, outside the study area of the Project (EPD, 2003b). Red Muntjac is abundant and widespread in Hong Kong while the distribution of Chinese Muntjac remains unclear (Shek, 2006). These species are protected under Cap. 170.
- 7a.4.4.5 In the adjacent WENT Landfill site and its vicinity, five species of mammals were also recorded by Shea *et al.* (1995), which included Asian House Rat (*Rattus tanezumi*), Chestnut Spiny Rat (*Niviventer fulvescens*), Lesser Rice-field Rat (*Rattus losea*), Musk Shrew (*Suncus murinus*) and Small Asian Mongoose (*Herpestes javanicus*). Rodent and insectivore populations were expected to be supported by the woodland and shrubland habitats at Nim Wan (EPD, 2003a). Mongoose is large and mobile, and would be expected to move throughout the area. They probably forage in areas abundant of rodent and reptile, but not in the ash lagoons (*ibid*).
- 7a.4.4.6 The mammal species of conservation interest recorded in previous literatures are summarized in **Table 7a.6**. Photographic records of mammal species of conservation interest are provided in **Appendix 7a.8**.

Table 7a.6 Mammal Species of Conservation Interest Previously Recorded from the Ash Lagoons and its Vicinity.

Common Name ¹	Distribution in HK	Level of Concern ³	Protection Status in China ⁴	References
Musk Shrew	Common	-	-	Landfill EcolA & Monitoring ⁵
Leschenault's Rousette ¹	Common	(LC)	-	WENT Ex EIA ⁵
Short-nosed Fruit Bat ¹	Common	-	-	STF ES ⁵ ; WENT Ex EIA ⁵
Japanese Pipistrelle ¹	Abundant	-	-	STF ES ⁵ ; STF EIA ⁵ ; WENT Ex EIA ⁵
Chestnut Spiny Rat	Abundant	-	-	Add WEF EIA ⁵ ; Landfill EcolA & Monitoring ⁵
Lesser Rice-field Rat	Uncommon	-	-	Landfill EcolA & Monitoring ⁵
Asian House Rat	Uncommon	-	-	Landfill EcolA & Monitoring ⁵
Ryukyu Mouse	Restricted	-	-	Add WEF EIA ⁵
Masked Palm Civet ¹	Uncommon	PRC	-	STF ES ⁵

Common Name ¹	Distribution in HK	Level of Concern ³	Protection Status in China ⁴	References
Small Indian Civet ¹	Uncommon	-	Class II	ACTF ⁵ ; WENT Ex EIA ⁵
Small Asian Mongoose ¹	Abundant	-	-	STF ES ⁵ ; WENT Ex EIA ⁵ ; Landfill EcoIA & Monitoring ⁵
Leopard Cat ^{1,2}	Uncommon	-	-	STF ES ⁵
Red Muntjac/ Chinese Muntjac ^{1,2}	Uncommon/ Data deficient	PRC	-	ACTF ⁵

Notes:

1. Protected under Wild Animal Protection Ordinance (Cap. 170)
2. Protected under Protection of Endangered Species of Animals and Plants Ordinance (Cap. 586)
3. Fellowes *et al.* (2002); LC=Local Concern; PRC=Potential Regional Concern. Letter in parentheses indicate that the assessment is on the basis of restrictedness in breeding and/or roosting sites rather than in general occurrence.
4. List of Wild Animals Under State Protection (promulgated by State Forestry Administration and Ministry of Agriculture on 14 January, 1989).
5. WEF EIA = Feasibility Study of Waste-to-Energy Facilities EIA; Add WEF EIA = Additional Waste-to-Energy Facilities EIA; ACTF = Animal Carcass Treatment Facilities EIA; STF ES = Sludge Treatment Facilities Environmental Study; STF EIA = Sludge Treatment Facilities Feasibility Study EIA; WENT Ex EIA = West New Territories Landfill Extensions Feasibility Study EIA.

Recent Survey Results

7a.4.4.7 A dead body of Small Indian Civet (*Viverricula indica*) was found on the access road north of the Middle Lagoon. The species forages on the woodland floor and prefers to excrete on road or exposed area (Shek, 2005). The Middle Lagoon is therefore not used as a foraging ground by the species. Two individuals of Japanese Pipistrelle (*Pipistrellus abramus*) were sighted lingering above the access road between the East and Middle Lagoons in February 2009. Small Indian Civet and Japanese Pipistrelle are abundant and widespread in Hong Kong (Shek, 2005). Japanese Pipistrelle roosts frequently in towns and villages, also abundant in wetland areas (*ibid*).

7a.4.4.8 Indirect observation of scats of mammal species were also recorded during recent surveys. Scats of Small Indian Civet were found on the seawall in June 2009.

7a.4.5 Herpetofauna

Literature Review

7a.4.5.1 A total of 2 to 6 amphibian species and 4 to 10 reptile species were previously recorded within or in the vicinity of the study area of the Project (EPD, 2003b, 2006, 2008, 2009). The majority are common and widespread in Hong Kong except the uncommon but widespread Grass Lizard (*Takydromus sexlineatus ocellatus*) found in surveys for the *Sludge Treatment Facilities Environmental Study* (EPD, 2006). Moreover, one reptile species, Copperhead Racer (*Elaphe radiate*), recorded at the seawall outside the East Lagoon in the *Sludge Treatment Facilities Feasibility Study EIA* (EPD, 2008), is considered of potential regional concern by Fellowes *et al.* (2002) due to drastic decline of its population in regional context. It is also listed as endangered in China Red Data Book. It occurs in rather dry habitats which could be flat and open, rocky or wooded.

Recent Survey Results

7a.4.5.2 Direct observation or evidence of six amphibian and three reptile species were recorded from the study area in recent surveys (**Appendix 7a.7**). All the species are common and widely distributed in Hong Kong. Majority of the amphibians were reported from the ash lagoons and grassland/shrubland habitat around the lagoons. Whilst, reptiles were found

in the ash lagoon, grassland/shrubland, developed area/disturbed area and orchard habitats. No rare species or species of conservation interest were found.

7a.4.6 Dragonflies and Butterflies

Literature Review

- 7a.4.6.1 A total of 6 to 22 dragonfly and 5 to 39 butterfly species were previously observed within or in the vicinity of the study area of the Project (EPD, 2003a, 2003b, 2006, 2009). Majority of the species are common and widespread except Coastal Glider (*Macromiella cora*), which is uncommon in Hong Kong (Wilson, 2004) and listed as “local concern” by Fellowes *et al.* (2002). A good number of this species was found utilizing the East and Middle Lagoons under the study of *Animal Carcass Treatment Facilities EIA* (EPD, 2003b). Coastal Glider has an extremely widespread global distribution (Wilson, 2004) and can be recorded at 10 locations in Hong Kong (Tam *et al.*, 2008).
- 7a.4.6.2 Surveys for the *Sludge Treatment Facilities Feasibility Study EIA* (EPD, 2008) also recorded 7 dragonfly, 2 damselfly and 30 butterfly species within or in the vicinity of the study area of the Project. Majority of the species are common and widespread in Hong Kong except uncommon species of Common Jay (*Graphium doson axion*), Danaid Eggfly (*Hypolimnas misippus*) and Little Branded Swift (*Pelopidas agna*), and rare Glassy Bluebottle (*Graphium cloanthus*). Amongst these, Danaid Eggfly and Glassy Bluebottle are of local concern (Fellowes *et al.*, 2002). Males of Danaid Eggfly usually inhabit highland area and females are rather rare, occurring near agricultural land and fish ponds in the Territories (Lo *et al.*, 2004). Glassy bluebottle occurs only in dense forests and has been recorded from Shing Mun, Tai Mo Shan, Tai Po Kau, Lam Tseun, Ma On Shan and Pat Sin Leng (Lo *et al.*, 2004).

Recent Survey Results

- 7a.4.6.3 One damselfly and 11 dragonfly species were recorded within the study area in recent survey (**Appendix 7a.7**). Most of the species are common and widespread in Hong Kong except Coastal Glider (*Macromiella cora*) is uncommon. It is considered of local concern by Fellowes *et al.* (2002). It was the dominant dragonfly in the Middle Lagoon, and a few individuals were recorded from the East Lagoon and the grassland/shrubland habitat at south of the Middle Lagoon. A photographic record of this dragonfly species of conservation interest is provided in **Appendix 7a.8**.
- 7a.4.6.4 Twenty-seven species of butterfly were recorded within the study area (**Appendix 7a.7**). Except two, other species found are common and widespread in Hong Kong. Chestnut Bob (*Iambrix salsala salsala*) is uncommon and Red Lacewing (*Cethosia biblis biblis*) is rare. The grassland/shrubland habitat supported the highest diversity and abundance of butterfly within the study area, followed by secondary woodland habitat.
- 7a.4.6.5 Chestnut Bob prefers dry grassy areas associated with shady secondary growth (Bascombe *et al.*, 1999). Small colonies of the species are found throughout Hong Kong (*ibid*). A single individual was found in the grassland/shrubland habitat of the West Lagoon in June 2009.
- 7a.4.6.6 A female Red Lacewing was encountered once in the grassland/shrubland habitat of the East Lagoon in June 2009. Females of this species appear to wander infrequently near the larval foodplant (*Passiflora coerulea*). Whilst, males are often found far from the larval foodplant (Bascombe *et al.*, 1999). However, no *Passiflora coerulea* was recorded during vegetation survey. One individual was also reported from West New Territories Landfill Extensions Feasibility Study EIA (EPD, 2009), but far away from the study area in Lung Kwu Tan. The species has been recorded from Plover Cove, Lantau North, Cape D’Aguilar, Sha Chau and Lung Kwu Chau. The biggest population in Hong Kong is found in Lung Kwu Tan (Young & Yiu, 2002).

7a.4.7 Freshwater Communities

Literature Review

- 7a.4.7.1 Six to twelve fish species were previously recorded within the ash lagoons and the two streams within the study area (EPD, 2003a, 2003b). Fish communities in the tidal channel and lower reaches of stream west of the study area were dominated by common estuarine species such as Grey Mullet (*Mugil cephalus*) and Jarbua terapon (*Terapon jarbua*) (EPD, 2006). Tilapia (*Oreochromis* sp.) and Mullet (*Mug/Lisa* sp.), were observed at the Middle Lagoon and in the tidal channel (EPD, 2003a). Most of the fish observed are common except *Squaliobarbus curriculus*, an unconfirmed cyprinid species *Osteochilus vittatus* and Dark-margined Flagtail (*Kuhlia marginata*) (EPD, 2003a, 2003b, 2006). *Squaliobarbus curriculus* had not been recorded previously in Hong Kong whereas *Osteochilus vittatus* is rare in Hong Kong and has been recorded from a few local reservoirs (Lee *et al.*, 2004). Dark-margined Flagtail (*Kuhlia marginata*) is of regional concern.
- 7a.4.7.2 Invertebrate communities in the ash lagoons and streams were of poor species diversity and richness (EPD, 2003b, 2006). Freshwater communities in the East and Middle Lagoons were dominated by abundant fauna of libellulid dragonfly nymphs, small crustaceans such as ostracods and copepods, and notonectid/corixid water-beetles (EPD, 2003a, 2006). Vast numbers of the water snail *Melanoides tuberculata* were present in the shallow pools in the East Lagoon (EPD, 2006).
- 7a.4.7.3 Invertebrate communities in the streams were dominated by taxa tolerant of brackish waters (e.g. amphipods, chironomids and polychaetes) (EPD, 2003b, 2006). Amphipods and chironomids were abundant in the two streams. Dragonfly and stonefly larvae were found in watercourse W2 while oligochaetes and polychaetes were recorded in watercourse W1 (EPD, 2003b). Higher diversity and abundance were found in watercourse W1 than watercourse W2, with records of Atyid shrimp *Caridina cantonensis*, small pond skaters and crabs *Varuna litterata* (EPD, 2009). Two shrimp species and damselfly nymph were also recorded in watercourse W1 (EPD, 2008). The lower reach of this stream were dominated by Nile Tilapia (*Oreochromis niloticus*) and Atyid shrimp *Cardina cantonensis* (ibid), while freshwater Long-armed Shrimp (*Macrobrachium* sp.) was observed in the upstream reach outside the current study boundary (EPD, 2003a).

Recent Survey Results

- 7a.4.7.4 A total of 27 freshwater species were recorded in recent surveys. A full list of freshwater species recorded is given in **Appendix 7a.7**.
- 7a.4.7.5 The upper reach of the watercourse W1 was abundant in water mite *Metrocrois* sp. Shrimps such as *Macrobrachium hainanense* and *Caridina cantonensis*, caddisfly *Anisocentropus maculatus*, mayfly Leptohlebiidae and whirligig beetle Gyrinidae were also commonly found. The midstream had a much lower diversity, dominated by Chameleon Goby *Tridentiger trigonocephalus* and leech. Water skater *Ptilomera tigrina* and oligochaete were also recorded. Five fish species were found in the tidal channel, including *T. trigonocephalus*, *Terapon jarbua*, *Mugil cephalus*, *Oreochromis niloticus* and *Periophthalmus modestus*. No rare species or species of conservation concern were found.
- 7a.4.7.6 The watercourse W2 was abundant in insect larvae, including dragonflies Tramea and Trithemis, mayflies Baetidae, Leptohlebiidae and Heptageniidae, trueflies *Simulium* sp. and Chironomidae and water skater *Ptilomera tigrina*. Snail *Physella acuta* and water mites Hydrachnida were also dominant.

7a.4.8 Intertidal Fauna

Literature Review

- 7a.4.8.1 Intertidal habitats within the study area supported low species diversity. Five to thirteen intertidal species were recorded on the seawall of the ash lagoons with rock oyster *Saccostrea cucullata* dominated the area (EPD, 2003a, 2008). The low shore was dominated by *Saccostrea cucullata* and the middle shore was dominated by *Nerita yoldii* (EPD, 2006, 2009). Other common species included nerite *Nerita albicilla* and encrusting algae *Hildenbrandia rubra* (EPD, 2008). Only occasional records of periwinkles, barnacles and black mussels were found in the upper shore (ibid). High abundance of a common crab species in western waters *Metapograpsus quadridentatus* was recorded (EPD, 2006, 2009).
- 7a.4.8.2 Nineteen faunal taxa were recorded in tidal channel (EPD, 2003b). The substratum at the mouth of tidal channel was dominated by oysters *Crassostrea gigas* and a couple of mudskipper *Periophthalmus* (EPD, 2006, 2009). Other fauna found included gastropods, bivalves and crustacean (EPD, 2003b). All species recorded are common and widespread in Hong Kong (EPD, 2003b, 2006, 2009).

Recent Survey Results

- 7a.4.8.3 The intertidal habitat within the study area is composed of artificial seawall with sloping boulders. A total of 26 floral and faunal species were recorded in the walk-through and transect surveys. None of the recorded species was rare or considered as species of conservation interest. Detailed results of the intertidal surveys are presented in **Appendix 7a.7**.
- 7a.4.8.4 Similar abundance and species diversity were shown in dry and wet seasons. But species composition varied slightly. Similar to the previous findings, the low shore was dominated by rock oyster *Saccostrea cucullata* and erect/encrusting algae. *Ulva* sp. was found in dry season, whereas *Hapalospongion gelatinosum* was present in wet season. The middle shore was abundant in rock oyster *S. cucullata* and nerite *Nerita albicilla*. The high shore was dominated by *N. albicilla*, periwinkles *Echinolittorina radiata* and *Littoraria articulata*. Mobile species such as crab *Hemigrapsus sanguineus* and sea slater *Ligia exotica* were mainly found at the low shore. Other species found included tubeworm, sea anemone, gastropods, bivalves and crustacean. All species recorded are common and widespread in Hong Kong. No intertidal fauna of conservation interests (e.g. horseshoe crabs) was recorded within the study area during the surveys. The intertidal assemblage at the two sampling locations reflected the typical semi-exposed nature of artificial seawalls in Hong Kong.
- 7a.4.8.5 The water level was extremely low during wet season survey. Gorgonian *Echinomuricea* sp. was also recorded exposed in low tide. This species is common across Hong Kong waters and is known tolerant to turbid and harsh environment.

7a.4.9 Subtidal Fauna

Literature Review

- 7a.4.9.1 Consultancy Study on Marine Benthic Communities in Hong Kong (AFCD, 2002) provided territory-wide information on the subtidal benthic communities including spatial distribution and species composition. Samples were collected from 120 stations over the Hong Kong waters. Stations 6 and 8 were located in outer Deep Bay offshore to the Project site. The benthos habitat off the study area was composed of very fine sand and/or silt/clay. Species diversity and evenness in this habitat was moderate, represented by the bivalve *Potamocorbula larvis*, and the polychaetes *Mediomastus californiensis* and *Mediomastus* sp. in summer, and the polychaetes *Nephtys polybranchia*, *Spionidae* sp., *Heteromastus*

filiformis, *Otopsis* sp., *Mediomastus* sp. and *Neanthes* sp. in winter. No benthic species of conservation concern was recorded from these stations. This previous territory-wide benthic studies provides representative ecological baseline information of benthic community of the study area. Considering that the project is a land-based project and loss of benthic habitat is not anticipated, no additional benthic survey is deemed necessary.

- 7a.4.9.2 The geographical distribution of reef-building scleractinian corals in Hong Kong is influenced by the water salinity. The western waters nearer to the Pearl River tend to support low coverage and diversity of hard corals mainly due to its estuarine environment. Results from the intensive underwater surveys commissioned by AFCD during 2001 and 2002 confirmed the low hard coral coverage and species diversity in the Western waters. Gorgonians, especially blue gorgonian *Guaiagorgia*, were found along much of the coastline at Lantau. Dive survey conducted under another EIA study at Pillar Point (CLP, 2006) showed that only small-sized isolated gorgonians *Echinomuricea* occurred in low abundance in the survey area.

Recent Survey Results

- 7a.4.9.3 Results similar to EIA study at Pillar Point were obtained. The seabed of the artificial seawall was composed of artificial boulders with scattered rock. Very low coverage (<1%) of single gorgonian species *Echinomuricea* sp. was found. The locations of the gorgonian found are given in **Figure 7a.3**. The size of gorgonians ranged from 3 to 11 cm in height compared to those recorded in Chiu Keng Wan (size ranged from 15 cm to 40 cm). The condition was unhealthy. Part of the gorgonian was dead. *Echinomuricea* sp. is common across Hong Kong waters and tolerant to turbid and harsh environment. In addition to the gorgonians recorded, the site comprised a limited marine life including green mussel (*Perna viridis*), rock oyster (*Saccostrea cucullata*) and green algae *Ulva* sp. No rare species or species of conservation interest was found.

7a.4.10 Marine Mammals

Literature Review

- 7a.4.10.1 Chinese White Dolphin (*Sousa chinensis*) and Finless Porpoise (*Neophocaena phocaenoides*) are the two most commonly found marine mammals in Hong Kong. Most Chinese White Dolphin groups were sighted in Northwest Lantau, Northeast Lantau, West Lantau and Southwest Lantau, and a few sightings were made in Deep Bay and Southeast Lantau (AFCD, 2009, 2010). Only two areas with consistent dolphin usage were identified, including the waters around Lung Kwu Chau, and the stretch of coastline from Shum Wat to Fan Lau (AFCD 2010).
- 7a.4.10.2 Finless Porpoise only occurs in the eastern and southern waters of Hong Kong (AFCD, 2009) and was never recorded from the northwestern waters. Distinct seasonal variation in porpoise distribution was observed (ibid). Porpoises were frequently found at the waters south of Tai A Chau, the offshore waters of Southeast Lantau, around Shek Kwu Chau and the southeast corner of Cheung Chau in high concentration in winter and spring months (i.e. December to May) (AFCD, 2010). In contrast, the distribution dramatically shifted to the eastern waters near east of Po Toi Islands in summer and autumn months (ibid). No sightings of Chinese White Dolphin or Finless Porpoise were recorded within the study area under this Project during the long-term marine mammals monitoring surveys by AFCD. Considering that the project is a land-based project and direct impact to marine mammals is not anticipated, no additional marine mammal survey is deemed necessary.

7a.5 Ecological Value

7a.5.1.1 With reference to EIAO-TM Annex 8 criteria, the ecological importance of recorded habitats is evaluated in **Table 7a.7 to Table 7a.15**

Table 7a.7 Ecological Value of Ash Lagoon in the Study Area of the Tsang Tsui Ash Lagoon Site

Criteria	Ash Lagoon
Naturalness	<u>East Lagoon</u> The PFA dumping ground is man-made and subject to frequent disturbance/modification from CLP's PFA filling activities. Pools formed after rainstorms were ephemeral in nature and covered less than 10% of the total lagoon area during dry season, to approximately 20% flooded during the wet season. The southern part of the lagoon was stockpiled with PFA. <u>Middle Lagoon</u> The PFA dumping ground is man-made in nature and subject to relatively lower disturbance. No PFA filling activities were observed during the surveys. The amount of water level was found to be varied with the amount of rainfall. The southern part of the lagoon was flooded through the survey period (i.e. January to June 2009). <u>West Lagoon</u> The PFA dumping ground is man-made in nature and subject to frequent disturbance/modification from CLP's dredging activities. Permanent pools formed at the rim of the lagoon are constantly flooded with water.
Size	East Lagoon: small (9.39 ha) Middle Lagoon: medium (21.28 ha; ~5 ha at the southern part was with open water, ~3 ha of which was core area for Little Grebe) West Lagoon: small (13.53 ha)
Diversity	<u>East Lagoon</u> Floral diversity: Low (26 species) Faunal diversity: Low to moderate (18 avifaunal species, 1 amphibian species, 4 butterfly species and 3 dragonfly species) <u>Middle Lagoon</u> Floral diversity: Low (29 species) Faunal diversity: Low to moderate (25 avifaunal species, 1 mammal species, 3 amphibian species, 1 reptile species, 4 butterfly species and 6 dragonfly species) <u>West Lagoon</u> Floral diversity: Low (28 species) Faunal diversity: Low to moderate (16 avifaunal species, 3 amphibian species, 2 butterfly species and 2 dragonfly species)
Rarity	<u>East Lagoon</u> Seven avifaunal species of conservation interest were

Criteria	Ash Lagoon
	<p>recorded in the recent surveys (Little Grebe, Grey Heron, Chinese Pond Heron, Eurasian Wigeon, Pied Kingfisher, White-throated Kingfisher and Zitting Cisticola).</p> <p><u>Middle Lagoon</u> Eight avifaunal species, one mammal and one dragonfly species of conservation interest were recorded in the recent surveys (Little Grebe, Little Egret, Osprey, Peregrine Falcon, Little Ringed Plover, Kentish Plover, White-throated Kingfisher, Zitting Cisticola, Small Indian Civet and Coastal Glider).</p> <p><u>West Lagoon</u> Three avifaunal species of conservation interest were recorded in the recent surveys (Little Grebe, Little Egret and White-throated Kingfisher).</p>
Re-creatability	High
Fragmentation	Moderate. The three lagoons are separated by traffic roads.
Ecological linkage	Not functionally or structurally linked to any nearby highly valuable habitat
Potential value	<p><u>East Lagoon</u> Low, with frequent disturbance from PFA filling activities.</p> <p><u>Middle Lagoon</u> Low, with frequent disturbance and variation of site conditions.</p> <p><u>West Lagoon</u> Low, with frequent disturbance from PFA dredging activities.</p>
Nursery ground	Potential breeding ground for a bird species of conservation interest (Little Grebe).
Age	The lagoons were constructed 15-20 years ago.
Abundance/richness of wildlife	<p><u>East Lagoon</u> Low to moderate</p> <p><u>Middle Lagoon</u> Moderate for avifauna, low for butterfly and dragonfly</p> <p><u>West Lagoon</u> Low to moderate</p>
Ecological value	Low to moderate

Table 7a.8 Ecological Value of Secondary Woodland in the Study Area of the Tsang Tsui Ash Lagoon Site

Criteria	Secondary Woodland
Naturalness	Habitat is dominated by native species, but is secondary in nature.
Size	Small (3.31 ha)
Diversity	Floral diversity: Low to moderate (59 species) Faunal diversity: Low to moderate (13 avifaunal species, 1 amphibian species, 21 butterfly species and 2 dragonfly species)
Rarity	One avifaunal species of conservation interest was recorded in the recent surveys (Greater Coucal).
Re-creatability	Recreatability is moderate but the habitat requires several decades to re-create.
Fragmentation	Moderate
Ecological linkage	Not functionally or structurally linked to any nearby highly valuable habitat
Potential value	Moderate
Nursery ground	No significant records
Age	Young in view of the structural complexity and community composition
Abundance/richness of wildlife	Low to moderate
Ecological value	Low to moderate

Table 7a.9 Ecological Value of Grassland/Shrubland in the Study Area of the Tsang Tsui Ash Lagoon Site

Criteria	Grassland/Shrubland
Naturalness	Habitat is largely natural but likely to be frequently disturbed by hill fires.
Size	Large (33.05 ha)
Diversity	Floral diversity: Low to moderate (103 species) Faunal diversity: Low to moderate (33 avifaunal species, 2 mammal species, 4 amphibian species, 1 reptile species, 22 butterfly species and 7 dragonfly species)
Rarity	Two avifaunal species of conservation interest, one uncommon and one rare butterfly species and dragonfly species of conservation interest were recorded in the recent surveys (Little Egret, Greater Coucal, Chestnut Bob, Red Lacewing and Coastal Glider).
Re-creatability	Moderate to high
Fragmentation	Low
Ecological linkage	Not functionally or structurally linked to any nearby highly valuable habitat.
Potential value	Low
Nursery ground	No significant records
Age	Relatively young in terms of succession pathway.
Abundance/richness of wildlife	Low to moderate
Ecological value	Low to moderate

Table 7a.10 Ecological Value of Plantation in the Study Area of the Tsang Tsui Ash Lagoon Site

Criteria	Plantation
Naturalness	Planted man-made habitat dominated by exotic species.
Size	Small (4.90 ha)
Diversity	Floral diversity: Low to moderate (57 species) Faunal diversity: Low to moderate (17 avifaunal species, 2 mammal species, 6 butterfly species and 3 dragonfly species)
Rarity	No rare species or species of conservation interest recorded
Re-creatability	High
Fragmentation	High
Ecological linkage	Not functionally or structurally linked to any nearby highly valuable habitat
Potential value	Low
Nursery ground	No significant record
Age	Relatively young
Abundance/richness of wildlife	Low
Ecological value	Low

Table 7a.11 Ecological Value of Watercourse in the Study Area of the Tsang Tsui Ash Lagoon Site

Criteria	Watercourse
Naturalness	Habitat was largely natural in upstream sections, but downstream sections have been subject to extensive channel modification.
Size	Small (3.70 ha) Watercourse W1: 1490 m Watercourse W2: 206 m
Diversity	Floral diversity: Low (27 species) Faunal diversity: Low to moderate (12 avifaunal species and 27 freshwater species)
Rarity	W1: Five avifaunal species of conservation interest were recorded in the recent surveys (Great Egret, Little Egret, Chinese Pond Heron, Greater Coucal and White-throated Kingfisher). W2: No rare species or species of conservation interest was recorded in the recent surveys.
Re-creatability	Low to moderate
Fragmentation	W1: Low W2: Moderate to high. A steep concrete lined cascade constructed between midstream and estuarine section.
Ecological linkage	Not functionally or structurally linked to any nearby highly valuable habitat
Potential value	Low
Nursery ground	No significant records
Age	Not applicable
Abundance/richness of wildlife	Low
Ecological value	W1: Low to moderate W2: Low

Table 7a.12 Ecological Value of Developed Area/Disturbed Area in the Study Area of the Tsang Tsui Ash Lagoon Site

Criteria	Developed area/Disturbed area
Naturalness	Man-made habitat
Size	Small (9.49 ha)
Diversity	Floral diversity: Low to moderate (125 species) Faunal diversity: Low to moderate (11 avifaunal species, 1 mammal species, 1 amphibian species, 2 reptile species, 9 butterfly species and 3 dragonfly species)
Rarity	No rare species or species of conservation interest was recorded in the recent surveys.
Re-creatability	High
Fragmentation	Not applicable
Ecological linkage	Not functionally or structurally linked to any nearby highly valuable habitat
Potential value	Low
Nursery ground	No significant records
Age	Not applicable
Abundance/richness of wildlife	Low
Ecological value	Low

Table 7a.13 Ecological Value of Orchard in the Study Area of the Tsang Tsui Ash Lagoon Site

Criteria	Orchard
Naturalness	Planted man-made habitat
Size	Small (0.79 ha)
Diversity	Floral diversity: Low (4 species) Faunal diversity: Low (4 avifaunal species, 1 reptile species, 9 butterfly species and 3 dragonfly species)
Rarity	No rare species or species of conservation interest recorded
Re-creatability	High
Fragmentation	Low
Ecological linkage	Not functionally or structurally linked to any nearby highly valuable habitat
Potential value	Low
Nursery ground	No significant records
Age	Relatively young
Abundance/richness of wildlife	Low
Ecological value	Low

Table 7a.14 Ecological Value of Seawall in the Study Area of the Tsang Tsui Ash Lagoon Site

Criteria	Seawall
Naturalness	Man-made habitat, but subsequently subject to low human disturbance/modification.
Size	Small (1.51 ha)
Diversity	Floral diversity: Low (26 species) Faunal diversity: Low (20 intertidal species)
Rarity	Six avifaunal species and one mammal species of conservation interest as well as one gorgonian species were recorded in the recent surveys (Grey Heron, Little Egret, Chinese Pond Heron, Black Kite, Common Buzzard, Pied Kingfisher, Small Indian Civet (scat) and <i>Echinomuricea</i> sp.).
Re-creatability	High
Fragmentation	Low
Ecological linkage	Not functionally or structurally linked to any nearby valuable habitat
Potential value	Low
Nursery ground	No significant records
Age	About 15 years since construction
Abundance/richness of wildlife	Low
Ecological value	Low

Table 7a.15 Ecological Value of Coastal Waters in the Study Area of the Tsang Tsui Ash Lagoon Site

Criteria	Coastal waters
Naturalness	Natural but in close proximity to one of the busiest shipping lanes in Hong Kong.
Size	Large (56.50 ha)
Diversity	Faunal diversity: low
Rarity	Two avifaunal species of conservation interest and one gorgonian species recorded (Little Egret, Pacific Reef Egret and <i>Echinomuricea</i> sp.)
Re-creatability	Low
Fragmentation	Not applicable
Ecological linkage	Structurally linked with the preferred habitats of marine mammal located to the south-west of the habitat (e.g. Sha Chau and Lung Kwu Chau Marine Park), but low in functionally linkage.
Potential value	Low
Nursery ground	No significant records
Age	Not applicable
Abundance/richness of wildlife	Moderate for benthic infauna. Low for coral community. No sighting of marine mammal within the study area.
Ecological value	Low

7a.5.1.2 Most identified habitats (grassland/shrubland, plantation, watercourse W2, developed area/disturbed area, orchard, seawall and coastal waters) in the study area are considered to have low ecological value. Ash lagoon, secondary woodland and watercourse W1 are of low to moderate value.

7a.5.1.3 The Middle Lagoon supported moderate diversity and abundance of avifauna of conservation interest including Little Grebe, Little Egret, Osprey, Peregrine Falcon, Little

Ringed Plover, Kentish Plover, White-throated Kingfisher and Zitting Cisticola. Protected Small Indian Civet and locally concerned Coastal Glider were also found. It was the main foraging and breeding ground for the wetland dependent avifauna and mammal recorded from the study area. However, the lagoon was subject to disturbance from PFA filling activities though such activities were not observed during the surveys. Moreover, only a small part of the southern portion of the lagoon was found to be flooded with water and utilized by wetland dependent birds throughout the survey period. Therefore, the ash lagoon habitat in the Middle Lagoon is ranked of low to moderate ecological value.

- 7a.5.1.4 Comparatively, the East and West Lagoons supported a low to moderate diversity of faunal species. The past and current management practices accounts for the relatively low value of the habitat. The utmost fluctuation of water levels in the East Lagoon and the regular PFA dumping and removal from the area limit the development of the lagoons to a high-valued wetland habitat. Moreover, about half of the East Lagoon was covered by PFA and shrubland, hence, the effective wet area was at most 25% during wettest months. It appeared to be completely dry during dryer season. Nevertheless, several species of conservation interest (e.g. Little Grebe, Little Egret, Grey Heron, Chinese Pond Heron, Eurasian Wigeon, Pied Kingfisher, White-throated Kingfisher and Zitting Cisticola) were also recorded. The East and West Lagoons are therefore considered of low to moderate ecological value due to their volatile and/or fairly disturbed nature.
- 7a.5.1.5 Secondary woodland habitat is considered to have low to moderate ecological value. The habitat within the study area was relatively young and supported only low floral and faunal diversity compared with other mature secondary woodland in Hong Kong. The habitat is situated near Nim Wan Road subject to a relatively high disturbance.
- 7a.5.1.6 Watercourse W1 is considered to have low to moderate ecological value. Although the downstream section of watercourse W1 has been channelized, it provided foraging habitat for a number of wetland dependent bird species of conservation interest.
- 7a.5.1.7 Despite a few species of conservation interest (i.e. avifauna, mammal and gorgonian) were recorded, the seawall and coastal waters habitat within the study area are not unique or major habitats for supporting the recorded species of conservation interest. The recorded avifauna and mammals of conservation interest inhabit a wide range of habitats. In view of artificial nature of the seawall habitat and high traffic disturbance of the coastal waters as well as low species diversity supported, the two habitats are ranked as low.
- 7a.5.1.8 In accordance with EIAO-TM Annex 8 criteria, species of conservation interest recorded in the study area are listed in **Table 7a.16**. In reviewing the previous studies, flora and fauna recorded in surveys conducted in 2008 (i.e. *Sludge Treatment Facilities – Feasibility Study Environmental Impact Assessment* and *West New Territories (WENT) Landfill Extensions Environmental Impact Assessment*) are considered to be updated site relevant baseline information and are also included in the current ecological impact assessment.

Table 7a.16 Species of Conservation Interest Recorded in the Study Area of the Tsang Tsui Ash Lagoon Site in 2008 and 2009

Common name	Scientific name	Locations	Protection status	Distribution	Rarity
Flora					
Incense Tree	<i>Aquilaria sinensis</i>	Grassland/shrubland habitat near the mouth of watercourse W1	Cap. 586, Category III nationally protected species in China	Lowland forests and fung shui woods	Locally common
Pitcher's Plant	<i>Nepenthes mirabilis</i>	Grassland/shrubland near watercourses	Cap. 96, IUCN Red List of Threatened Species (Category LR/LC), CITES Appendix III	Wet, open places on granite and sedimentary rocks (western New Territories)	Common
Bamboo Orchid ¹	<i>Arundina graminifolia</i>	Grassland/shrubland near watercourse W2	Cap. 96 and Cap. 586	Grassland and streamside	Locally very common
Indian Orchid ¹	<i>Zeuxine strateumatica</i>	Ash Lagoons	Cap. 96 and Cap. 586	Open grassland and fly ash lagoon	Restricted
Avifauna					
Little Grebe	<i>Tachybaptus ruficollis</i>	East, Middle and West Lagoons	Cap. 170	Mainly reported from northern New Territories	Locally common
Grey Heron	<i>Ardea cinerea</i>	East Lagoon	Cap. 170	Mainly reported from northern New Territories	Locally common
Great Egret	<i>Egretta alba</i>	Tidal channel	Cap. 170	Widely distributed in Hong Kong	Locally common
Little Egret	<i>Egretta garzetta</i>	Middle and West Lagoons, seawall, watercourse W1, tidal channel	Cap. 170	Widely distributed in Hong Kong	Locally common
Pacific Reef Egret	<i>Egretta sacra</i>	Coastal waters	Cap. 170; Class II Protected Animal of PRC	Mainly found in rocky shores in southern areas of Hong Kong Island	Locally uncommon
Cattle Egret ¹	<i>Bubulcus ibis</i>	Watercourses and developed/disturbed area	Cap. 170	Widely distributed in Hong Kong	Locally common
Chinese Pond Heron	<i>Ardeola bacchus</i>	East Lagoon and seawall	Cap. 170	Widely distributed in Hong Kong	Locally common
Black-crowned Night Heron ¹	<i>Nycticorax nycticorax</i>	Grassland/shrubland	Cap. 170	Widely distributed in Hong Kong	Locally common
Eurasian Wigeon	<i>Anas penelope</i>	East Lagoon	Cap. 170	Mainly reported from northeast New Territories	Winter Visitor
Osprey	<i>Pandion haliaetus</i>	Middle Lagoon	Cap. 170; Cap. 586; Class II Protected Animal of PRC; CITES Appendix II	Mainly reported from Inner Deep Bay	Locally common
Black Kite	<i>Milvus migrans</i>	Seawall	Cap. 170; Class II Protected Animal of PRC; CITES Appendix II	Widely distributed in Hong Kong	Locally common

Common name	Scientific name	Locations	Protection status	Distribution	Rarity
White-bellied Sea Eagle ¹	<i>Haliaeetus leucogaster</i>	Middle Lagoon, grassland/shrubland near the WENT Landfill site	Cap. 170; Class II Protected Animal of PRC; CITES Appendix II	Mainly found in eastern waters of Hong Kong	Locally uncommon, about 8 pairs breed in Hong Kong
Crested Goshawk	<i>Accipiter trivirgatus</i>	On passage over the study area	Cap. 170; Cap. 586; Class II Protected Animal of PRC; CITES Appendix II	Widely distributed in Hong Kong	Uncommon
Common Buzzard	<i>Buteo buteo</i>	Seawall	Cap. 170; Class II Protected Animal of PRC; CITES Appendix II	Widely distributed in Hong Kong	Locally common
Common Kestrel	<i>Falco tinnunculus</i>	On passage over the study area	Cap. 170; Cap. 586; Class II Protected Animal of PRC; CITES Appendix II	Widely distributed in Hong Kong	Common
Peregrine Falcon	<i>Falco peregrinus</i>	Middle Lagoon	Cap. 170; Cap. 586; Class II Protected Animal of PRC; CITES Appendix II	Widely distributed in Hong Kong	Scarce
Eurasian Coot ¹	<i>Fulica atra</i>	Middle Lagoon	Cap. 170	Mainly reported from Northern New Territories	Locally common
Little Ringed Plover	<i>Charadrius dubius</i>	Middle Lagoon	Cap. 170	Widely distributed in Hong Kong	Locally common
Kentish Plover	<i>Charadrius alexandrinus</i>	Middle Lagoon	Cap. 170	Widely distributed in Hong Kong	Abundant
Common Redshank ¹	<i>Tringa totanus</i>	Middle Lagoon	Cap. 170	Mainly reported from Northern New Territories	Locally common
Wood Sandpiper ¹	<i>Tringa glareola</i>	Middle Lagoon	Cap. 170	Widely distributed in Hong Kong	Locally common
Eurasian Woodcock ¹	<i>Scolopax rusticola</i>	Middle Lagoon	Cap. 170	Widely distributed in Hong Kong	Locally rare
Greater Coucal	<i>Centropus sinensis</i>	Watercourse W1 and secondary woodland habitats	Cap. 170; Class II Protected Animal of PRC	Widely distributed in Hong Kong	Locally common
Lesser Coucal	<i>Centropus bengalensis</i>	Flying over the study area	Cap. 170; Class II Protected Animal of PRC	Widely distributed in Hong Kong	Locally common
Pacific Swift	<i>Apus pacificus</i>	East Lagoon	Cap. 170	Widely distributed in Hong Kong	Locally common
Pied Kingfisher	<i>Ceryle rudis</i>	East Lagoon and seawall around the Ash Lagoons	Cap. 170	Mainly reported from northern New Territories	Locally uncommon

Common name	Scientific name	Locations	Protection status	Distribution	Rarity
White-throated Kingfisher	<i>Halcyon smyrnensis</i>	East, Middle and West Lagoons	Cap. 170	Widely distributed in Hong Kong	Locally common
Black-capped Kingfisher ¹	<i>Halcyon pileata</i>	Watercourse and grassland/shrub	Cap. 170	Widely distributed in Hong Kong	Locally common
Zitting Cisticola	<i>Cisticola juncidis</i>	Middle Lagoon	Cap. 170	Mainly reported from northern New Territories	Locally common
Blue-tailed Bee-eater ¹	<i>Merops philippinus</i>	Grassland/shrubland north of the Middle Lagoon	Cap. 170	Widely distributed in Hong Kong	Locally scarce
Black-winged Cuckoo-shrike ¹	<i>Coracina melaschistos</i>	Grassland/shrubland	Cap. 170	Widely distributed in Hong Kong	Locally scarce
White-shouldered Starling ¹	<i>Sturnus sinensis</i>	East Lagoon	Cap. 170	Widely distributed in Hong Kong	Locally common
<u>Mammal</u>					
Japanese Pipistrelle	<i>Pipistrellus abramus</i>	Developed area/disturbed area in the Ash Lagoons	Cap. 170	Widely distributed in Hong Kong	Locally very common
Leschenault's Rousette ¹	<i>Rousettus leschenaulti</i>	WENT Landfill site	Cap. 170	Widely distributed in Hong Kong	Locally common
Short-nosed Fruit Bat ¹	<i>Cynopterus sphinx</i>	WENT Landfill site	Cap. 170	Widely distributed in Hong Kong	Locally common
Small Asian mongoose ¹	<i>Herpestes javanicus</i>	Ash lagoons	Cap. 170	Mainly reported from Northern New Territories	Locally uncommon
Small Indian Civet	<i>Viverricula indica</i>	Middle Lagoon, seawall around the Ash Lagoons	Cap. 170	Widely distributed in Hong Kong	Locally very common
Leopard Cat	<i>Prionailurus bengalensis</i>	Plantation slope near Nim Wan Road	Cap. 170; China Red Data Book (V)	Widely distributed in Hong Kong	Locally uncommon
<u>Herpetofauna</u>					
Copperhead Racer ¹	<i>Elaphe radiata</i>	Seawall near East Lagoon	China Red Data Book(En)	Widely distributed in Hong Kong	Locally uncommon
<u>Butterfly</u>					
Red Lacewing	<i>Cethosia biblis biblis</i>	Grassland/shrubland habitat west of the East Lagoon.	Not applicable	Widely distributed in Hong Kong	Locally rare
Glassy Bluebottle ¹	<i>Graphium cloanthus clymenus</i>	Tsang Tsui Road	Not applicable	Found in Shing Mun, Tai Mo Shan, Tai Po Kau, Lam Tsuen, Ma On Shan, Pat Sin Leng.	Locally rare

Common name	Scientific name	Locations	Protection status	Distribution	Rarity
Chestnut Bob	<i>Iambrix salsala salsala</i>	Grassland/shrubland habitat around West Lagoon	Not applicable	Widely distributed in Hong Kong	Locally uncommon
Common Jay ¹	<i>Graphium doson axion</i>	Shrubland around East Lagoon	Not applicable	Widely distributed in Hong Kong	Locally uncommon
Danaid Eggfly ¹	<i>Hypolimnus misippus</i>	Shrubland around East Lagoon, secondary woodland along Tsang Tsui Road and watercourse W1	Not applicable	Widely distributed in Hong Kong	Locally uncommon
Little Branded Swift ¹	<i>Pelopidas agna</i>	Shrubland around East Lagoon	Not applicable	Widely distributed in Hong Kong	Locally uncommon
<u>Dragonfly</u>					
Coastal Glider	<i>Macromdiplax cora</i>	Middle Lagoon, East Lagoon and the grassland/shrubland habitat south of the Middle Lagoon.	Not applicable	Found in Tsang Tsui Ash Lagoon, KCRC's constructed wetland in Kam Tin, the Hong Kong Wetland Park at Tin Shui Wai and Sam Po Shue	Locally uncommon
<u>Gorgonian</u>					
	<i>Echinomuricea</i> sp.	Seawall	Not applicable	Widely distributed in Hong Kong	Common

Note:

1. Flora/fauna recorded in previous studies only.

7a.6 Identification and Evaluation of Environmental Impacts

7a.6.1 Introduction

- 7a.6.1.1 The construction of the proposed Project is scheduled to commence in 2013 and complete in 2016. Whilst, the Project is estimated to be in operation in 2016. The facilities of the IWMF Phase 1 mainly include an Incineration Plant, a Mechanical Treatment plant and some ancillary and supporting facilities.
- 7a.6.1.2 Potential ecological impacts arising from construction and operation phase activities are identified and described in the following sections.

7a.6.2 Construction Phase

Direct Impact

(i) Habitat and vegetation loss

- 7a.6.2.1 The direct impact resulted from construction of the proposed Project would be loss of habitats and vegetation within the site boundary.

Loss to ash lagoon habitat and vegetation

- 7a.6.2.2 Approximately 11 ha of ash lagoon habitat at the Middle Lagoon would be permanently affected and turned to developed area. Species diversity and abundance within the Middle Lagoon were found to be low to moderate with 10 species of conservation interest recorded. The loss would in turn cause the loss of foraging and roosting ground of the wildlife and potential breeding ground of Little Grebe in the Middle Lagoon.

- 7a.6.2.3 However, the condition of Middle Lagoon is volatile. Wildlife was found concentrated in the portion containing water. *West New Territories (WENT) Landfill Extensions Environmental Impact Assessment* (EPD, 2008) also identified the major breeding habitat of Little Grebes was confined to the open water area with emergent vegetation on the southern portion of the Middle Lagoon. Only 18% of the project footprint (1.98 ha) would encroach on the area usually flooded. About 82% of proposed site area would be located at the proportion of the Middle Lagoon where floral and faunal diversity as well as food source are limited. The volatile nature of this portion of land limited its potential as a breeding ground for Little Grebe and foraging and roosting ground for other wildlife.

- 7a.6.2.4 Similar habitat with more stable condition could be found in the West Lagoon and Ha Pak Nai. *Feasibility Study of Sludge Treatment Facilities Environmental Study* (EPD, 2006) recorded the whole West Lagoon was filled with PFA on a regular basis and was unsuitable for Little Grebe. Recently water pools were formed in the West Lagoon. Records of juvenile Little Grebes and Little Egret in the West Lagoon under *West New Territories (WENT) Landfill Extensions Environmental Impact Assessment* (EPD, 2008) and the current study indicated that, Little Grebe and Little Egret from other places (i.e. East and Middle Lagoons) would occupy the West Lagoon as an alternative habitat. Other landbird species and Small Indian Civet are mostly habitat generalists. Coastal Glider, though it is uncommon in Hong Kong, it is widely distributed in Hong Kong with population occurring in lagoons and estuaries (Wilson, 2004). It is therefore anticipated that the affected species could use these alternative habitats.

- 7a.6.2.5 Considering the size of the potential foraging habitat is small and alternative habitat is available nearby, the impact due to the loss of foraging ground for the wildlife is anticipated to be low. However, in view of the restricted breeding ground for Little Grebe, the impact due to the loss of habitat is thus considered to be low to moderate. Mitigation to the breeding ground loss would be required.

- 7a.6.2.6 Vegetation loss is limited to pioneer species (e.g. *Pennisetum alopecuroides*, *Phragmites* spp.). The vegetation within the Project site was limited by the volatile condition of the Middle Lagoon and was relatively young in terms of vegetation composition. No plant species of conservation interest would be affected. The impact is therefore anticipated to be minor.
- 7a.6.2.7 The water level of the Middle Lagoon fluctuated throughout the year. The water level would be high during the wet season, and low during the dry season. Water draining work would be required to facilitate the site formation work only if the site formation work commences during wet season. This would result in an additional loss of 10.28 ha of low to moderate valued ash lagoon habitat at the Middle Lagoon outside the footprint of the IWMF. The loss would be short term, temporary and reversible as the unoccupied Middle Lagoon area would be filled by rainwater in wet season. Apart from the water draining work, it is anticipated that site formation work and other construction works itself would cause negligible change in water level in the unoccupied Middle Lagoon. Thus, physical condition of the unoccupied Middle Lagoon would not be significantly altered if site formation work commences in dry season (i.e. site draining work not required). In view of the abundance and diversity of species of conservation interest affected, the temporary impact due to a further loss of 10 ha of habitat if the site formation work is to be commenced during wet season is considered to be low to moderate and mitigation to this temporary habitat loss would be required.

Loss to seawall habitat

- 7a.6.2.8 The construction of seawater intake /saline water discharge would result in the loss of approximately 20 m long seawall. No loss of seabed and coastal waters habitats would be expected. The seawall supported low floral and faunal species diversity. Common gorgonian *Echinomuricea* sp. was recorded along the seawall. The gorgonian would be removed if the seawater intake or saline water discharge is constructed at the section of artificial seawall where the gorgonians are located. However, poor health condition of the gorgonians suggested that the marine environmental condition within the study area was not suitable for the growth of the species of conservation interest. Therefore, in view of the poor habitat quality and the small size of seawall habitat affected, the impact due to the loss of seawall habitat is considered to be low.

(ii) Fauna loss

- 7a.6.2.9 Fauna with lower mobility such as amphibian and the juveniles of avifauna would subject to higher level of risk, and could be killed or injured by the construction activities. No direct impact to wildlife with higher mobility such as adult avifauna and mammals is expected.

- 7a.6.2.10 The proposed site is located mainly at the area where faunal diversity is scarce and condition is unfavourable for breeding activities. Therefore, direct loss of fauna is unlikely and the impact is anticipated to be minor.

Indirect Impact

(i) Habitat fragmentation

- 7a.6.2.11 Water pool at the southern portion of the Middle Lagoon usually extends to northwest end. The proposed Project would divide the pool into 2 halves and cause habitat fragmentation. Habitat fragmentation could inhibit species dispersal and increase edge effect through changing the vegetation composition and structure at habitat edges, and increasing susceptibility to disturbance, predation and invasive species at habitat edges. Core or characteristic species dependent on large habitat patches (e.g. avifauna) could be lost, and more facultative ‘edge’ species could concomitantly increase. It, in turns, could result in decline in species number and population.

7a.6.2.12 Unoccupied portion of the Middle Lagoon with a size of 10 ha and the associated wildlife would be affected. Species recorded inhabiting the pool area which may be dependent on large habitat patches included Little Grebe, Little Egret and the raptors. It was observed during field survey that Little Grebe and Little Egret would use smaller water pools (about 1 ha) in West Lagoon. Seemingly, these two species are less affected by habitat fragmentation and edge effect. Provided that human and noise disturbance is shielded, the species would continue to inhabit the unoccupied Middle Lagoon. However, the construction of the IWMF in the middle of the lagoon might create a barrier effect that discourages the birds to explore other suitable habitats at the other side of the lagoon. Taking consideration of the original moderately fragmented nature of the ash lagoon habitat the impact due to habitat fragmentation is considered to be low to moderate. Mitigation to enhance integrity of the wetland habitat is therefore recommended.

(ii) Disturbance impact

7a.6.2.13 Construction activities would increase human activities and noise disturbance from traffic and construction machinery, and would in turn bring about indirect impacts to nearby habitats and their associated fauna. Potential consequences to wildlife include avoidance of areas in the vicinity of the works areas, and decline in density in areas close to the source of disturbance.

7a.6.2.14 Currently, wildlife inhabiting the habitats near to Nim Wan Road (i.e. plantation, developed area, grassland/shrubland, and secondary woodland) are subject to noise due to traffic entering/leaving the WENT Landfill. Therefore, increase in construction work noise would not significantly intensify the noise impact to wildlife in these areas.

7a.6.2.15 The ash lagoons are about 100 m away from Nim Wan Road, and the wildlife are currently screened from the road. Avifaunal species of conservation interest that inhabit in the ash lagoons would be prone to disturbance during construction of the IWMF. These birds currently inhabit in a relatively quiet environment. The increase in noise level and human disturbance would induce greater influence. The potential breeding populations of Little Grebe in the Middle Lagoon during wet season are of particular concern since they are more susceptible to the disturbance impact from human activities.

7a.6.2.16 From field observation, Little Grebe also bred in the West Lagoon, where was subjected to PFA filling and dredging activities. Therefore, Little Grebe is expected to be tolerant to minor construction disturbance (i.e. site excavation work and backfilling work) provided that mitigation measures, for example in form of shielding, are in place.

7a.6.2.17 However, occasional sudden noise such as piling could be more perturbing than more regular, even louder noise (EPD, 2003) and cause considerable disturbance. In view of its short duration and reversible nature as well as the low to moderate number of species affected, the disturbance impact is considered to be low to moderate. Mitigation measures would be recommended.

(iii) Release of PFA leachate

7a.6.2.18 Piling would be adopted for foundation construction of the proposed Project. The piles could penetrate the base of the Middle Lagoon to the hard granite bedrock. As discussed in **Sections 5a.7.1.5 to 5a.7.1.15** of the Water Quality Impact Assessment of this EIA Report, it is unlikely that piling activities would cause significant changes in geological structure of the lagoon site, and the leakage through the base of the Middle Lagoon would not be significant. It is also anticipated that the PFA leachate in the Middle Lagoon is unlikely to cause unacceptable impact on the aquatic environment from an ecotoxicological point of view.

(iv) Construction dust and site runoff

- 7a.6.2.19 Dust generated during the construction phase and improper storage or dumping of construction materials could degrade the habitats adjacent to works areas. Construction dust could cover leaves and result in lethal/sublethal effects by reduction in photosynthetic rate, abrasion and blockage of stomata. Accidental spills of oils and other chemicals could also affect aquatic/marine communities. It could result in lethal/sublethal impacts (abnormal structures and reproductive retardation) on aquatic/marine organisms.
- 7a.6.2.20 The Project site is in immediate vicinity of the water body of the Middle Lagoon. Removal of vegetation within works areas during site formation could elevate sediment levels in site run-off. It could impede aquatic, epifaunal and infaunal communities in the lagoons, watercourse, seawall and coastal waters. Apart from the physical injury caused by larger particles, small particles could clog the respiratory and feeding systems of fish and invertebrates. Increased turbidity could reduce photosynthetic rate of aquatic plants, and affect feeding and other activities of species which are largely sight-dependent.
- 7a.6.2.21 Previous studies (EPD, 2006) showed that the freshwater communities in the Middle Lagoon were species poor, being dominated by libellulid dragonfly nymphs, small crustaceans such as ostracods and copepods and notonectid/corixid water-bugs. These species are tolerant to turbid water. Moreover, no fish were recorded, and the plant species of conservation interest are far from the proposed construction site. No unacceptable adverse impact would be expected due to construction dust and site runoff.

7a.6.3 Operation Phase

Direct Impact

- 7a.6.3.1 The operation phase activities would be confined to the proposed site boundary. No additional land would be occupied during operation. Hence, no direct impacts are anticipated during the operation phase.

Indirect Impact

(i) Disturbance impact

- 7a.6.3.2 The operation of the IWMF and increased traffic entering and leaving the site would increase disturbance impact. As a consequence, the wildlife would avoid the adjacent areas of the site and associated access road, and the wildlife density close to the source of disturbance would reduce.
- 7a.6.3.3 All machinery will be enclosed in building structure, and noise generated will be isolated from the nearby wildlife. Noise generated from worker activities at open space and the trucks would be the key sources of disturbance. It is anticipated that the amount of time the workers staying outdoor is short. The duration of noise disturbance on wildlife caused by human activities would be intermittent.
- 7a.6.3.4 As the access entrance and exit will be placed at the western side of the proposed site, increased traffic along the western side of the Middle Lagoon would be expected. Little Grebe and ardeids inhabit in the unoccupied Middle Lagoon would be potentially affected. But it is known that these species are less susceptible to traffic noise than to human disturbance.
- 7a.6.3.5 In view of the intermittent nature of increase in human disturbance, and the presence of alternative habitat nearby, the disturbance impact to fauna inhabit in the Middle Lagoon is expected to be low to moderate. Mitigation measures to minimize the disturbance impact and traffic noise such as boundary walls would be required.

(ii) Intake of seawater/discharge of saline water

- 7a.6.3.6 The amount of seawater taken from the nearby marine waters for the proposed Project daily operation would be small comparing with the waterbody and intake of seawater is not expected to affect the hydrology within the study area.
- 7a.6.3.7 The proposed Project would adopt a “zero-discharge” scheme and no processed or unprocessed effluent would be discharged into Deep Bay during operation phase. Only approximately 1,520 m³/day of saline water from the proposed desalination plant would be discharged to the coastal waters through outlets. No wastewater effluent, persistent organic pollutants (POPs), heavy metals and other contaminants would be released during operation. No adverse impact to Chinese White Dolphin and their preys as well as the oyster culture area in the Deep Bay area would be expected.
- 7a.6.3.8 Salinity of saline water discharged would be 45,000 to 57,000 mg/L. Concentration of the discharged saline water is about 1.7-1.8 times of the feedwater. With a low discharge volume (1,520 m³/day), the concentrated saline water would be immediately diluted by marine waters to the level as the feedwater. Besides, the discharged saline water would comply with the standards for effluents discharged into the coastal waters of Deep Bay Water Control Zone. Moreover, marine organisms recorded during field surveys including *Echinomuricea* sp., are widely distributed in local waters and could be recorded in the more saline eastern waters. It is expected that these species are able to tolerate considerable increased salinity. Therefore, ecological impact on the identified marine habitats and their associated fauna due to the intake of seawater/discharge of saline water would be insignificant.
- 7a.6.3.9 Potential ecological impacts to habitats arising from the proposed Project are evaluated according to Table 1 of Annex 8 of the *EIAO-TM*, and are summarized in below.

Table 7a.17 Overall Impact Evaluation: Ash Lagoons

Evaluation criteria	Ash lagoon
Habitat quality	<p><u>East Lagoon</u></p> <p>Low to moderate. A man-made PFA dumping ground subject to frequent disturbance/modification from PFA filling activities. Habitat quality and its availability to wildlife fluctuated with the water coverage (i.e. rainfall) in the lagoon and level of human disturbance governed by the intensity of CLP's PFA filling activities. The habitat condition is highly volatile and the whole lagoon was found to be completely dry before rainy seasons. The lagoon was completely dry in most part of the year and did not provide suitable habitat for the water dependent species of conservation in the area. Lagoon habitat is therefore not considered to provide a stable habitat for wildlife use.</p> <p><u>Middle Lagoon</u></p> <p>Low to moderate. A man-made PFA dumping ground subject to some degrees of disturbance. Habitat quality fluctuated with the water coverage (i.e. rainfall) in the lagoon and the level of human disturbance governed by the intensity of CLP's PFA filling and dredging activities in the East and West Lagoons. The lagoon habitat was relatively stable for wildlife use as the southern part of the lagoon was found to be flooded with water throughout the period of wet and dry season surveys. In contrast, the northern portion was bare ground with scarce vegetation and faunal diversity. No PFA filling activities were observed during the survey period.</p>

Evaluation criteria	Ash lagoon
	<u>West Lagoon</u> Low to moderate. The PFA dumping ground is man-made in nature and subject to frequent disturbance/modification from CLP's dredging activities. But pools formed at the rim of the lagoon contain constant level of water, and provide a stable environment for the water dependent species of conservation in the area.
Species	<u>East Lagoon</u> Seven avifaunal species of conservation interest recorded (Little Grebe, Grey Heron, Chinese Pond Heron, Eurasian Wigeon, Pied Kingfisher, White-throated Kingfisher and Zitting Cisticola). <u>Middle Lagoon</u> Eight avifaunal species, one mammal and one dragonfly species of conservation interest recorded (Little Grebe, Little Egret, Osprey, Peregrine Falcon, Little Ringed Plover, Kentish Plover, White-throated Kingfish, Zitting Cisticola, Small Indian Civet and Coastal Glider) recorded from the lagoon. <u>West Lagoon</u> Three avifaunal species of conservation interest recorded (Little Grebe, Little Egret and White-throated Kingfisher). A bird species of conservation interest (Little Grebe) probably breed in pool(s) formed within the ash lagoon during wet season.
Size/abundance	Moderate. Approximately 11 ha of Middle Lagoon would be lost. Only 1.98 ha (18%) of the affected area is considered as important habitat for most of species of conservation interest. The remaining affected area would be mainly located at the northern portion where the vegetation is scarce and species diversity is relatively low. Approximately 33.20 ha of ash lagoon habitat and associated wildlife would be affected due to habitat fragmentation, construction noise, traffic and human disturbance. But the number of bird found within the site is relatively small compared with the Deep Bay population.
Duration	<u>Construction phase</u> Habitat loss and habitat fragmentation would be permanent in nature. Impact due to construction noise, traffic and human disturbance would last for 3 years. <u>Operation Phase</u> Indirect impact to wildlife resulting from human disturbance and increased road traffic would be permanent.
Reversibility	<u>Construction phase</u> Habitat loss and habitat fragmentation would be irreversible in nature. Indirect impact to wildlife resulting from human disturbance, construction activities and increased road traffic would be reversible. <u>Operation Phase</u> Indirect impact to wildlife resulting from human disturbance and increased road traffic would be reversible.

Evaluation criteria	Ash lagoon
Magnitude	<p><i>Construction Phase</i> Low to moderate. The proposed Project will take up small portion of the Middle Lagoon where considered as important habitat for most of species of conservation interest. Construction noise in particular piling would be detrimental to avifauna. Increase in road traffic and human disturbance would be low to moderate.</p> <p><i>Operation Phase</i> Low to moderate. Increase in road traffic and human disturbance would be low to moderate.</p>
Overall impact conclusion	East Lagoon: Low Middle Lagoon: Low to moderate West Lagoon: Low

Table 7a.18 Overall Impact Evaluation: Secondary Woodland

Evaluation criteria	Secondary woodland
Habitat quality	Low to moderate. Woodland habitats are immature, but dominated by native species.
Species	One avifaunal species of conservation interest (Greater Coucal) recorded in this habitat.
Size/abundance	The habitat would not be directly affected.
Duration	<p><i>Construction phase</i> Indirect impact to wildlife resulting from human disturbance, construction activities and increased road traffic would be temporary.</p> <p><i>Operation Phase</i> Indirect impact to wildlife resulting from human disturbance and increased road traffic would be permanent.</p>
Reversibility	<p><i>Construction phase</i> Indirect impact to wildlife resulting from human disturbance, construction activities and increased road traffic would be reversible.</p> <p><i>Operation Phase</i> Indirect impact to wildlife resulting from human disturbance and increased road traffic would be reversible.</p>
Magnitude	<p><i>Construction Phase</i> Low. The magnitude of the impact is insignificant as no direct impact is anticipated.</p> <p><i>Operation Phase</i> Low. The magnitude of the impact is insignificant as no direct impact is anticipated.</p>
Overall impact conclusion	Low

Table 7a.19 Overall Impact Evaluation: Grassland/Shrubland

Evaluation criteria	Grassland/Shrubland
Habitat quality	Low.
Species	Two avifaunal species of conservation interest, one uncommon and one rare butterfly species and dragonfly species of conservation interest (Little Egret, Greater Coucal, Chestnut Bob, Red Lacewing and Coastal Glider) recorded in this habitat.
Size/abundance	The habitat would not be directly affected.
Duration	<p><i>Construction phase</i> Indirect impact to wildlife resulting from human disturbance, construction activities and increased road traffic would be temporary.</p> <p><i>Operation Phase</i> Indirect impact to wildlife resulting from human disturbance and increased road traffic would be permanent.</p>
Reversibility	<p><i>Construction phase</i> Indirect impact to wildlife resulting from human disturbance, construction activities and increased road traffic would be reversible.</p> <p><i>Operation Phase</i> Indirect impact to wildlife resulting from human disturbance and increased road traffic would be reversible.</p>
Magnitude	<p><i>Construction Phase</i> Low. The magnitude of the impact is insignificant as no direct impact is anticipated.</p> <p><i>Operation Phase</i> Low. The magnitude of the impact is insignificant as no direct impact is anticipated.</p>
Overall impact conclusion	Low

Table 7a.20 Overall Impact Evaluation: Plantation

Evaluation criteria	Plantation
Habitat quality	Low.
Species	No rare species or species of conservation interest recorded in this habitat.
Size/abundance	The habitat would not be directly affected.
Duration	<p><i>Construction phase</i> Indirect impact to wildlife resulting from human disturbance, construction activities and increased road traffic would be temporary.</p> <p><i>Operation Phase</i> Indirect impact to wildlife resulting from human disturbance and increased road traffic would be permanent.</p>
Reversibility	<p><i>Construction phase</i> Indirect impact to wildlife resulting from human disturbance, construction activities and increased road traffic would be reversible.</p> <p><i>Operation Phase</i> Indirect impact to wildlife resulting from human disturbance and increased road traffic would be reversible.</p>

Evaluation criteria	Plantation
Magnitude	<p><i>Construction Phase</i> Low. The magnitude of the impact is insignificant as no direct impact is anticipated.</p> <p><i>Operation Phase</i> Low. The magnitude of the impact is insignificant as no direct impact is anticipated.</p>
Overall impact conclusion	Low

Table 7a.21 Overall Impact Evaluation: Watercourse

Evaluation criteria	Watercourse
Habitat quality	W1: Low to moderate W2: Low
Species	Streams provide foraging habitat for five avifaunal species of conservation interest recorded (Great Egret, Little Egret, Chinese Pond Heron, Greater Coucal and White-throated Kingfisher).
Size/abundance	The habitat would not be directly affected.
Duration	<p><i>Construction phase</i> Indirect impact to wildlife such as avifauna resulting from human disturbance, construction activities and increased road traffic would be temporary. But impact on aquatic fauna is expected to be minor.</p> <p><i>Operation Phase</i> Indirect impact to wildlife resulting from human disturbance and increased road traffic would be permanent.</p>
Reversibility	<p><i>Construction phase</i> Indirect impact to wildlife resulting from human disturbance, construction activities, increased road traffic and sedimentation would be reversible.</p> <p><i>Operation Phase</i> Indirect impact to wildlife resulting from human disturbance and increased road traffic would be reversible.</p>
Magnitude	<p><i>Construction Phase</i> Low. Indirect impact can be controlled through good site practices.</p> <p><i>Operation Phase</i> Low. The magnitude of the impact is insignificant as no direct impact is anticipated.</p>
Overall impact conclusion	Low

Table 7a.22 Overall Impact Evaluation: Developed Area/Disturbed Area

Evaluation criteria	Developed area/disturbed area
Habitat quality	Low.
Species	No rare species or species of conservation interest recorded in this habitat.
Size/abundance	The habitat would not be directly affected.
Duration	<p><i>Construction phase</i> Indirect impact to wildlife resulting from human disturbance, construction activities and increased road traffic would be temporary.</p> <p><i>Operation Phase</i> Indirect impact to wildlife resulting from human disturbance and increased road traffic would be permanent.</p>
Reversibility	<p><i>Construction phase</i> Indirect impact to wildlife resulting from human disturbance, construction activities and increased road traffic would be reversible.</p> <p><i>Operation Phase</i> Indirect impact to wildlife resulting from human disturbance and increased road traffic would be reversible.</p>
Magnitude	<p><i>Construction Phase</i> Low. The magnitude of the impact is insignificant as no direct impact is anticipated.</p> <p><i>Operation Phase</i> Low. The magnitude of the impact is insignificant as no direct impact is anticipated.</p>
Overall impact conclusion	Low

Table 7a.23 Overall Impact Evaluation: Orchard

Evaluation criteria	Orchard
Habitat quality	Low.
Species	No rare species or species of conservation interest recorded in this habitat.
Size/abundance	The habitat would not be directly affected.
Duration	<p><i>Construction phase</i> Indirect impact to wildlife resulting from human disturbance, construction activities and increased road traffic would be temporary.</p> <p><i>Operation Phase</i> Indirect impact to wildlife resulting from human disturbance and increased road traffic would be permanent.</p>
Reversibility	<p><i>Construction phase</i> Indirect impact to wildlife resulting from human disturbance, construction activities and increased road traffic would be reversible.</p> <p><i>Operation Phase</i> Indirect impact to wildlife resulting from human disturbance and increased road traffic would be reversible.</p>

Evaluation criteria	Orchard
Magnitude	<p><i>Construction Phase</i> Low. The magnitude of the impact is insignificant as no direct impact is anticipated.</p> <p><i>Operation Phase</i> Low. The magnitude of the impact is insignificant as no direct impact is anticipated.</p>
Overall impact conclusion	Low

Table 7a.24 Overall Impact Evaluation: Seawall

Evaluation criteria	Seawall
Habitat quality	Low.
Species	Six avifaunal species and one mammal species of conservation interest and one gorgonian species (grey Heron, Little Egret, Chinese Pond Heron, Black Kite, Common Buzzard, Pied Kingfisher and Small Indian Civet (scat)) recorded in this habitat.
Size/abundance	Small. About 20m long seawall would be disturbed.
Duration	<p><i>Construction phase</i> Habitat loss due to construction of water outfall would be permanent. Indirect impact to wildlife resulting from human disturbance, construction activities, increased road traffic and water quality change would be temporary.</p> <p><i>Operation Phase</i> Indirect impact to wildlife resulting from human disturbance, increased road traffic and increased salinity would be permanent.</p>
Reversibility	<p><i>Construction phase</i> Habitat loss due to construction of water outfall would be irreversible. Indirect impact to wildlife resulting from human disturbance, construction activities, increased road traffic and water quality change would be reversible.</p> <p><i>Operation Phase</i> Indirect impact to wildlife resulting from human disturbance, increased road traffic and increased salinity would be reversible.</p>
Magnitude	<p><i>Construction Phase</i> Low. The potential direct impact to seawall and water quality change is localized.</p> <p><i>Operation Phase</i> Low. The potential direct impact to seawall and salinity change is localized. Change in salinity is insignificant and could be tolerated by marine species.</p>
Overall impact conclusion	Low

Table 7a.25 Overall Impact Evaluation: Coastal Waters

Evaluation criteria	Coastal waters
Habitat quality	Low.
Species	The habitats support low biodiversity and two avifaunal species of conservation interest and one gorgonian species (Little Egret, Pacific Reef Egret and <i>Echinomuricea</i> sp.) recorded in this habitat. No sighting of marine mammals and benthic species of conservation interest were recorded within the study area.
Size/abundance	The habitat would not be directly affected.
Duration	<p><i>Construction phase</i> Indirect impact to wildlife resulting from human disturbance, construction activities, increased road traffic and water quality change would be temporary.</p> <p><i>Operation Phase</i> Indirect impact to wildlife resulting from human disturbance, increased road traffic and saline water discharge would be permanent.</p>
Reversibility	<p><i>Construction phase</i> Indirect impact to wildlife resulting from human disturbance, construction activities, increased road traffic and water quality change would be reversible.</p> <p><i>Operation Phase</i> Indirect impact to wildlife resulting from human disturbance, increased road traffic and saline water discharge would be reversible.</p>
Magnitude	<p><i>Construction Phase</i> No direct impact is expected and the area is currently subject to disturbance from heavy traffic in the nearby areas. Level of water quality change is localized and insignificant.</p> <p><i>Operation Phase</i> No direct impact is expected. The area is currently subject to disturbance from heavy traffic in the nearby areas. Increase in salinity due to saline water discharge would be insignificant and could be tolerated by marine species..</p>
Overall impact conclusion	Low

- 7a.6.3.10 Major impacts to species of conservation importance recorded within the study area have been described. A summary of potential construction and operation phase impacts to all species of conservation importance recorded within the study area is presented in **Table 7a.26**.

Table 7a.26 Overall Impacts to Species of Conservation Interest

Species of Conservation Interest	Construction phase impacts		Operation phase impacts	
	Description	Evaluation	Description	Evaluation
Indian Orchid <i>Zeuxine strateumatica</i>	The species was previously recorded from the ash lagoons, but not found in subsequent studies since 2000. It was small and opportunistic, and could have been displaced as if the vegetation in the ash lagoon has passed through a natural process of succession (Chau and Siu, 1998). The plant is considered to be absent from the ash lagoons, and no direct or indirect impacts are anticipated.	No impact	No impact	No impact
Flora species of conservation interest outside the Project site (Incense Tree <i>Aquilaria sinensis</i> , Bamboo Orchid <i>Arundina graminifolia</i> and Pitcher Plant <i>Nepenthes mirabilis</i>)	Individual of these species falls outside works areas, no direct loss predicted. Construction dust may cover the plant and disturb photosynthesis. Since the plants are located far away from the construction site, impact due to construction dust is anticipated to be negligible.	No impact	No impact	No impact
Little Grebe <i>Tachybaptus ruficollis</i>	<p>One individual was recorded incubating eggs in the Middle Lagoon suggested that the lagoon was a potential breeding site of the species. However, the fluctuated water level reduced the suitability of the northern portion where the proposed Project located as a breeding site.</p> <p>The West Lagoon, where most Little Grebe juvenile were found, has been subjected to frequent disturbance from PFA dredging and filling activities. It indicated that Little Grebe can tolerate construction noise and road traffic. Increased human activities would have little impact on the species provided shielding is available. Occasional sudden noise such as piling could be detrimental. But the impact is temporary and similar habitat is also available in the adjacent West Lagoon and area near Pak Nai.</p>	Low to moderate	General disturbance levels would be increased due to the operation of the proposed Project. The most substantial source of disturbance would be human activities and road traffic. The amount of time which the staff staying outdoor is short. Increase in human activities would be insignificant compared to the present condition. The breeding population of the Little Grebe could be susceptible to noise disturbance. In view of size of breeding population found in the Middle Lagoon and the presence of alternative habitat nearby (i.e. West Lagoon), impact due to increased disturbance on the species is considered to low to moderate.	Low to moderate

Species of Conservation Interest	Construction phase impacts		Operation phase impacts	
	Description	Evaluation	Description	Evaluation
Other avifauna species of conservation interested within the Project site (Great Egret, Little Egret, Chinese Pond Heron, Osprey, White-bellied Sea Eagle, Peregrine Falcon, Eurasian Coot, Little Ringed Plover, Kentish Plover, Common Redshank, Eurasian Woodcock, White-throated Kingfisher and Zitting Cisticola)	<p>Individuals were recorded from the Middle Lagoon, suggested that the Project site were used as roosting and foraging sites by the species.</p> <p>The proposed works at the Middle Lagoon might cause direct loss of their roosting ground. Increased edge effect, construction noise, road traffic, human activities and site runoff to Middle Lagoon might affect the quality of their roosting and foraging habitats.</p> <p>Most species are common and widely distributed in Hong Kong, and occurs in various habitats. There are similarly suitable habitats available nearby for the species in Tsang Tsui and Pak Nai. Birds potentially disturbed by construction phase activities would therefore be likely to use similar suitable habitats available further from the source of disturbance (e.g. Ha Pak Nai and Pak Nai). The number of affected individuals only accounts for a small proportion of the local population and alternative similar habitats are present nearby. The impacts are therefore considered low and acceptable.</p> <p>A single bird of White-bellied Sea Eagle was previously recorded once from Middle Lagoon. The species was not found in recent surveys. Its use of the study area is considered to be very low. Although the species is uncommon resident in coastal areas and offshores island, and has a widespread distribution but irregularly reported in Deep Bay (Carey <i>et al</i>, 2001), in considering its low utilization of the Middle Lagoon, the impacts are therefore considered minor.</p>	Low	<p>General disturbance levels would be increased due to the operation of the proposed Project. The most substantial source of disturbance would be human activities and road traffic. The amount of time which the staff staying outdoor is short. Increase in human activities would be insignificant compared to the present condition. Moreover, ardeids are known to be tolerant to noise and disturbance. Potential disturbance impacts are therefore considered low.</p>	Low

Species of Conservation Interest	Construction phase impacts		Operation phase impacts	
	Description	Evaluation	Description	Evaluation
Avifauna species of conservation interested outside the Project site (Great Egret, Little Egret, Chinese Pond Heron, White-bellied Sea Eagle, White-throated Kingfisher, Zitting Cisticola, Grey Heron, Pacific Reef Egret, Cattle Egret, Black-crowned Night Heron, Eurasian Wigeon, Black Kite, Crested Goshawk, Common Buzzard, Common Kestrel, Greater Coucal, Lesser Coucal, Pacific Swift, Pied Kingfisher, Black-capped Kingfisher, Blue-tailed Bee-eater, Black-winged Cuckoo-shrike, White-shouldered Starling)	<p>Individuals were recorded outside the Project site (i.e. East Lagoon, grassland/shrubland, woodland, developed area, watercourse, seawall and coastal waters) or flying over the study area. It indicated the study area was used as roosting and foraging sites by the species.</p> <p>There will be no direct loss of their habitats due to the proposed works. Construction noise, road traffic, human activities and site runoff to the aquatic system might affect the quality of their roosting and foraging habitats.</p> <p>Most species are common in Hong Kong and/or widely disturbed in various habitats. There are similarly suitable habitats available nearby for the species. Birds potentially disturbed by construction phase activities would therefore be likely to use similar suitable habitats available further from the source of disturbance (e.g. Ha Pak Nai and Pak Nai). Ardeids are known to be tolerant to noise and disturbance. Site runoff, if uncontrolled, would spread to the watercourse. However, the number of affected individuals only accounts for a small proportion of the local population and alternative similar habitats are present nearby. The impacts are therefore considered minor.</p>	Low	<p>General disturbance levels would be increased due to the operation of the proposed Project. The most substantial source of disturbance would be human activities and road traffic. The amount of time which the staff staying outdoor is short. Increase in human activities would be insignificant compared to the present condition. Moreover, ardeids are known to be tolerant to noise and disturbance. Potential disturbance impacts are therefore considered minor.</p>	Low or very low depending on their degrees of dependence on the study area and the distance away from the Project site

Species of Conservation Interest	Construction phase impacts		Operation phase impacts	
	Description	Evaluation	Description	Evaluation
Mammal species of conservation interest within the Project site (Small Asian Mongoose and Small Indian Civet)	<p>Individual or dead body were recorded from the Middle Lagoon suggested the lagoon was utilized by the species as foraging habitat or for other purposes.</p> <p>The proposed works would directly affect their foraging habitat. Construction noise, road traffic, human activities and site runoff to the Middle Lagoon might affect the quality of their foraging ground.</p> <p>The species is fairly widespread in Hong Kong and occurs in wide range of habitats (i.e. lowland wetland to open plains, woodland). There are thus alternative suitable habitats nearby. Individuals potentially disturbed by construction phase activities would therefore be likely to use similar suitable habitats available further from the source of disturbance (e.g. Ha Pak Nai and Lung Kwu Tan). In view of their density in the Project site, the impacts are therefore considered low.</p>	Low	General disturbance levels would be increased due to the operation of the proposed Project. The most substantial source of disturbance would be human activities and road traffic. The amount of time which the staff staying outdoor is short. Increase in human activities would be insignificant compared to the present condition. However, there are similar suitable habitats available nearby for the species. Potential disturbance impacts are therefore considered low.	Low
Mammal species of conservation interest outside the Project site (Japanese Pipistrelle, Leschenault's Rousette, Short-nosed Fruit Bat, Small Indian Civet and Leopard Cat)	<p>Individual or scats were recorded outside the Project site (i.e. developed area/disturbed area, seawall and plantation).</p> <p>Construction noise, road traffic, human activities and site runoff to the seawall might affect the quality of their foraging habitats.</p> <p>Most species occurs in a number of localities in Hong Kong and is fairly widespread in Hong Kong. The species usually hunt at night (Shek, 2005). Construction activities mainly occur in the day would have little impact on their activities. Besides, there are alternative suitable habitats nearby. Individuals potentially disturbed by construction phase activities would therefore be likely to use similar suitable habitats available further from the source of disturbance (e.g. Ha Pak Nai and Lung Kwu Tan). The impacts are therefore considered minor.</p>	Low	General disturbance levels would be increased due to the operation of the proposed Project. The most substantial source of disturbance would be human activities and road traffic. The amount of time which the staff staying outdoor is short. Increase in human activities would be insignificant compared to the present condition. However, there are similar suitable habitats available nearby for the species. Potential disturbance impacts are therefore considered minor.	Very low

Species of Conservation Interest	Construction phase impacts		Operation phase impacts	
	Description	Evaluation	Description	Evaluation
Copperhead Racer	<p>A single individual was previously recorded from the Middle Lagoon and seawall. The species is widespread throughout Hong Kong. They are commonly found in open, dry, hilly, rocky habitat of mixed grassland and shrubland (Karsen et al., 1998).</p> <p>The proposed works would directly affect their potential habitat. Construction noise, road traffic, human activities and site runoff to the Middle Lagoon might affect the quality of their roosting and feeding ground. As there are alternative suitable habitats nearby, individuals potentially disturbed by construction phase activities would therefore be likely to use similar suitable habitats available further from the source of disturbance (e.g. Black Point). The impacts are therefore considered minor.</p>	Low	<p>General disturbance levels would be increased due to the operation of the proposed Project. The most substantial source of disturbance would be human activities and road traffic. The amount of time which the staff staying outdoor is short. Increase in human activities would be insignificant compared to the present condition. However, there are similar suitable habitats available nearby for the species. Potential disturbance impacts are therefore considered minor.</p>	Low
Coastal Glider within the Project site	<p>Twenty one individuals were recorded from the Middle Lagoon. However, the fluctuated water level reduced the suitability of the northern portion where the proposed Project located as a suitable habitat.</p> <p>Construction noise, road traffic and human activities might affect the quality of their habitats. Site runoff, if uncontrolled, would spread to the Middle Lagoon. Although the species is uncommon and occurs in several localities in Hong Kong, individuals potentially disturbed by construction phase activities would therefore be likely to use similar suitable habitats available further from the source of disturbance (e.g. Ha Pak Nai and Pak Nai). The impacts are therefore considered low.</p>	Low	<p>General disturbance levels would be increased due to the operation of the proposed Project. The most substantial source of disturbance would be human activities and road traffic. The amount of time which the staff staying outdoor is short. Increase in human activities would be insignificant compared to the present condition. However, there are similar suitable habitats available nearby for the species. Potential disturbance impacts are therefore considered low.</p>	Low

Species of Conservation Interest	Construction phase impacts		Operation phase impacts	
	Description	Evaluation	Description	Evaluation
Butterfly and dragonfly species of conservation interest outside the Project site (Red Lacewing, Glassy Bluebottle, Chestnut Bob, Common Jay, Danaid Eggfly, Little Branded Swift and Coastal Glider)	Low numbers of individuals were recorded outside the Project site. There will be no direct loss of their habitats due to the proposed works. Although construction noise, road traffic and human activities might affect the quality of their habitats, it is anticipated that the proposed works would not cause significant impact on the species as similar suitable habitats are available nearby for the species (e.g. hillsides near Nim Wan Road, Ha Pak Nai, Pak Nai and Lung Kwu Tan). The impacts are therefore considered minor.	Low	General disturbance levels would be increased due to the operation of the proposed Project. The most substantial source of disturbance would be human activities and road traffic. The amount of time which the staff staying outdoor is short. Increase in human activities would be insignificant compared to the present condition. It is also anticipated increased road traffic is confined to northern traffic road and far from their habitat. Potential disturbance impacts are therefore considered minor.	Very low
<i>Echinomuricea</i> sp.	<p>Very low coverage (<1%) of the species was recorded at artificial seawall and the condition was unhealthy. The ecological value of the species recorded is considered to be low.</p> <p>Construction of seawater intake /saline water discharge would remove the gorgonian species and cause the loss of its habitat. With the mitigation measure to avoid the construction of intake/discharge at places where the gorgonians are located, and considering the small size of habitat loss and availability of suitable habitat nearby (e.g. Black Point), the impact is therefore considered minor.</p> <p>The species is known to be tolerant to turbid and harsh environment. Indirect impact due to surface runoff would be insignificant.</p>	Low	Records of the species in more saline water zone in Hong Kong indicated the species can tolerate salinity higher than the existing level in the survey waters. The slightly increased salinity due to the saline water discharge would therefore have insignificant impact to the gorgonian species.	Very low

7a.6.3.11 The potential impacts to the ecological resources within the study area arising from the proposed Project during construction and operation phases are summarized in **Table 7a.27** and **Table 7a.28**, respectively.

Table 7a.27 Overall Construction Stage Impact and Mitigation/Enhancement

Potential Impact	Source	Receiver	Nature of Impact						Severity	Further mitigation / enhancement required
			Habitat Quality	Species affected	Size / abundance	Duration	Reversibility	Magnitude		
Loss of ash lagoon habitat and vegetation	Footprint of the IWMF	Ash lagoon habitat and vegetation	Low to moderate	Direct impact: breeding ground of Little Grebe and some pioneer floral species. Indirect impact: 8 avifaunal, 1 mammal and 1 dragonfly species of conservation interest.	Moderate to large (11 ha), but only 1.98 ha of the affected area is considered as important habitat for most of species of conservation interest, scarce vegetation coverage	Permanent	Irreversible	Low to moderate. The proposed Project will take up a small portion of the Middle Lagoon which provided breeding habitat for Little Grebe.	Low to moderate	Enhancement/ compensatory habitat for Little Grebe; and scheduling of site formation work in dry season to minimize temporary habitat loss
Loss of seawall habitat and associated gorgonian	Footprint of seawater intake /saline water discharge	Seawall habitat and gorgonian	Low	Direct impact: 1 gorgonian species. Indirect impact: 6 avifaunal species and 1 mammal species of conservation interest.	Small size and very low coverage of gorgonian	Permanent	Irreversible	Low	Low	Adjustment of the location of seawater intake /saline water discharge

Potential Impact	Source	Receiver	Nature of Impact						Severity	Further mitigation / enhancement required
			Habitat Quality	Species affected	Size / abundance	Duration	Reversibility	Magnitude		
Fauna loss	Site formation work	Fauna with lower mobility inhabited in Middle Lagoon	Low to moderate	Amphibian and the juveniles of avifauna (i.e. Little Grebe)	Low. The proposed site avoided areas of high faunal diversity and Little Grebe breeding grounds.	Permanent	Irreversible	Low	Low	Avoidance of site formation work during major breeding season of Little Grebe, site inspection for the presence of breeding activities and Little Grebe
Habitat fragmentation	Construction of the IWMF	Fauna in Middle Lagoon	Low to moderate	8 avifaunal species, 1 mammal and 1 dragonfly species of conservation interest, pioneer floral species	Low to moderate	Permanent	Irreversible	Low	Low to moderate	Provision of compensatory pond habitat to enhance integrity of the wetland habitat
Disturbance impact	Construction site activities (e.g. site workers, construction traffic)	Mainly fauna in Middle Lagoon	Low to moderate	8 avifaunal species and 1 mammal species of conservation interest	Low to moderate	Temporary	Reversible	Low to moderate	Low to moderate	Hoarding, use of quieter piling machinery and construction plants, and full enclosure for static plant
Release of PFA leachate	Piling work	Watercourse and marine habitats	Low to moderate	Freshwater fauna in watercourse W1 and marine fauna in nearby waters	Localized area	Temporary	Irreversible	Insignificant	Insignificant	Not required.

Potential Impact	Source	Receiver	Nature of Impact						Severity	Further mitigation / enhancement required
			Habitat Quality	Species affected	Size / abundance	Duration	Reversibility	Magnitude		
Construction dust and site runoff	Construction works area	Vegetation in the vicinity of the Project site and freshwater community within Middle Lagoon	Low to moderate	Pioneer floral species and low diversity of freshwater species	Low	Temporary	Reversible	Low	Low	Standard good site practices, measures to control potential water and air quality impacts

Table 7a.28 Overall Operation Stage Impact and Mitigation/Enhancement

Potential Impact	Source	Receiver	Nature of Impact					Severity	Further mitigation / enhancement required	
			Habitat Quality	Species affected	Size / abundance	Duration	Reversibility			
Disturbance impact	Operation of the IWMF, human activities and traffic	Mainly fauna in Middle Lagoon	Low to moderate	8 avifaunal species and 1 mammal species of conservation interest	Moderate	Intermittent	Reversible	Low to moderate	Low to moderate	Mitigation measures to minimize the disturbance impact and traffic noise such as boundary walls and restricted access to the unoccupied Middle Lagoon
Change in hydrology and increased salinity	Intake of seawater /discharge of saline water	Seawall and coastal water habitat	Low	Intertidal fauna at nearby seawall and marine fauna in nearby waters such as gorgonian	Low	Permanent	Reversible	Low	Insignificant	Not required

7a.7 Cumulative Impacts

7a.7.1 Construction Phase

- 7a.7.1.1 The construction of the proposed Project is scheduled to commence in 2013 and complete in 2016. The construction of the proposed Project would coincide with the construction/implementation programmes of the Black Point Gas Supply (BPGS) (2011-2013). The construction works of BPGS will be confined to marine area. Therefore cumulative loss of artificial seawall habitat and degradation in water quality (i.e. increased suspended solid, decreased dissolved oxygen) are expected. Given the small extent of the marine works of the IWMF and the low ecological value of artificial seawall and coastal waters habitats, the IWMF is not anticipated to contribute to unacceptable cumulative impacts within the study area and the nearby waters.
- 7a.7.1.2 Two other projects are planned to be constructed in the vicinity of the Project area: Sludge Treatment Facilities (STF) and West New Territories (WENT) Landfill Extensions coupled with Nim Wan Road diversion. The construction works of STF is scheduled to be commenced in October 2010 and be completed in 2013. Whilst, the WENT Landfill Extensions is commenced in 2016/17 and planned to be divided into 6 phases. The West Lagoon and the southern and western portions of the Middle Lagoon would be occupied in Phase 5 and Phase 6 respectively. The construction works of Phase 5 and Phase 6 would start in 2021 and 2022. Since the construction phases for these planned projects would not be overlapped, no cumulative indirect construction impact (i.e. construction noise and human disturbance) is anticipated.
- 7a.7.1.3 However, the operation of STF, WENT Landfill Extensions, Nim Wan Road diversion and the proposed Project would result in a cumulative loss of about 46 ha ash lagoon (i.e. sum of the sizes of the three ash lagoons). Of which, about 7 ha of the affected ash lagoon habitats are the major breeding habitat of Little Grebes. To provide suitable alternative habitats to Little Grebe and other fauna, at least 8 ha of pond habitat would be created before the first year of the commencement of the WENT Landfill Extensions project (details refer to **Section 7a.8.3.1**). Since the IWMF would be constructed in advance of the provision of the aforementioned alternative habitats, about 11 ha of the ash lagoon at the part of the Middle Lagoon would be lost between 2012 and 2016/2017. Given the size of ecological important habitat loss is small (1.98 ha, details refer to **Section 7a.6.2.2 to 7a.6.2.3**) and the duration is short, the impact due to the loss of habitats is considered to be low to moderate. Mitigation measures would be required for the loss of the Middle Lagoon between the commencements of the proposed Project and WENT Landfill Extensions.

7a.7.2 Operation Phase

- 7a.7.2.1 Saline water discharge from both STF and the proposed Project would increase salinity around the discharge point. Nevertheless, the volume of saline water discharge would be small and readily diluted by marine water. Increase in salinity is anticipated to be insignificant. The associated impacts to intertidal and marine habitats are thus expected to be acceptable.
- 7a.7.2.2 No temperature elevation is expected in the brine water discharge as compared to the ambient water temperature. Therefore, the proposed Project would not contribute to the cumulative impact with BPGS and STF to the nearby waters.

7a.8 Mitigation of Adverse Environmental Impacts

7a.8.1 *Introduction*

7a.8.1.1 According to EIAO-TM Annex 16 guidelines, mitigation measures are discussed in this section to avoid, minimize and compensate for identified ecological impacts.

7a.8.2 *Avoidance and Minimization*

7a.8.2.1 The construction design, methods and sequences, and operation of the proposed Project have been considered to avoid impact to the natural habitats and species of conservation interest as far as possible. The site boundary would be mainly located at the northern portion of the Middle Lagoon, where vegetation is scarce and species diversity is relatively low. Development is constrained by limited alternatives of extensive area. Any construction would unavoidably affect the lagoon habitat. To minimize the habitat loss, the site footprint has been reduced by shifting the southern boundary northward, away from the open water. Mitigation measures have been adopted to avoid impacts to the surrounding habitats where possible.

Measures to Avoid Mortality of Little Grebe

7a.8.2.2 Site formation work of the proposed Project would be scheduled to commence in dry season to avoid the major breeding season of Little Grebe where practicable. It is expected that the water coverage of the Middle Lagoon would be minimal and largely confined to its southern portion during the dry season. Hoarding and waterproof membrane could be set up between the works boundary and the unoccupied Middle Lagoon before backfilling. Thus, water draining is not required for site formation work. As such, the impact to the wetland-dependent wildlife in the Middle Lagoon could be minimized.

7a.8.2.3 The proposed Project would affect about 11 ha of Middle Lagoon area. Breeding activities of Little Grebe were recorded within the Middle Lagoon. Juvenile and chicks of Little Grebe which have lower mobility could be killed by construction activities if unmitigated. As a precautionary measure, the whole Project site would be thoroughly inspected twice at the earliest two weeks prior to the proposed commencement date of construction activities to confirm no breeding activities of Little Grebe (including their eggs, chicks and juveniles) would be affected by the construction activities. The inspection should be performed by experienced ecologist(s) with over seven year of experience in the relevant aspect. Agriculture, Fisheries and Conservation Department (AFCD) should be informed in writing about the suitability of commencing construction work at the Project site before the commencement of any site activities.

7a.8.2.4 If breeding activities of Little Grebe are found during site inspection, the construction programme and method should be reviewed to identify practicable measures to minimize impact to the breeding birds through:

- Careful phasing of construction work: postpone the works that are located within and near the breeding area(s).
- Minimization of disturbance to the breeding birds due to construction activities: since Little Grebe is very sensitive to human disturbance, hoarding should be set up around the breeding ground to screen off construction works and human activities. Sufficient buffer zone should be given between the breeding birds and the hoarding without hindering their feeding, foraging and roosting activities. The fenced-off area would be inspected once a week until the breeding season ends to review the effectiveness of the mitigation measure and make adaptive actions promptly.
- Restriction of access to the breeding site (fenced-off area): no personnel are allowed to encroach on the breeding area without any written permission from the Resident

Engineer of this Project.

- 7a.8.2.5 The mitigation measures mentioned above should be stipulated in contract documents to ensure the Contractors are well aware of the requirements.
- 7a.8.2.6 With the implementation of the above measure, no direct loss of Little Grebe is anticipated to be aroused from the proposed Project.

Measures to Avoid Loss of Gorgonians

- 7a.8.2.7 The saline water outfall would cause loss of gorgonians if it is constructed at the section of artificial seawall where the gorgonians are located. Field surveys indicated that the distribution of gorgonians along the seawall is patchy. The location of the saline water outfalls has been refined to avoid any direct impact to the gorgonians. It is expected that no rare species or species of conservation interest would be lost due to the construction of the saline water outfall.

Measures to Minimize Disturbance Impact to Wildlife

- 7a.8.2.8 The construction work of the proposed Project would increase human activities in the works area. Wildlife is sensitive to human activities and would avoid or reduce the use of the nearby area. To reduce the disturbance to wildlife in the Middle Lagoon, alternative locations for the access entrance and exit of the Project site has been explored. If the access entrance and exit is relocated to the eastern side of the Project site, there would be insufficient space to accommodate the trucks from both Sludge Treatment Facilities and the proposed Project. If the access entrance is relocated to the northern side of the Project site, there would be inadequate space for trucks to safely turn inside the Project site.
- 7a.8.2.9 In order to minimize the potential impact to the wildlife in the Middle Lagoon outside works area, the following mitigation measures would be adopted during the construction and operation phases:-

Construction Phase

- 7a.8.2.10 To shield the fauna in the Middle Lagoon and other natural habitats from visual disturbance by human activities during construction phase, hoarding of at least 3 m high would be set up along the southern and western boundary of the works areas during the formation of the additional compensatory habitat and associated site access (**Figure 7a.5** refers). After the establishment of the additional compensatory habitat, the hoarding at the western boundary would be disassembled. New hoarding would be set up between the additional compensatory habitat and the site (**Figure 7a.6** refers). Moreover, the access to the unoccupied Middle Lagoon area and the additional compensatory habitat would be restricted by the hoardings. No personnel are allowed to encroach on the unoccupied Middle Lagoon area.
- 7a.8.2.11 Piling would be the major source of construction noise. Previous studies suggested birds are sensitive to occasional noise (EPD, 2003). Since many avifaunal species of conservation interest were observed utilizing the nearby habitats, piling could lead to avoidance and reduction in density of avifauna in areas in the vicinity of the works area. To reduce noise disturbance on habitats and wildlife adjacent to the works area, mitigation measures including adoption of quieter piling machinery and construction plants, and full enclosure for static plant would be implemented to lower the noise level due to construction works.

Operation Phase

- 7a.8.2.12 Boundary walls of at least 3.5 m high with climbing plants are proposed to be erected along the southern side of the Project site, and between the access road and the additional compensatory habitat for Little Grebe (**Figure 7a.7** refers). The walls would provide screening effect so that the access entry and exit could not be seen directly from the Middle Lagoon, and vice versa. The walls could also prevent human access to the Middle Lagoon. Potential disturbance to the wildlife due to intrusion of the staff to Middle Lagoon, and accidental injury of wildlife by trucks travelling along the access road would be minimized. In addition, the walls are also effective in noise reduction.
- 7a.8.2.13 The works boundaries would be confined within the proposed Project site. All work crews and equipment would be restricted within the designated works area only. Any personnel would be prohibited to encroach or wilfully disturb any wildlife and their habitats. Traffic and human access from the western side of the Project site would be avoided as far as possible.

Measures to Minimize Impacts to Habitats

- 7a.8.2.14 The Middle Lagoon portion with open water supports a higher faunal diversity and abundance. To minimize the habitat loss, the proposed Project site has purposefully chosen the drier northern Middle Lagoon with scarce vegetation, and the site footprint has been reduced by shifting the southern boundary northward.
- 7a.8.2.15 All construction works would be confined within the proposed site boundary. To minimize the impacts to habitat, the commencement of site formation work would be scheduled to the dry season when the water level in the Middle Lagoon is minimal. Therefore, no water draining would be required for the site formation work. Water would be retained in the unoccupied Middle Lagoon.
- 7a.8.2.16 Measures to control potential water quality impacts to the nearby aquatic and marine environment during construction phase would be implemented as mentioned in **Section 5a.8** of this EIA report.
- 7a.8.2.17 Standard good site practices would be enforced during the construction phase as follows:-
- Placement of equipment or stockpile in designated works areas, and selection of access routes on existing disturbed land to minimize disturbance to the unoccupied ash lagoons or natural habitat;
 - Construction activities should be restricted to works areas that would be clearly demarcated;
 - The works areas would be reinstated immediately after completion of works;
 - Waste skips should be provided to collect general refuse and construction wastes. The wastes should be disposed of timely and properly;
 - Drainage arrangements should include sediment traps to collect and control construction run-off;
 - Open burning on works sites is illegal, and should be strictly prohibited;
 - Temporary fire fighting equipment in the works areas before the commencement of works to prevent tipping, vehicle movements and encroachment of personnel into adjacent areas;
 - Only well-maintained plant should be operated on site and plant should be serviced regularly during the construction programme;
 - Machines and plant which may be in intermittent use should be shut down between

work periods or should be throttled down to a minimum;

- Plant known to emit noise strongly in one direction, should, where possible, be orientated so that the noise is directed away from the southern and western end of site boundary;
- Silencer or mufflers on construction equipment should be utilized and should be properly maintained during the construction period;
- Mobile plant (such as generator) should be sited as far away from the southern and western end of site boundary as possible; and
- Material stockpiles and other structures should be effectively utilized, where practicable, to screen noise from on-site construction activities.

7a.8.2.18 It is expected that with the proper implementation of the measures proposed in **Sections 7a.8.2.10 to 7a.8.2.17**, together with those suggested in Air Quality Impact Assessment and Water Quality Impact Assessment, disturbance to wildlife and surrounding habitats due to traffic and human activities, construction noise, construction dust and site runoff could be minimized. No unacceptable impact is anticipated.

7a.8.3 Compensation

Compensatory Habitat for Little Grebe

7a.8.3.1 The EIA of the WENT Landfill Extensions project (EPD, 2009), whose siting would occupy all three ash lagoons in Tsang Tsui area (i.e. southern East Lagoon, Middle Lagoon and West Lagoon), was approved in 2009. Under this project, at least 8 ha of compensatory freshwater ponds would be created in the WENT Landfill site no later than the first year of the commencement of construction of the WENT Landfill Extensions project (i.e. 2016/2017 tentatively) (*ibid*). These compensatory freshwater ponds are provided to compensate for the loss of the Little Grebe habitats resulting from the occupation of all 3 ash lagoons. Hence, the loss of Little Grebe habitat in Middle Lagoon due to IWMF Project would be fully compensated by the provision of these 8 ha wetland areas.

7a.8.3.2 Under IWMF Project, an additional permanent water pond would be created as Little Grebe habitat at the western side of the IWMF Project site at the early stage of construction phase (**Figure 7a.1**). This additional water pond in the IWMF site with a size of about 1.2 ha would incorporate habitat characteristics suitable for Little Grebe. The water depth in the pond would be maintained between 0.8 m to 1.5 m. Consistent water source would be secured. The appropriate type and species of aquatic plants would be planted to provide sustainable supply of food for Little Grebes. The water quality of the pond would be maintained for the growth of the aquatic plants and associated wildlife including Little Grebe's food sources. Floating raft with special design for the breeding requirement of Little Grebe could be installed to enhance its breeding habitat. The slope of pond bund would be profiled to provide gentle gradient of about 1:4 to 1:6 to facilitate the growth of emergent plants. Gentle sloping would also encourage the use of the pond by other wading birds and emergent vegetations would provide habitats for amphibian and dragonflies. The Project Proponent would be responsible for the management and monitoring of this 1.2 ha compensatory habitat.

7a.8.3.3 The location of this 1.2 ha compensatory pond habitat is specifically chosen to minimize the impact of habitat fragmentation by linking up the unoccupied Middle Lagoon, and maintain a reasonable distance from human disturbance (e.g. administrative building). It also serves as a buffer area to screen out the unoccupied Middle Lagoon area to reduce the disturbance due to traffic and human activities. In addition, boundary walls planted with climbers would be set up between the compensatory habitat and the access road to effectively minimize the noise generated from the traffic.

Enhanced Wetland Habitat for Little Grebe

- 7a.8.3.4 Apart from providing the 1.2 ha permanent compensatory habitat within IWMF Project site, the habitat condition of the southern unoccupied Middle Lagoon portion would be also enhanced.
- 7a.8.3.5 The Project Proponent of IWMF is committed to maintain the southern unoccupied Middle Lagoon portion with a size of 4.5 ha as an enhanced wetland habitat until the area is occupied by WENT Landfill Extension Project (**Figure 7a.1**). The enhanced wetland habitat would be formed at the early stage of construction phase of the IWMF Project. No PFA filling activities would be allowed. Freshwater source to the enhanced wetland habitat would be secured and the water level of the enhanced wetland habitat would be regulated to provide a more stable wetland area. This measure could also enhance the integrity of the water pools in the unoccupied Middle Lagoon, minimizing the impact of habitat fragmentation. To further enhance the breeding environment for Little Grebe, floating raft with special design suiting with the species' breeding requirement would be installed.
- 7a.8.3.6 A Habitat Creation and Management Plan (HCMP) for the proposed 1.2 ha of permanent compensatory habitat in IWMF site and the 4.5 ha of temporary enhanced wetland habitat in the unoccupied Middle Lagoon would be prepared by experienced ecologist possesses at least a Bachelor's degree in relevant discipline and at least 7 years relevant professional experience. The HCMP would be circulated to relevant departments including AFCD, and for approval prior to the construction and enhancement works.

7a.9 Evaluation of Residual Impacts

- 7a.9.1.1 A total loss of 11 ha of Middle Lagoon area (including 9.02 ha of dry area and 1.98 ha of wet area) and 20 m long of seawall habitat would be resulted due to the Project. With the provision of compensatory habitats proposed under the IWMF and WENT Landfill Extension Projects to fully compensate for the loss of the wet lagoon area, a residual loss of 9.02 ha of dry ash lagoon area would be resulted. The dry ash lagoon area is considered to be of limited ecological value due to its low species diversity. In addition, by refining the location of the saline water outfalls, the loss of gorgonians would be avoided. Only a small size of seawall habitat with poor habitat quality would be lost. Therefore, the residual impact is considered as acceptable.
- 7a.9.1.2 With the proper implementation of mitigation measures suggested in **Section 7a.8**, potential impact to the wildlife in the nearby habitats (i.e. habitat and breeding ground loss, edge effect, barrier effect, construction and traffic noise and human disturbances) would be minimized and the residual impact is considered to be acceptable.

7a.10 Environmental Monitoring and Audit

- 7a.10.1.1 Mitigation measures described in **Section 7a.8** would be regularly audited. Details of environmental monitoring and audit (EM&A) requirement are discussed in the separate EM&A Manual.

7a.11 Conclusion

- 7a.11.1.1 The major ecological impact of the proposed Project would be the loss of about 11 ha of ash lagoon in Tsang Tsui. About 82% of the Project area is arid area with low biodiversity and ecological value. As the remaining ash lagoon to be lost is identified as 1.98 ha breeding ground of Little Grebe, the potential loss of breeding ground would be mitigated by the provision of permanent compensatory habitats within the IWMF site and the existing WENT Landfill area. Additionally, the southern unoccupied Middle Lagoon would be enhanced to provide more stable wetland habitat.

- 7a.11.1.2 Disturbance impact to the breeding activities of Little Grebe would be minimized by scheduling the commencement of site formation work in dry season. As a precautionary measure, the works area would be thoroughly inspected by experience ecologist(s) to confirm no breeding activities of Little Grebe would be affected by the construction work before commencement of any site works.
- 7a.11.1.3 Other indirect impacts during construction phase would include noise and human disturbance, release of PFA leachate and construction site runoff and wastewater. With proper implementation of good site practices, use of quiet machinery and mitigation measures suggested in water quality impact assessment, no adverse ecological impact is anticipated.
- 7a.11.1.4 Disturbance impacts during operation phase would be resulted from increased human activities and noise due to vehicles entering and exiting the site. Mitigation measures such as landscape planting have been recommended to screen the visual interface and limit public access to the natural habitat and the associated wildlife nearby.
- 7a.11.1.5 With the implementation of the recommended mitigation measures, no unacceptable ecological impact due to the construction and operation of the proposed Project would be expected. The implementation of mitigation measures would be subject to regular audit as part of the EM&A programme.

7a.12 Reference

- Anon (1995). Focus on fish ponds. Porcupine! 13:20.
- Anon (2006). Winter 2005-06 Report on Waterbird Monitoring at the Mai Po Inner Deep Bay Ramsar Site. Report by Hong Kong Bird Watching Society to the Agriculture, Fisheries and Conservation Department, Hong Kong Special Administrative Region Government.
- Anon (2009). Monthly Waterbird Counts Data April 2008 – March 2009: Waterbird Monitoring at the Mai Po Inner Deep Bay Ramsar Site. Report by Hong Kong Bird Watching Society to the Agriculture, Fisheries and Conservation Department, Hong Kong Special Administrative Region Government.
- Ades, G. and Reels, G. (1998). Mammals. In Anon. 1998. Special Feature: Focus on Farmlands. Porcupine! 18:19.
- Agriculture, Fisheries and Conservation Department. (2009). Monitoring of Marine Mammals in Hong Kong Waters – Data Collection (2008-09): Final Report (10 April 2008 to 31 March 2009).
- Agriculture, Fisheries and Conservation Department. (2010). Monitoring of Marine Mammals in Hong Kong Waters – Data Collection (2009-10): Final Report (1 April 2009 to 31 March 2010).
- Bascombe, M.J., Johnston, G. & Bascombe, F.S. (1999). The Butterflies of Hong Kong. Academic Press, United Kingdom.
- Carey, G.J., Chalmers, M.L., Diskin, D.A., Kennerley, P.R., Leader, P.J., Leven, M.R., Lewthwaite, R.W., Melville, D.S., Turnbull, M. & Young, L. (2001). The Avifauna of Hong Kong. Hong Kong Bird Watching Society, Hong Kong.
- Chan, S.K.F., Cheung, K.S., Ho, C.Y., Lam, F.N., Tang, W.S., Lau, M.W.N. & Bogadek, A. (2005). A Field Guide to the Amphibians of Hong Kong. Friends of the Country Parks.

- Chandrasekhar-Rao, A. (1994). Distribution and ecology of Hong Kong small mammals, with special reference to seasonality. M. Phil. Thesis. Department of Ecology and Biodiversity , the University of Hong Kong.
- Chau, L. & Siu, G. (1998). Orchid on ash. Porcupine! No. 17, page 8.
- Corlett, R., Xing, F., Sai-Chit, N., Chau, L. & Wong, L. (2000). Hong Kong Vascular Plants: Distribution and Status. Memoirs of the Hong Kong Natural History Society, Hong Kong.
- Ecosystem. (2000) Appendix 9. Route 3 Highway Operational Ecological Monitoring and Audit and Sham Tseng Stream Restoration, Final Monitoring Report and Summary: September – December 2000.
- Environmental Protection Department. (2003a). Additional Study of Waste-to-Energy Facilities (WEF) Environmental Impact Assessment Report.
- Environmental Protection Department. (2003b). Animal Carcass Facilities Treatment. Environmental Impact Assessment Report.
- Environmental Protection Department. (2006). Feasibility Study of Sludge Treatment Facilities Environmental Study Report.
- Environmental Protection Department. (2008a). West New Territories (WENT) Landfill Extensions – Feasibility Study: Baseline Ecological Survey Report for Sludge Treatment Facilities.
- Environmental Protection Department. (2008b). Sludge Treatment Facilities – Feasibility Study. Environmental Impact Assessment Report.
- Environmental Protection Department. (2009). West New Territories (WENT) Landfill Extensions Environmental Impact Assessment Report.
- Fellowes, J.R., Lau, M.W.N., Dudgeon, D., Reels, G.T., Ades, G.W.J., Carey, G.J., Chan, B.P.L., Kendrick, R.C., Lee, K.S., Leven, M.R., Wilson, K.D.P. & Yu, Y.T. (2002). Wild animals to watch: Terrestrial and freshwater fauna of conservation concern in Hong Kong. Memoirs of the Hong Kong Natural History Society 25: 123-159.
- Goodyer, N.J. (1992). Notes on the land mammals of Hong Kong. Memoirs of the Hong Kong Natural History Society 19:71-78.
- Green Valley Landfill Ltd. (1996). Southeast New Territories Landfill Environmental Monitoring, Ecological Monitoring Programme, Report on Sampling Period Number 6, August 1996.
- Highway Department. (2002). Deep Bay Link – Investigation and Preliminary Design. Environmental Impact Assessment Report.
- Hong Kong Herbarium. (2004). Website of Hong Kong Herbarium. URL:<<http://www.hkherbarium.net>>. Agriculture, Fisheries and Conservation Department, Hong Kong.
- Hu, Q.M. (ed.). (2003). Rare and Precious Plants of Hong Kong. Agriculture, Fisheries and Conservation Department, Hong Kong.
- Karsen, S., Lau, M. & Bogadek, A. (1998). Hong Kong Amphibians and Reptiles. 2nd edition. The Provisional Urban Council, Hong Kong.

- Lo, P.Y.F. & Hui, W.L. (2004). Hong Kong Butterflies., Hong Kong. Friends of the Country Parks & Cosmos Books, Hong Kong.
- Melville, D. (1980) Birds at Kai Tak Airport, Hong Kong. Agriculture and Fisheries Department, Hong Kong.
- Shek, C.T. (2006). A Field Guide to the Terrestrial Mammals of Hong Kong. Agriculture, Fisheries and Conservation Department, Hong Kong.
- Shea, S.S., Smith, L. and Sander, P. (1995). Ecological impact assessment and ecological monitoring of a strategic landfill: a case study in Hong Kong in Proceedings of The First Symposium of Chinese Zoologists in Southeast Asia, Guangzhou, 14-17 December 1994. Supplement to the Journal of the Sun Yat-sen University 1995(3): 30-39.
- Siu, G.L. P. (2002). Orchidaceae of Hong Kong. Memoirs of the Hong Kong Natural History Society 23: 137-147.
- Tam, T.W., Kwan, B.S.P., Wu, K.K.Y., Wong, B.S.F., Tang, S.S.H., Fung, C.H.L., Wong, W.S.Y., Wong, J.K., Fong, S.W.L. and Lei, A.H.C. (2008). Current Status of Dragonflies (Odonata) and Their Representation in Protected Areas of Hong Kong. Hong Kong Biodiversity, 16: 1-7. Agriculture, Fisheries and Conservation Department, Hong Kong Special Administrative Region Government. Hong Kong.
- Wilson, K.D.P. (2004). Field Guide to the Dragonflies of Hong Kong. Agriculture, Fisheries and Conservation Department, Hong Kong.
- Wong, L.C. (2007) An enhanced fishpond at Nam Chung, Starling Inlet, North East NT.
- Xing, F.W., Ng, S.C. & Chau, L.K.C. (2000). Gymnosperms and Angiosperms of Hong Kong. Memoirs of the Hong Kong Natural History Society 23: 21-136.
- Young, J.J. & Yiu, V. (2002) Butterfly Watching in Hong Kong. Wan Li, Hong Kong.
- Zheng, G. and Wang, Q. (1998). China Red Data Book of Endangered Animals: Aves. Science Press, Beijing.