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9 Ecological Impact (Terrestrial and Marine)

9.1 Legislation, Standards, and Guidelines

9.1.1 General

9.1.1.1 The ordinances and associated regulations/guidelines of the Hong Kong Special Administrative Region, which are relevant to the present ecological impact assessment (EcoIA) report include the following:

- Forests and Countryside Ordinance (Cap. 96) and its subsidiary legislation, the Forestry Regulations (Cap. 96A);
- Wild Animals Protection Ordinance (WAPO) (Cap. 170);
- Country Parks Ordinance (Cap. 208) and its subsidiary legislation;
- Environmental Impact Assessment Ordinance (EIAO) (Cap. 499) and the Technical Memorandum on Environmental Impact Assessment Process (EIAO-TM); and
- Protection of Endangered Species of Animals and Plants Ordinance (Cap. 586) and its subsidiary legislation.

9.1.1.2 The present EcoIA makes reference to the following guidelines and standards:

- Hong Kong Planning Standards and Guidelines Chapter 10, "Conservation";
- Planning, Environment &. Lands Branch Technical Circular No. 1/97 / Works Branch Technical Circular No. 4/97, "Guidelines for Implementing the Policy on Off-site Ecological Mitigation Measures";
- EIAO Guidance Note (GN) No. 3/2010 – Flexibility and Enforceability of Mitigation Measures Proposed in an EIA Report;
- EIAO GN No. 6/2010 – Some Observations on Ecological Assessment from the Environmental Impact Assessment Ordinance Perspective;
- EIAO GN No. 7/2010 – Ecological Baseline Survey for Ecological Assessment; and
- EIAO GN No. 10/2010 – Methodologies for Terrestrial and Freshwater Ecological Baseline Surveys.

9.1.1.3 This EcoIA also makes reference to the following Mainland legislation:

- List of Wild Animals under State Priority Conservation, promulgated by the National Forestry and Grassland Administration and the Ministry of Agricultural and Rural Affairs; and
- List of Wild Plants under the State Priority Protection, promulgated by the National Forestry and Grassland Administration and the Ministry of Agriculture and Rural Affairs.

9.1.1.4 Other international conventions and guidelines that are relevant to this EcoIA report include the followings:

- Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES);
- International Union for Conservation of Nature (IUCN) Red List of Threatened Species; and

- United Nations Convention on Biological Diversity.

9.1.2 Criteria of Evaluating Species of Conservation Importance

9.1.2.1 Species of flora and fauna with conservation importance will be given special attention. In accordance with Table 3, Annex 8 of EIAO-TM, the ecological value of species will be assessed in terms of protection status, distribution and rarity. For faunal species, the protection status (e.g. fauna protected under WAPO (Cap. 170) (except birds as all wild birds are protected under the ordinance but their conservation importance is not equal), Protection of Endangered Species of Animals and Plants Ordinance (Cap. 586), and/or regional/global laws/conventions), the species distribution (e.g. endemic), and the rarity (e.g. rare or very rare, or level of concern highlighted in Fellowes *et al*. (2002)) will be considered. Similarly, floral species of conservation importance will be considered from protection status (e.g. listed under Forestry Regulations and Cap. 586 in Hong Kong, listed by IUCN or CITES, or listed as Category I or II protected species in mainland China); species distribution (e.g. endemic); and rarity (e.g. considered rare or very rare by Corlett *et al*. (2000) and regarded as rare by Yip *et al*. (2010)). However, exotic species, escaped cultivars, captive species and vagrants will be excluded.

9.1.2.2 The following laws/regulations and conventions for conservation are relevant to the evaluation of the conservation importance of flora and fauna species:

- IUCN Red List of Threatened Species;
- China Plant Red Data Book;
- China Red Data Book of Endangered Animals;
- Category I or II protected species in mainland China in the List of Wild Animals and Plants under State Priority Conservation;
- Threatened Species List of China's Higher Plants;
- Red List of China's Vertebrates;
- CITES;
- Forestry Regulations (Cap. 96A) which are subsidiary legislation of the Forests and Countryside Ordinance (Cap. 96);
- WAPO (Cap. 170) (except birds as all wild birds are protected under the ordinance but their conservation importance is not equal);
- Protection of Endangered Species of Animals and Plants Ordinance (Cap. 586);
- PRC Wild Animal Protection Law;
- Plant species considered 'Rare' or 'Very Rare' by Corlett *et al*. (2000), or regarded as "Rare" by Yip *et al.* (2010) where applicable; and
- Fauna species considered of concern in Fellowes *et al*. (2002).

9.2 Literature Review

9.2.1 General

9.2.1.1 In accordance with Section 5.1.2.1 of the Annex 16 of EIAO-TM, existing information regarding the Project footprint and its vicinity shall be reviewed. Such information includes both published materials (books, journals, reports, registers, etc.) and those made available by government and non-government bodies. The publicly available information, as well as internal bat roost data provided by the Agriculture, Fisheries and

Conservation Department (AFCD), regarding the ecological characters of the assessment area are collated and summarized as follows.

9.2.1.2 The assessment area for the present study is partially covered by those of the following studies:

- Ground Investigation Works within Tai Lam Country Park for Route 11 (Section between Yuen Long and North Lantau) (DIR-295/2022);
- Cycle Track between Tsuen Wan and Tuen Mun (Tuen Mun to So Kwun Wat) (AEIAR-239/2022);
- Development at San Hing Road and Hong Po Road, Tuen Mun (AEIAR-227/2020);
- Hung Shui Kiu New Development Area (AEIAR-203/2016);
- Tuen Mun - Chek Lap Kok Link (AEIAR-146/2009);
- Upgrading of Pillar Point Sewage Treatment Works (AEIAR-118/2008);
- Castle Peak Road Improvement between Area 2 and Ka Loon Tsuen, Tsuen Wan, Construction of Reclamation West of Tsing Lung Tau (DIR-120/2005);
- Improvement to Castle Peak Road between Ka Loon Tsuen and Siu Lam (AEIAR-047/2001);
- Tuen Mun Sewerage - Eastern Coastal Sewerage Extension (AEIAR-034/2000);
- Preliminary Land Use Study for Lam Tei Quarry and the Adjoining Areas – Feasibility Study – WP6 – Preliminary Feasibility Assessments on Preferred Land Use Option (4th Batch Draft Submission);
- Agreement No. CE 39/2018 (WS) Strategic Cavern Areas to Accommodate Existing and Proposed Service Reservoirs in Lam Tei and Adjoining Areas – Feasibility Study;
- Route 10 North Lantau to Yuen Long Highway Investigation and Preliminary Design (Southern Section) (AEIAR-030/2000);
- Feasibility Study for the Agreement No. CE 51/2016 (HY) Route 11 (between North Lantau and Yuen Long); and
- Feasibility Study for the Agreement No. CE 50/2020 (HY) Feasibility Review of Tsing Yi – Lantau Link.

9.2.2 Recognized Sites of Conservation Importance

9.2.2.1 Adopting the definition of recognized sites of conservation importance as delineated in Note 1 of Appendix A of EIAO-TM, the recognized sites of conservation importance falling within the assessment area include part of "Conservation Area" under the Approved Lam Tei (LT) and Yick Yuen Outline Zoning Plan (OZP) No. S/TM-LTYY/12 and part of Tai Lam Country Park (TLCP), while Siu Lang Shui Site of Special Scientific Interest falls outside the assessment area.

<u>"Conservation Area" ("CA")</u>

9.2.2.2 Under the Approved LT and Yick Yuen OZP No. S/TM-LTYY/12, a slope flanking TLCP has been zoned as "CA", which is intended to protect and retain the existing natural landscape, ecological or topographical features of the area for conservation, educational and research purposes and to separate sensitive natural environment, such as CPs, from the adverse effects of development. The Project footprint will not encroach on this "CA".

The nearest works item to this "CA" (i.e. slope works area in LT) is situated at around 300 metres to its west (**Figure 9.1**).

Tai Lam Country Park

9.2.2.3 The proposed Lam Tei Tunnel (LTT), So Kwun Wat Link Road (SKWLR) and Tai Lam Chung Tunnel (TLCT) are beneath TLCP (**Figure 9.1**), which was designated in 1979 and spans across Tsuen Wan to Tuen Mun, occupying 5,412 hectares of land in the western New Territories (AFCD 2023). After deforestation during the Second World War, the area of the present TLCP has been intensively reforested with exotic pioneer tree species. Plantation stands of *Acacia confusa*, *Eucalyptus robusta*, *Lophostemon confertus*, *Pinus elliottii* and other exotic tree species were established throughout the territory of TLCP to reduce soil erosion, restore the landscape and protect water catchments. Native tree species, such as *Machilus* spp. and *Castanopsis fissa*, have also been gradually incorporated and planted, to replace the aging exotic plantations and to enhance biodiversity and thus the ecological value of TLCP.

9.2.2.4 A few reservoirs are present in TLCP, including LT Irrigation Reservoir, Hung Shui Hang (HSH) Irrigation Reservoir and Tai Lam Chung (TLC) Reservoir.

Siu Lang Shui Site of Special Scientific Interest

9.2.2.5 Siu Lang Shui Site of Special Scientific Interest (SLS SSSI) is situated at around 600m to the northwest of the Pillar Point magazine site (**Figure 9.1**), occupying an area of around 2.3ha and covering a plantation slope composed of *Acacia confusa* and *Eucalyptus torelliana* and naturally colonized with native species at the northern part of the closed and restored SLS Landfill managed by EPD. Designated in 2008, SLS SSSI has been known as the largest overwintering site of Danaids, including Blue-spotted Crow, Common Indian Crow, Striped Blue Crow, Common Tiger, Ceylon Blue Glassy Tiger, Blue Tiger and Dark Blue Tiger in Hong Kong since 1999 (Planning Department 2008).

9.2.2.6 The condition of SLS as an overwintering danaid ground has been monitored by Green Power since 2009. The number of overwintering danaids surveyed and publicized by Green Power in each year since 2009, where available, are tabulated in **Table 9.1**. The exact location of and the dates when these overwintering danaids were observed are unspecified. From October 2022 to January 2023, 601 overwintering danaids were observed at SLS and reported (Green Power 2023).

Table 9.1 Overwintering Danaids Recorded in Siu Lang Shui by Green Power since 2009

Year of overwintering danaid survey	Number of overwintering danaids reported by Green Power [1,2,3,4,5,6,7,8,9,10,11]
Late 2022 to early 2023	601
Late 2020 to early 2021	195
Late 2019 to early 2020	649
Late 2016 to early 2017	59
Late 2015 to early 2016	66
Late 2014 to early 2015	1587
Late 2013 to early 2014	41
Late 2012 to early 2013	230
Late 2011 to early 2012	5000-6000
Late 2010 to early 2011	601
Late 2009 to early 2010	65
Late 2008 to early 2009	41

Notes:

1. Green Power. (2011). Press Release: "Overwintering Danaids Survey 2009 & 2010" Results - Less than 100 Counted at the Largest Overwintering Site of Tigers and Crows in Hong Kong (19 Jun 2011).
2. Green Power. (2012). Press Release: "Overwintering Danaids Survey 2011" Results - Overwintering Danaids Visited Siu Lang Shui Again and Overwintering Pattern has Changed (23 Feb 2012).
3. Green Power. (2013). Press Release: Concerns Raised Over Threat to Hong Kong's Largest Danaid Over-wintering Site by Development in Tuen Mun (6 Oct 2013).
4. Green Power. (2014). Press Release: "Overwintering Danaids Survey 2013" Results (19 Mar 2014).
5. Green Power. (2015). Press Release: Newly Discovered Danaids Overwintering Site in South Lantau.
6. Green Power. (2016). Press Release: "Overwintering Danaids Survey 2015" Results - Population at Siu Lang Shui Jumps 40-fold.
7. Green Power. (2017). Press Release: "Overwintering Danaids Survey 2016" Results - Population at Siu Lang Shui Plummets 90 Percent.

8. Green Power. (2018). Press Release: "Overwintering Danaids Survey 2017" Results – Number of Butterflies at Deep Water Bay Doubles to New Record (22 Mar 2018).
9. Green Power. (2020). Press Release: "Overwintering Danaids Survey 2019" Results - Number of Butterflies Rises at Siu Lang Shui and Deep Water Bay, Fan Lau and Shui Hau As Mid-point for Overwintering Common Tiger (12 Mar 2020).
10. Green Power. (2021). Press Release: "Overwintering Danaids Survey 2020" Results – Record-setting of Over 1,000 Danaids in Deep Water Bay Two New Overwintering Sites were Found (11 Jan 2021).
11. Green Power. (2023). Press Release: "Overwintering Danaids Survey" recorded the largest Danaid population in Fan Lau in South Lantau, and No Danaids in Deep Water Bay for the first time (Chinese only) (19 Mar 2023).

9.2.3 Important Habitats

9.2.3.1 Adopting the definition of important habitat as delineated in Note 2 of Appendix A of EIAO-TM, the important habitats falling within the assessment area include four patches of fung shui woodland (FSW) in So Kwun Wat (SKW) and Tai Lam Chung (TLC) Catchwater Tunnels Nos. 5, 6 and 8, while those outside but in the vicinity of the assessment area include TLC Catchwater Tunnels Nos. 1 and 7, Ma Wan (MW) Egretry and SLS Butterfly Habitat (**Figure 9.1**).

Fung Shui Woodland in So Kwun Wat

9.2.3.2 Four patches of FSW were identified in SKW area outside TLCP, specifically near Li Uk (LU), Tin Hau Temple (THT) and Ching Uk Tsuen (CUT), the last of which is with eastern and western patches (**Figure 9.1**). Based on the reviewed aerial photos, they have remained largely undisturbed for more than 70 years. Mott Connell Limited (MCL) and Environmental Resources Management Hong Kong Limited (ERMHKL) (1999) described their floristic composition in the approved EIA report for ex-Route 10 North Lantau to Yuen Long Highway Investigation and Preliminary Design (Southern Section) (AEIAR-030/2000) as follows.

Li Uk Fung Shui Woodland

9.2.3.3 Li Uk Fung Shui Woodland (LUFSW) was dominated by *Antidesma bunius*, *Dimocarpus longan*, *Microcos nervosa*, *Ficus microcarpa* and *Sterculia lanceolata* and was scattered with a few individuals of *Celtis timorensis* and an individual of *Ficus tinctoria* subsp. *gibbosa*. *Pavetta hongkongensis*, which is of conservation importance, was also recorded therein.

Tin Hau Temple Fung Shui Woodland

9.2.3.4 Tin Hau Temple Fung Shui Woodland (THTFSW) was largely dominated by *Ixonanthes reticulata* of conservation importance and reaching as tall as 15m with diameter at breast height (DBH) greater than 40cm.

Ching Uk Tsuen Fung Shui Woodland

9.2.3.5 Ching Uk Tsuen Fung Shui Woodland (CUTFSW) was segregated into eastern and western patches (**Figure 9.1**). It shared similar floristic composition as THTFSW and was dominated by *Ixonanthes reticulata*, *Antidesma bunius*, *Microcos nervosa* and *Ficus microcarpa*. *Lithocarpus litseifolius* and *Castanopsis concinna*, the latter of which is of conservation importance, were also once recorded.

Tai Lam Chung Catchwater Tunnels

9.2.3.6 Shortlisted in Issue Nos. 7 and 10 of the Hong Kong Biodiversity Newsletter published by AFCD, roosts of cave-dwelling bats inside TLC Catchwater Tunnels Nos. 6 and 8, which are situated within TLCP and managed by the Water Supplies Department (WSD), were identified. With reference to the recent data of bat roost surveys conducted by the AFCD from 2020 to 2023, 9 bat species had been cumulatively recorded from these two roosts within the assessment area.

9.2.3.7 Furthermore, bat roosts inside TLC Catchwater Tunnel Nos. 1 and 7, which are both outside the assessment area, were also recorded by the AFCD.

Tai Lam Chung Catchwater Tunnel No. 6

9.2.3.8 TLC Catchwater Tunnel No. 6 is about 340m in length. TLCT (South Section) will run around 20 metres underneath TLC Catchwater Tunnel No. 6 (**Figure 9.1**).

9.2.3.9 According to the bat roost survey data provided by AFCD, 7 bat species had been cumulatively recorded from 2020 to 2023. The overall number of bats found therein only reached double figures once during the surveys and no breeding/maternity/nursery behaviour was noted therein in breeding season. Furthermore, very few overwintering bats were supported therein.

Tai Lam Chung Catchwater Tunnel No. 8

9.2.3.10 TLC Catchwater Tunnel No. 8 is about 480m in length. LTT will be situated approximately 115 metres to the west of the western portal of TLC Catchwater Tunnel No. 8 (**Figure 9.1**).

9.2.3.11 According to the bat roost survey data provided by AFCD, 7 bat species had been cumulatively recorded from 2020 to 2023 and the total number of bats reached 3-digit figures in both breeding and overwintering seasons, comprising stable populations of Leschenault's Rousette and Himalayan Leaf-nosed Bat in breeding season and consistent overwintering population of Leschenault's Rousette. Juveniles of both bat species were recorded in the breeding season survey in 2020, suggesting that TLC Catchwater Tunnel No. 8 once served as a nursery ground for both bat species.

Tai Lam Chung Catchwater Tunnel No. 5

9.2.3.12 TLC Catchwater Tunnel No. 5, about 150m in length, though is not known as a roosting ground of bats from the reviewed literature, could be a possible bat roosting ground and is separated from TLCT (South Section) by around 350m to its north (**Figure 9.1**).

Tai Lam Chung Catchwater Tunnel No. 1

9.2.3.13 TLC Catchwater Tunnel No. 1, which is about 1,970m in length, falls outside the assessment area and is situated at approximately 1,250 metres to the east of TLC Catchwater Tunnel No. 6.

9.2.3.14 According to the data provided by AFCD, 8 bat species had been cumulatively recorded inside TLC Catchwater Tunnel No. 1 from 2020 to 2023. In particular, colonies of Himalayan Leaf-nosed Bat were consistently recorded therein, during both breeding season and overwintering season, and juveniles of Himalayan Leaf-nosed Bat were recorded therein in the breeding season survey in 2020. According to the bat roost survey data provided by AFCD, except Leschenault's Rousette, all other bat species recorded in TLC Catchwater Tunnel Nos. 6 and 8 could be found in TLC Catchwater Tunnel No. 1 in the bat roost surveys.

Tai Lam Chung Catchwater Tunnel No. 7

9.2.3.15 TLC Catchwater Tunnel No. 7, of about 950m in length, falls outside the assessment area and is situated at approximately 895 metres to the east of TLC Catchwater Tunnel No. 8. According to the data provided by the AFCD, 6 bat species had been cumulatively recorded inside TLC Catchwater Tunnel No. 7. 240 Himalayan Leaf-nosed Bats, comprising 90 juveniles, were recorded therein in the breeding season survey in 2020. Furthermore, regular and consistent population of Himalayan Leaf-nosed Bat (>600 individuals) and colonies of Chinese Horseshoe Bat (>45 individuals) were also recorded in the overwintering season survey in 2021, 2022 and 2023. According to the bat roost

survey data provided by AFCD, except Leschenault's Rousette, all other bat species recorded in TLC Catchwater Tunnel Nos. 6 and 8 could be found in TLC Catchwater Tunnel No. 7 in the bat roost surveys.

Ma Wan Egretry

9.2.3.16 MW Egretry is situated at approximately 1.5km to the east of TLB (**Figure 9.1**). Along a southwest-facing coastal woodland, MW Egretry was first discovered and reported by a birdwatcher in 2014 (Anon 2014), since then nesting of Great Egret, Little Egret, Black-crowned Night Heron and Eastern Cattle Egret have been reported. Great Egret, Little Egret and Black-crowned Night Heron have been the dominants of MW Egretry. The number of nests recorded at MW Egretry by Hong Kong Bird Watching Society (HKBWS) during ardeid breeding season from 2014 to 2022 is summarized and tabulated in **Table 9.2**. Compared to other egretries in Hong Kong, MW Egretry is comparatively smaller in size in terms of the number of nests supported. From April to July 2022, a total of 39 nests, comprising 6 nests of Great Egret, 25 nests of Little Egret and 8 nests of Black-crowned Night Heron, were found in MW Egretry (Anon 2022). Besides, the woodland where MW Egretry is located also serves as a day and night roost for ardeids.

Table 9.2 Number of Nests at Ma Wan Egretry Reported by HKBWS (2014 to 2022)

Year	Number of nests of each bird species				Total number of nests	Percentage of nests when compared to the entire Hong Kong (%)	Rank in Hong Kong
	Great Egret	Little Egret	Black-crowned Night Heron	Eastern Cattle Egret			
2022	6	25	8		39	3	11
2021	7	15	3		25	1.4	15
2020	9	9	9		27	1.4	13
2019	5	12	22	5	44	2.7	10
2018	3	19	9		31	2.9	11
2017	1	20	20		41	3.3	10
2016	2	20	40		62	5	9
2015	1	26	21		48	3.4	11
2014		5	20		25	2.6	12

Notes:
1. Anon. (2014). Summer 2014 Report: Egretry Counts in Hong Kong with particular reference to the Mai Po Inner Deep Bay Ramsar Site.
2. Anon. (2015). Summer 2015 Report: Egretry Counts in Hong Kong with particular reference to the Mai Po Inner Deep Bay Ramsar Site.
3. Anon. (2016). Summer 2016 Report: Egretry Counts in Hong Kong with particular reference to the Mai Po Inner Deep Bay Ramsar Site.
4. Anon. (2017). Summer 2017 Report: Egretry Counts in Hong Kong with particular reference to the Mai Po Inner Deep Bay Ramsar Site.
5. Anon. (2018). Summer 2018 Report: Egretry Counts in Hong Kong with particular reference to the Mai Po Inner Deep Bay Ramsar Site.
6. Anon. (2019). Summer 2019 Report: Egretry Counts in Hong Kong with particular reference to the Mai Po Inner Deep Bay Ramsar Site.
7. Anon. (2020). Summer 2020 Report: Egretry Counts in Hong Kong with particular reference to the Mai Po Inner Deep Bay Ramsar Site.
8. Anon. (2021). Summer 2021 Report: Egretry Counts in Hong Kong with particular reference to the Mai Po Inner Deep Bay Ramsar Site.
9. Anon. (2022). Summer 2022 Report: Egretry Counts in Hong Kong with particular reference to the Mai Po Inner Deep Bay Ramsar Site.
10. Some nests at Ma Wan were found in dense vegetation, and the number of nests might have been underestimated.

San Po Tsui Historical Egretry

9.2.3.17 An egretry once utilized by Little Egret, Black-crowned Night Heron, Eastern Cattle Egret, Little Egret and Chinese Pond Heron was first reported from San Po Tsui (SPT) (**Figure 9.1**) in 2005 and lasted until 2006 (Anon 2005 and 2006). Following the absence of breeding sign at this egretry in 2007 and 2008 (Anon 2007 and 2008), no reinvigoration of this egretry has been noted.

To Kau Wan Historical Egretry

9.2.3.18 An egretry at To Kau Wan (TKW) (**Figure 9.1**) was first discovered in 2002, with 31 nests belonging mainly to Little Egret (Anon 2002). Following the absence of breeding

sign at TKW Egretry in 2003 and 2004 (Anon 2003 and 2004), no reinvigoration of this abandoned egretry has been noted.

Siu Lang Shui Butterfly Habitat

9.2.3.19 In view that the number of overwintering Danaids had declined during 2016 to 2020 (EPD 2022), EPD commissioned the Environmental Association to utilize the middle and western platforms of the Restored SLS Landfill as a butterfly habitat as a means of enhancing butterfly living habitat to attract local and overwintering butterfly species and increase the overall biodiversity. The west platform is for attracting local butterfly species and the middle platform is with plantation are specifically established for overwintering Danaids and grown with climber plants for Danaids to lay eggs. SLS Butterfly Habitat is located at approximately 700m to the northwest of the Pillar Point magazine site (**Figure 9.1**).

Chinese White Dolphin Habitat

9.2.3.20 Chinese White Dolphin (CWD) *Sousa chinensis*, also commonly known as Indo-Pacific Humpback Dolphin, and Finless Porpoise *Neophocaena phocaenoides* are the two cetacean residents of Hong Kong waters. CWD can be found in coastal and inshore waters throughout the Indo-pacific, ranging from Australia and east of China to the west of South Africa. Off the coast of south China, seven or more separate populations have been identified from Guangxi to the mouth of Yangtze River, where all coincide with the presence of river mouths. There is a population of CWD in the estuary of the Pearl River that inhabits waters of the Hong Kong SAR and Guangdong Province including the waters around Macau SAR. In Hong Kong, CWD is commonly found in the more estuarine-influenced waters, including all the waters of western Hong Kong. Occurring permanently in a year-round basis in the waters of north and west of Lantau Island, CWD has also been recorded seasonally or in small numbers to the south and east of Lantau Island, as well as the southern Deep Bay and west of Lamma Island. Western and northern Lantau waters have been identified as the most important areas of CWD in the Hong Kong waters, concluded from the systematic boat surveys on CWD within Hong Kong waters since 1996. Finless Porpoise can be found in the southern and eastern waters of Hong Kong, while no previous sighting records near northeast Lantau or Tsing Lung Tau (TLT).

9.2.3.21 Since 1995, there has been a longitudinal study on CWD and Indo-Pacific finless porpoise in Hong Kong waters. Annual monitoring studies on marine mammals in Hong Kong waters have been conducted by the Hong Kong Cetacean Research Project with support from AFCD. According to the result of annual monitoring studies since 2017 (Hung 2018, 2019, 2020, 2021, 2022), CWD has been rarely sighted in the waters east of Brothers Island or the vicinity of Sunny Bay, MW and TLT. The distribution of CWD sightings recorded in the past five years of monitoring studies with sighting location data available, i.e. 2017 to 2021, was shown in **Figure 9.3** with reference to the Project footprint and assessment area. In the past five years, the closest CWD sighting had been recorded south of the Brothers Islands, which was considered an occasional record as no further sighting was recorded nearby in the following years. The waters of North Lantau close to MW and TLT have not been considered the traditional habitat or hotspot of CWD in the past decade. Beside the CWD sightings recorded in daytime near the Brothers Islands, passive acoustics monitoring in the past several years revealed that a very low level of dolphin detections, with most of them made during night-time, was recorded near the Brothers Islands. Also, the closest finless porpoise sighting had been recorded even further south of Hong Kong waters, over 15km away from the assessment area (*ibid*).

9.2.4 Species of Conservation Importance

9.2.4.1 Species of conservation importance from the literature available for review, which also fall within the assessment area of the Project, are tabulated in **Table 9.3** and illustrated in **Figure 9.2**.

Table 9.3 Species of Conservation Importance from the Reviewed Literature

Number	Species	Location [1 2 3 4 5 6 7]			Rarity and Distribution in Hong Kong [8 9 10 11 12]	Protection / Conservation status [13 14 15 16 17 18 19 20 21 22 23 24 25 26]	Source [1 2 3 4 5 6 7]
		Within the Project footprint		Outside the Project footprint but within the assessment area			
		Within the aboveground works areas (i.e. outside TLCP)	Outside the aboveground works areas				
Flora							
1	Tutcher's Maple *Acer tutcheri*	/	/	West of Lam Tei Irrigation Reservoir	Restricted. Distributed in forest.	Rare and Precious Plants of Hong Kong	Ecosystems (2021)
2	Purple Bulb Orchid *Ania hongkongensis*	/	/	Near Hung Shui Hang (HSH) Irrigation Reservoir	Very common. Found in lowland to montane forest.	Cap. 96A Cap. 586 CITES Appendix II	Ecosystems (2021)
3	*Aralia chinensis*	/	/	San Po Tsui	Restricted. Found in forest margins.	IUCN Red List of Threatened Species (2023): VU	Meinhardt – Aurecon Joint Venture (2021)
4	Hairy Chestnut *Castanopsis concinna*	/	/	Eastern patch of CUTFSW South of the eastern patch of CUTFSW	Restricted. Distributed in forest.	Rare and Precious Plants of Hong Kong IUCN Red List of Threatened Species (2023): VU China Plant Red Data Book: EN State Protection (Category II)	Maunsell Consultants Asia Ltd. in association with Maunsell Environmental Management Consultants Ltd (2001)
5	Small Persimmon *Diospyros vaccinioides*	NKL and Kwai Shek	Within TLCP Slope southwest of Choi Yuen Tsuen	East of LT Quarry Southwest of HSH Irrigation Reservoir Southwest of TLC Reservoir Downslope of catchwater in TLC (C5) Upslope and downslope of catchwater in TLT Kwai Shek, NKL and San Po Tsui Tai Chuen and Yi Chuen	Very common. Distributed in shrubland.	IUCN Red List of Threatened Species (2023): CR	Meinhardt – Aurecon Joint Venture (2021)

Number	Species	Location [1 2 3 4 5 6 7]			Rarity and Distribution in Hong Kong [8 9 10 11 12]	Protection / Conservation status [13 14 15 16 17 18 19 20 21 22 23 24 25 26]	Source [1 2 3 4 5 6 7]
		Within the Project footprint		Outside the Project footprint but within the assessment area			
		Within the aboveground works areas (i.e. outside TLCP)	Outside the aboveground works areas				
6	Chinese New Year Flower *Enkianthus quinqueflorus*	Temporary works areas in SL	/	Upslope of catchwater in TLT (C6) Plantation slope between Tuen Mun Road and TLT catchwater	Common. Distributed in shrubland and forest.	Cap. 96A	Meinhardt – Aurecon Joint Venture (2021) Maunsell Consultants Asia Ltd. in association with Maunsell Environmental Management Consultants Ltd (2001)
7	Luofushan Joint-fur *Gnetum luofuense*	LT, SKW, SL, TL, TLT and NKL areas			Very common. Distributed forest and shrublands.	IUCN Red List of Threatened Species (2023): NT	Meinhardt – Aurecon Joint Venture (2021) Ove Arup & Partners (2022)
8	Ixonanthes *Ixonanthes reticulata*	Eastern patch of CUTFSW	Eastern patch of CUTFSW	THTFSW and western patch of CUTFSW	Common. Distributed in forest.	China Red Data Book: VU IUCN Red List of Threatened Species (2023): VU Rare and Precious Plants of Hong Kong Threatened Species List of China's Higher Plants: VU	Maunsell Consultants Asia Ltd. in association with Maunsell Environmental Management Consultants Ltd (2001)

Number	Species	Location [1 2 3 4 5 6 7]			Rarity and Distribution in Hong Kong [8 9 10 11 12]	Protection / Conservation status [13 14 15 16 17 18 19 20 21 22 23 24 25 26]	Source [1 2 3 4 5 6 7]
		Within the Project footprint		Outside the Project footprint but within the assessment area			
		Within the aboveground works areas (i.e. outside TLCP)	Outside the aboveground works areas				
9	Pitcher Plant *Nepenthes mirabilis*	/	/	Near, north and downstream of Hung Shui Hang Irrigation Reservoir Upslope of MacLehose Trail Section 10 in SKW North of catchwater in TLT (C6) South of the eastern patch of CUTFSW Northeast of Grand Pacific Heights	Common. Distributed in wet, open places on granite and sedimentary rocks.	Cap. 96A Cap. 586 Appendix II of CITES	Meinhardt – Aurecon Joint Venture (2021) Maunsell Consultants Asia Ltd. in association with Maunsell Environmental Management Consultants Ltd (2001)
10	Emarginate-leaved Ormosia *Ormosia emarginata*	/	/	Yi Chuen	Common. Distributed in shrubland and forest.	State Protection (Category II)	Ove Arup & Partners (2022)
11	Soft-fruited Ormosia *Ormosia semicastrata*	/	/	North of the eastern patch of CUTFSW	Restricted. Distributed in forest.	State Protection (Category II)	Maunsell Consultants Asia Ltd. in association with Maunsell Environmental Management Consultants Ltd (2001)
12	Hong Kong Pavetta *Pavetta hongkongensis*	/	/	THTFSW Near Kwai Shek	Common. Distributed in fung shui woods and lowland forest.	Cap. 96A	Meinhardt – Aurecon Joint Venture (2021) Ove Arup & Partners (2022)
13	Maile-scented Fern *Phymatodes scolopendria*	/	/	Untraceable location in North Lantau but within the current assessment area	Rare. Found in rock crevices on rocky shores.	/	Maunsell Consultants Asia Ltd. in association with Maunsell Environmental Management Consultants Ltd (2001)
14	Red Azalea *Rhododendron simsii*	/	/	Northeast of LT Quarry	Very common. Distributed in shrubland.	Cap. 96A	Ecosystems (2021)

Number	Species	Location [1 2 3 4 5 6 7]			Rarity and Distribution in Hong Kong [8 9 10 11 12]	Protection / Conservation status [13 14 15 16 17 18 19 20 21 22 23 24 25 26]	Source [1 2 3 4 5 6 7]
		Within the Project footprint		Outside the Project footprint but within the assessment area			
		Within the aboveground works areas (i.e. outside TLCP)	Outside the aboveground works areas				
Mammal							
15	Pallas's Squirrel *Callosciurus erythraeus*	/	/	Northwest of LT Quarry Northeast of LT Quarry	Fairly widely distributed, with the styani subspecies found in the New Territories (e.g. Tai Lam, Shing Mun and Tai Po Kau), and the thai subspecies found on the Hong Kong Island (e.g. Tai Tam and Pok Fu Lam)	Cap. 170	Ecosystems (2021) Meinhardt – Aurecon Joint Venture (2021)
16	Scat of Leopard Cat *Prionailurus bengalensis*	/	/	Plantation east of HSH Irrigation Reservoir	Widely distributed in countryside areas throughout Hong Kong, except for Lantau Island.	China Red Data Book: VU Cap. 170 Cap. 586 Red List of China's Vertebrate: VU	Ecosystems (2021)
17	*Pipistrellus* sp.	/	/	Developed area west of TLC Road	Common resident and migrant. Widely distributed in Hong Kong.	Fellowes *et al*. (2002): LC Cap. 170	Meinhardt – Aurecon Joint Venture (2021)
18	Leschenault's Rousette *Rousettus leschenaultii*	/	/	TLC Catchwater Tunnel No. 8	Common. Fairly widely distributed in countryside areas throughout Hong Kong.	Fellowes *et al.* (2002): (LC) Cap. 170	AFCD
19	Chinese Horseshoe Bat *Rhinolophus sinicus*	/	/	TLC Catchwater Tunnel Nos. 6 and 8	Very common. Widely distributed in forested areas throughout Hong Kong.	Cap. 170	
20	Intermediate Horseshoe Bat *Rhinolophus affinis*	/	/	TLC Catchwater Tunnel No. 6	Uncommon. Widely distributed in forested areas throughout Hong Kong.	Fellowes *et al.* (2002): (LC) Cap. 170	

Number	Species	Location [1 2 3 4 5 6 7]			Rarity and Distribution in Hong Kong [8 9 10 11 12]	Protection / Conservation status [13 14 15 16 17 18 19 20 21 22 23 24 25 26]	Source [1 2 3 4 5 6 7]
		Within the Project footprint		Outside the Project footprint but within the assessment area			
		Within the aboveground works areas (i.e. outside TLCP)	Outside the aboveground works areas				
21	Least Horseshoe Bat *Rhinolophus pusillus*	/	/	TLC Catchwater Tunnel No. 6	Uncommon. Widely distributed in countryside areas throughout Hong Kong.	Fellowes *et al*. (2002): PRC, (RC) Cap. 170	
22	Himalayan Leaf-nosed Bat *Hipposideros armiger*	/	/	TLC Catchwater Tunnel Nos. 6 and 8	Very common. Widely distributed in countryside areas throughout Hong Kong.	Fellowes *et al*. (2002): (LC) Cap. 170	
23	Chinese Myotis *Myotis chinensis*	/	/	TLC Catchwater Tunnel No. 8	Uncommon. Fairly widely distributed in countryside areas throughout Hong Kong.	China Red Data Book: VU Fellowes et al. (2002): (LC) Cap. 170	
24	Rickett's Big-footed Myotis *Myotis pilosus*	/	/	TLC Catchwater Tunnel No. 8	Common. Fairly widely distributed in countryside areas throughout Hong Kong.	Fellowes *et al*. (2002): (LC) Cap. 170 IUCN Red List of Threatened Species (2023): VU	
25	Greater Bent-winged Bat *Miniopterus magnater*	/	/	TLC Catchwater Tunnel No. 8	Data deficient.	Fellowes *et al*. (2002): PRC, (RC) Cap. 170	
26	Lesser Bent-winged Bat *Miniopterus pusillus*	/	/	TLC Catchwater Tunnel No. 8	Uncommon. Fairly widely distributed in countryside areas throughout Hong Kong.	Fellowes *et al*. (2002): (LC) Cap. 170	
27	Bat Species 1	/	/	LT Irrigation Reservoir	/	Cap. 170	Ecosystems (2021)
Bird							
28	Black-crowned Night Heron *Nycticorax nycticorax*	/	/	East of TLC San Po Tsui Near To Kau Wan	Common resident and migrant. Widely distributed in Hong Kong.	Fellowes *et al*. (2002): LC	Meinhardt – Aurecon Joint Venture (2021)

Number	Species	Location [1 2 3 4 5 6 7]			Rarity and Distribution in Hong Kong [8 9 10 11 12]	Protection / Conservation status [13 14 15 16 17 18 19 20 21 22 23 24 25 26]	Source [1 2 3 4 5 6 7]
		Within the Project footprint		Outside the Project footprint but within the assessment area			
		Within the aboveground works areas (i.e. outside TLCP)	Outside the aboveground works areas				
29	Chinese Pond Heron *Ardeola bacchus*	/	/	Downstream of HSH Irrigation Reservoir Tsoi Yuen Tsuen Downstream of Pak Shek Hang in SKW (C2) East of TLC Kwai Shek	Common resident. Widely distributed in Hong Kong.	Fellowes *et al.* (2002): PRC	Meinhardt – Aurecon Joint Venture (2021)
30	Little Egret *Egretta garzetta*	/	/	Downstream of HSH Irrigation Reservoir Tan Kwai Tsuen Downstream of Pak Shek Hang in SKW (C2) TLC Northeast of Grand Pacific Heights Coast in TLT Near To Kau Wan and Yi Chuen San Po Tsui	Common resident, migrant and winter visitor. Widely distributed in coastal area throughout Hong Kong.	Fellowes *et al.* (2002): PRC	Meinhardt – Aurecon Joint Venture (2021) Ecosystems (2021)
31	Black Kite *Milvus migrans*	Barging point in San Po Tsui	/	Upslope of MacLehose Trail Section 10 South of the channel downstream of Pak Shek Hang in SKW (C2) Downslope of catchwater in TLT (C6) East of LT Irrigation Reservoir Yuen Long Highway Wo Ping San Tsuen Near San Po Tsui Near Yi Chuen	Common resident and winter visitor. Widely distributed in Hong Kong.	Fellowes *et al*. (2002): RC Appendix 2 of CITES Cap. 586	Meinhardt – Aurecon Joint Venture (2021) Ecosystems (2021) Ove Arup & Partners (2022)
32	Crested Serpent Eagle *Spilornis cheela*	/	/	Northeast of the eastern patch of CUTFSW Downslope of catchwater in TLT (C6) Southwest of Hong Kong Garden in TLT	Common resident. Widely distributed in shrublands on hillsides throughout Hong Kong.	China Red Data Book: VU Fellowes *et al*. (2002): LC Appendix 2 of CITES Cap. 586	Meinhardt – Aurecon Joint Venture (2021)

Number	Species	Location [1 2 3 4 5 6 7]			Rarity and Distribution in Hong Kong [8 9 10 11 12]	Protection / Conservation status [13 14 15 16 17 18 19 20 21 22 23 24 25 26]	Source [1 2 3 4 5 6 7]
		Within the Project footprint		Outside the Project footprint but within the assessment area			
		Within the aboveground works areas (i.e. outside TLCP)	Outside the aboveground works areas				
33	Greater Coucal *Centropus sinensis*	/	/	North and east of LT Irrigation Reservoir Northeast of LT Quarry West of TLC Northeast of Grand Pacific Heights	Common resident. Widely distributed in Hong Kong.	Class 2 Protected Animal of China China Red Data Book: VU	Meinhardt – Aurecon Joint Venture (2021) Ecosystems (2021) Ove Arup & Partners (2022)
34	Common Emerald Dove *Chalcophaps indica*	Barging point in San Po Tsui	/	Near Kwai Shek	Uncommon but widespread resident. Widely distributed in woodland throughout Hong Kong.	China Red Data Book: VU	Ove Arup & Partners (2022)
35	Great Egret *Ardea alba*	/	/	Downstream of Pak Shek Hang in SKW (C2) Near To Kau Wan San Po Tsui	Common resident, migrant and winter visitor. Widely distributed in Hong Kong.	Fellowes *et al.* (2002): PRC	Meinhardt – Aurecon Joint Venture (2021) Ove Arup & Partners (2022)
36	Pacific Reef Heron *Egretta sacra*	/	/	Near Yi Chuen	Common resident. Widely distributed in coastal area throughout Hong Kong.	Class 2 Protected Animal of China China Red Data Book: Rare Fellowes *et al.* (2002): LC	Meinhardt – Aurecon Joint Venture (2021) Ove Arup & Partners (2022)
37	Rufous-capped Babbler *Stachyridopsis ruficeps*	/	/	Northeast of LT Quarry Northeast of the eastern patch of CUTFSW Southeast of Tai Lam Chung Tsuen Downslope of catchwater in TLT (C6)	Common resident. Found in Shing Mun, Tai Po Kau, Tai Mek Tuk, Ng Tung Chai, Fo Tan, Tai Mo Shan, The Peak, Kadoorie Agricultural Research Centre.	Fellowes *et al.* (2002): LC	Meinhardt – Aurecon Joint Venture (2021)

Number	Species	Location [1 2 3 4 5 6 7]			Rarity and Distribution in Hong Kong [8 9 10 11 12]	Protection / Conservation status [13 14 15 16 17 18 19 20 21 22 23 24 25 26]	Source [1 2 3 4 5 6 7]
		Within the Project footprint		Outside the Project footprint but within the assessment area			
		Within the aboveground works areas (i.e. outside TLCP)	Outside the aboveground works areas				
38	White-throated Kingfisher *Halcyon smyrnensis*	TLC	/	East of TLC	Common resident. Widely distributed in coastal areas throughout Hong Kong.	Fellowes *et al.* (2002): (LC)	Meinhardt – Aurecon Joint Venture (2021)
Herpetofauna							
39	Lesser Spiny Frog *Quasipaa exilispinosa*	/	Within TLCP Slope west of Choi Yuen Tsuen	/	Widely distributed in upland forest streams throughout Hong Kong	Fellowes *et al*. (2002): PGC Red List of China's Vertebrates: VU	Meinhardt – Aurecon Joint Venture (2021)
40	Romer's Tree Frog *Liuixalus romeri*	/	/	Near Kwai Shek	Distributed in woodlands on Lantau Island, Po Toi Island, Lamma Island, Hong Kong Island and New Territories.	Fellowes *et al*. (2002): PGC IUCN Red List of Threatened Species (2023): EN Cap. 170 Red List of China's Vertebrates: VU	Ove Arup & Partners (2022)
41	Copperhead Racer *Coelognathus radiatus*	/	/	North of LT Quarry Downslope of catchwater in TLT (C6)	Widely distributed throughout Hong Kong	China Red Data Book: EN Fellowes *et al*. (2002): PRC Red List of China's Vertebrates: EN	Meinhardt – Aurecon Joint Venture (2021)
Butterfly							
42	Albocerulean *Udara albocaerulea*	/	/	HSH Reservoir	Very rare. So Lo Pun, Tai Po Kau, Kap Lung, Pak Tam Chung, Shing Mun, Tai Mo Shan.	Fellowes et al. (2002): LC	Ecosystems (2021)
43	Danaid Eggfly *Hypolimnas misippus*	/	/	Northwest of Harlow International School Hong Kong	Uncommon. Ngau Ngak Shan, Lung Kwu Tan, Hong Kong Wetland Park, Mount Parker, Cloudy Hill, Lin Ma Hang.	Fellowes *et al.* (2002): LC	Atkins (2022)

Number	Species	Location [1 2 3 4 5 6 7]			Rarity and Distribution in Hong Kong [8 9 10 11 12]	Protection / Conservation status [13 14 15 16 17 18 19 20 21 22 23 24 25 26]	Source [1 2 3 4 5 6 7]
		Within the Project footprint		Outside the Project footprint but within the assessment area			
		Within the aboveground works areas (i.e. outside TLCP)	Outside the aboveground works areas				
Odonate							
44	Blue Chaser *Potamarcha congener*	/	/	East of Lam Tei Quarry	Common. Found in small weedy ponds, puddles and marshes. Widely distributed in the New Territories.	Fellowes *et al*. (2002): LC	Ecosystems (2021)
45	Blue-tailed Shadowdamsel *Drepanosticta hongkongensis*	/	/	Upslope of catchwater in TLT (C6)	Common. Found in small mature forest streams with steep gradients and mossy banks. Widely distributed in well forested areas throughout Hong Kong.	Fellowes *et al*. (2002): GC	Meinhardt – Aurecon Joint Venture (2021)
46	Ruby Darter *Rhodothemis rufa*	/	/	Downstream of HSH Irrigation Reservoir	Common. Widely distributed in ponds and marshes with dense floating plants.	Fellowes *et al*. (2002): LC	Ecosystems (2021)
47	Emerald Cascader *Zygonyx iris*	/	/	Northwest of Harlow International School Hong Kong	Abundant. Widely distributed in moderately clean, rapidly flowing forested streams throughout Hong Kong.	Fellowes *et al*. (2002): PGC	Atkins (2022)
Freshwater fauna							
48	Predaceous Chub *Parazacco spilurus*	/	/	Downstream of LT Irrigation Reservoir Tsoi Yuen Tsuen in LT	Common. A widespread species occurring in most unpolluted hill streams in both upper and lower courses	China Red Data Book: VU	Meinhardt – Aurecon Joint Venture (2021)

Number	Species	Location [1 2 3 4 5 6 7]			Rarity and Distribution in Hong Kong [8 9 10 11 12]	Protection / Conservation status [13 14 15 16 17 18 19 20 21 22 23 24 25 26]	Source [1 2 3 4 5 6 7]
		Within the Project footprint		Outside the Project footprint but within the assessment area			
		Within the aboveground works areas (i.e. outside TLCP)	Outside the aboveground works areas				
49	Small Snakehead *Channa asiatica*	/	/	Downstream of Pak Shek Hang in SKW (C2)	Uncommon in the wild. Records from a few streams in North district and on Lantau Island. The fish is also cultivated in some fish farms and are available from fish market.	Fellowes *et al*. (2002): LC	Meinhardt – Aurecon Joint Venture (2021)
50	*Cryptopotamon anacoluthon*	/	/	Downstream of Pak Shek Hang in SKW (C2)	Widely distributed within Hong Kong; recorded throughout the New Territories, Hong Kong and Lantau Islands	IUCN Red List of Threatened Species (2023): VU Fellowes *et al*. (2002): PGC Endemic to Hong Kong	Meinhardt – Aurecon Joint Venture (2021)
Marine fauna							
51	Hard coral *Coscinaraea* n sp., *Favites pentagona*, *Leptastrea purpurea*, *Oulastrea crispata*, *Platygyra carnosa*, *Porites* sp., *Psammocora profundacella*	/	/	Coastal area of Yi Tsuen	Widely distributed in Hong Kong waters, in particular northeast, east and southeast waters	Cap. 586 Appendix II of CITES	Ove Arup & Partners (2022)
52	Gorgonian *Guaiagornia* sp	/	/	Coastal area of Yi Tsuen	Common in western waters	Nil	Ove Arup & Partners (2022)

Notes:

1. AECOM. (2016). Approved Environmental Impact Assessment Report for Hung Shui Kiu New Development Area.
2. Atkins (2022). Approved Environmental Impact Assessment Report for Cycle Track between Tsuen Wan and Tuen Mun (Tuen Mun to So Kwun Wat) (AEIAR-239/2022).
3. Ecosystems (2021). Draft Ecological Survey Report of the Feasibility Study for the Agreement No. CE 39/2018 (WS) Strategic Cavern Areas to Accommodate Existing and Proposed Service Reservoirs in Lam Tei and Adjoining Areas
4. Maunsell Consultants Asia Ltd. in association with Maunsell Environmental Management Consultants Ltd. (2001). Approved Environmental Impact Assessment Report for Tuen Mun Sewerage – Eastern coastal Sewerage Extension – Environmental Impact Assessment.
5. Meinhardt – Aurecon Joint Venture (2021). Preliminary Environmental Review Report (Final – Rev. 5) of the Feasibility Study for the Agreement No. CE 51/2016 (HY) Route 11 (between North Lantau and Yuen Long.
6. Mott Connell Limited and Environmental Resources Management Hong Kong Limited (1999). Approved Environmental Impact Assessment Report for Route 10 North Lantau to Yuen Long Highway Investigation and Preliminary Design (Southern Section) (AEIAR-030/2000)
7. Ove Arup & Partners (2022). Preliminary Environmental Review Report for Agreement No. CE 50/2020 (HY) Feasibility Review of Tsing Yi – Lantau Link – Feasibility Study.
8. AFCD (2022). Species Database of Hong Kong Biodiversity Information Hub.
9. Corlett et al. (2000). Hong Kong Vascular Plants: Distribution and Status.
10. Chan et al. (2011). A review of the local restrictedness of Hong Kong Butterflies.
11. Shek (2006). A Field Guide to the Terrestrial Mammals of Hong Kong.
12. Tam *et al*. (2011). The Hong Kong Dragonflies.
13. Convention on International Trade in Endangered Species of Wild Fauna and Flora. (2023). Appendices I, II and III.

14. Fellowes et al. (2002). Wild animals to watch: Terrestrial and freshwater fauna of conservation concern in Hong Kong.
    - For conservation status listed by Fellowes et al. (2002), letters in parentheses indicate that the assessment is on the basis of restrictedness in breeding and/or roosting sites rather than in general occurrence.
15. Forestry Regulations (Cap. 96A), the subsidiary legislation of the Forests and Countryside Ordinance (Cap. 96).
16. Fu & Chin (1992). China Plant Red Data Book – Rare and Endangered Plants.
17. Hu et al. (2003). Rare and Precious Plants of Hong Kong
18. International Union of Conservation for Nature (2023). IUCN Red List of Threatened Species. Version 2022-2.
19. Jiang et al. (2016). Red List of China's Vertebrates.
20. Protection of Endangered Species of Animals and Plants Ordinance (Cap. 586).
21. Qin et al. (2017). Threatened Species List of China's Higher Plants.
22. State Forestry Administration & Ministry of Agriculture. (2021). Wild Plants under the State Priority Protection.
23. Wang (1998). China Red Data Book of Endangered Animals: Mammalia.
24. Wild Animals Protection Ordinance (Cap. 170)
25. Yue & Chen (1998). China Red Data Book of Endangered Animals: Pisces.
26. Zheng and Wang (1998). China Red Data Book of Endangered Animals: Aves.

- Only conservation status/protection status meeting the criteria of EIAO-TM are listed.
- The EIAO designated project entitled "Ground Investigation Works within Tai Lam Country Park for Route 11 (Section between Yuen Long and North Lantau)" shares concurrent ecological survey programme with the current Project and the assessment area of the former falls entirely within the latter. The ecological survey findings of the former have been incorporated as part of the latter.
- All wild birds are protected under WAPO (Cap. 170).
- Cave-dwelling bat species known to occur within the assessment area, especially within and/or in the vicinity of TLC Catchwater Tunnels No. 6 and 8, were also provided by the AFCD.
- In the surveys in 2004, < 3% coverage of hard and soft corals were recorded on coastlines to the east and the west of Grand Bay Villa of Tsing Lung Tau. The low coverage corals were then lost due to the reclamation works under the DIR-120/2005.

Abbreviations:

- CR: Critically Endangered; EN: Endangered; GC: Global Concern; LC: Local Concern; NT: Near Threatened; PGC: Potential Global Concern; PRC: Potential Regional Concern; RC: Regional Concern; VU: Vulnerable

9.2.5 Data Gap

9.2.5.1 After reviewing all the best available literature, it was considered that an ecological field survey programme covering terrestrial ecology and marine ecology (except CWD survey) was needed to collect up-to-date ecological baseline data and to establish a comprehensive ecological baseline, for assessing the ecological impacts arising from the Project. Ecological surveys focusing on the Project footprint, including both aboveground and underground works areas, especially those not covered by the reviewed studies, and their vicinity are required for assessing ecological impacts in details. Survey for CWD, however, is not required because of the following reason.

Information on Chinese White Dolphin

9.2.5.2 AFCD has conducted territorial-wide marine mammal survey for about two decades and has accumulated sufficient field survey data for CWD in North Lantau waters. The territorial-wide marine mammal survey has been conducting annually and the results are published every year. It is considered that the data is the most comprehensive data in Hong Kong and suitable for the purpose of impact assessment. According to the abovementioned AFCD survey data, it is known that the area of the proposed Tsing Lung Bridge (TLB) is consistently of low CWD usage, and the proposed bridge would only involve limited coastal reclamation for the landing point at TLT. Given the availability of existing data and the small scale of marine works, it is proposed to conduct the assessment for CWD based upon literature review and no field survey is required.

9.3 Ecological Field Survey Methodology

9.3.1 Objective of the Ecological Survey

9.3.1.1 Aiming at filling the information gap identified from literature review, ecological surveys were carried out to establish a more focal ecological baseline for the Project elements, including mainline alignment, haul road, slope works, temporary works areas, magazine sites and marine works areas.

9.3.1.2 The assessment area includes all areas within 500m distance from the Project elements (**Figure 9.1**).

9.3.2 Programme

9.3.2.1 Surveys on habitat and vegetation, terrestrial mammals, avifauna, herpetofauna, butterflies, odonates, freshwater community, intertidal community, benthic community and coral community had been primarily undertaken within the assessment area from May 2022 to January 2023 for a duration of 9 months (**Table 9.4**) to collect ecological baseline information, with supplementary daytime terrestrial ecological surveys carried out within the assessment area in February and March 2023 as well as supplementary bat roost survey carried out in May 2023 to collect further ecological information. The transects and sampling points for carrying out ecological surveys are shown in the figure in **Appendix 9.1**.

9.3.2.2 The recommended months and methodology of conducting surveys for specific taxa follows the EIAO GN No. 7/2010 "Ecological Baseline Survey for Ecological Assessment", No. 10/2010 "Methodologies for Terrestrial and Freshwater Ecological Baseline Survey" and No. 11/2010 "Methodologies for Marine Ecological Baseline Surveys". The ecological survey programme and methodology were agreed with relevant government departments, including but not limited to AFCD, in prior. The survey methodology for flora and each fauna group is described in the following sections.

Table 9.4 Ecological Survey Programme

Types of survey	2022								2023			
	Wet season					Transitional month	Dry season					Wet season
	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	May
Habitat & vegetation	D			D			D		D	D	D	
Mammal	D+N	D+N	D+N	D+N	D+N	D+N	D+N	D+N	D+N	D	D	Bat roost, acoustics and/or emergence surveys for TLC Catchwater Tunnel Nos. 5, 6 and 8
Avifauna	D+N	D+N	D+N	D+N	D+N	D+N	D+N	D+N	D+N	D	D	
Ardeid flight path	D	D	D	D								
Butterfly	D	D	D	D	D	D	D	D	D	D	D	
Odonate	D	D	D	D	D	D	D	D	D	D	D	
Herpetofauna	D+N	D+N	D+N	D+N	D+N	D+N	D+N	D+N	D	D	D	
Freshwater community	D	D	D	D	D	D	D	D				
Intertidal community			D				D					
Benthic community		D					D					
Coral community			D									

Abbreviations:

- D: Daytime; D + N: Daytime and night-time
- Fauna observed in surveys for other taxa (including daytime or night-time, within or beyond their active periods) were also recorded.

9.3.3 Methodology

Habitat and Vegetation

9.3.3.1 Habitats within the assessment area were mapped based on government latest aerial photos and field ground-truthing. Representative areas of each habitat type were surveyed on foot. Plant species of each habitat type encountered and their relative abundance were recorded with special attention to species of conservation importance. The location(s) of any plant species of conservation importance encountered were recorded. Nomenclature and rarity of plant species in Hong Kong follow Corlett *et al*. (2000).

Terrestrial Mammal

9.3.3.2 **Non-Flying Mammal Survey** – All sightings, tracks, and signs of mammals (including droppings) within the representative area within the assessment area were surveyed actively during daytime and night-time, covering dusk. The location(s) of any mammal species of conservation importance encountered were recorded, along with notable behaviour, such as feeding, nesting or breeding and the associated habitats. Night surveys were conducted to survey nocturnal mammal species (e.g. bats). Hand torch was used to search for the nocturnal mammals. Nomenclature and rarity of mammals follows Shek (2006).

9.3.3.3 **Bat Acoustics Survey and Emergence Survey** – Acoustic survey and emergence survey were conducted for bat roosts and bat habitats, including TLC Catchwater Tunnel Nos. 5, 6 and 8. TLC Catchwater Tunnel No. 5, about 150m in length and around 350m to the north of TLC Catchwater Tunnel No. 6, though is not known as a roosting ground of bats from the reviewed literature, could be a potential bat roosting ground. Given its potential, in additional to the known bat roosts in Catchwater Tunnels No. 6 and 8, acoustics and emergence surveys were also conducted in this catchwater tunnel. Bat detector was adopted to locate bats, if necessary, and was conducted using a bat detector (Wildlife Acoustics – Echo Meter Touch 2 PRO) near the entrance of potential bat roosts (i.e. catchwater tunnels) and along the transects. Aside from the entrance of potential and known bat roosts in catchwater tunnels, attention was also given to potential foraging and drinking sites such as fruiting trees and freshwater ponds. The bat species were located upon the detection location of echolocation calls and from direct observation. The acoustic information (species-specific echolocation calls) was recorded for later analysis. All bat echolocation calls recorded were identified according to species-specific echolocation call structure, supplemented with direct observations (e.g. size, flying pattern, flight height and utilization of nearby habitats). Bat emergence surveys, with the aid of bat detector for bat species identification, were also conducted at the entrances of catchwater tunnels during dusk when roosting bats start to leave their roosts, to confirm the status of the roosts and estimate the abundance of roosting bats.

9.3.3.4 **Non-overwintering and Breeding Season Bat Roost Survey** – Among the catchwater tunnel bat roosts within the assessment area, TLC Catchwater Tunnel Nos. 6 and 8 are located closer to the main alignment. In addition to acoustics survey and emergence survey at the tunnel entrances, daytime non-overwintering bat roost survey was also conducted inside TLC Catchwater Tunnel No. 6 in October 2022 and breeding season bat roost surveys were performed inside TLC Catchwater Tunnel Nos. 6 and 8 in May 2023. Direct roost census using camera was conducted for bat species identification. The abundance of each bat species observed therein was counted. Any observed bat individuals, droppings, urine splashes, fur-oil staining, feeding remains, squeaking noises or odour of bats was taken into account. Bat roost survey started from the inlet of the catchwater tunnel and ended at its outlet. Disturbance to the bats was kept at minimum level with the adoption of the least intrusive survey method (e.g. adequate light level for

illumination, record and identification purpose, but not excessive light level). Space and crevices inside the catchwater tunnels were also checked for the presence of bats.

9.3.3.5 **Overwintering Bat Roost Survey** – As the highest numbers of bats were found in the coldest conditions (Collins 2016), overwintering bat roost survey was preferentially conducted on the coldest working days during the ecological survey period. According to the internal records of AFCD, the overwintering season of bats in Hong Kong usually lasts from mid-December to early March of the next year. Overwintering bat survey was conducted in TLC Catchwater Tunnel Nos. 6 and 8 in January 2023. All cracks, crevices and voids were searched for overwintering bats using torches and mirrors. For fruit bat and horseshoe bat surveys, visual inspection was primarily adopted owing to their habit of hanging freely from the walls and ceilings of their overwintering ground. Visual inspection of overwintering Bent-winged Bats, Myotises and other bats present, was supplemented by observing droppings or oil staining around cracks and crevices or droppings beneath. Nonetheless, bats were identified and recorded with minimal disturbance and with due consideration of their torpid state during the overwintering period. The location and species (or genus) of all observed bats were marked.

Avifauna

9.3.3.6 The avifauna of each habitat type within the assessment area was surveyed using transect count method during daytime and night-time, covering early morning and dusk. The presence and abundance of avifauna species at various habitats observed from transects (**Appendix 9.1**) were recorded visually and aurally. Bird species encountered outside sampling transects but within the assessment area were also recorded. Night surveys were conducted to record nocturnal avifauna (e.g. owls). The location(s) of any avifauna species of conservation importance encountered was recorded, along with notable behaviour, such as feeding, nesting or breeding and the associated habitats. Ornithological nomenclature follows the most updated List of Hong Kong Birds from HKBWS.

Ardeid Flight-line

9.3.3.7 MW Egretry, Day Roost and Night Roost is located at around 1.5km to the east of TLB. Surveys on the flight paths of ardeids at MW Egretry, Day Roost and Night Roost were undertaken from May to August 2022 during the breeding season of ardeids to investigate the flight directions of ardeids. The ardeid flight path surveys were undertaken at a vantage point near MW Pier (**Appendix 9.1**), commencing 30 minutes before sunrise and lasted continuously for around two hours during the period of peak activity in early morning. The sunrise and ardeid survey commencement timing were recorded along with the weather condition for each ardeid flight path survey. The ardeid species composition and population size at MW Egretry, Day Roost and Night Roost were recorded. The flight paths, directions and height of ardeid individuals taking off from the concerned egretry were recorded on map, by making reference to land features. The focus was on birds carrying out long-distance flights from the egretry, especially to their feeding grounds, and the flight of the largest flock of ardeids during the ardeid flight-line survey. The location of MW Egretry, Day Roost and Night Roost and vantage point for conducting flight path survey are shown in **Appendix 9.1**. Besides, check of the activeness of the historical egretries at San Po Tsui and To Kau Wan was also conducted during the 2022 ardeid breeding season.

Herpetofauna

9.3.3.8 Herpetofauna were surveyed through direct observation and active searching in potential hiding places such as among leaf litter, inside holes, under stones and logs within representative areas of the assessment area. During the surveys, all reptiles and

amphibians sighted and heard were recorded. Attention was paid on species-specific calls of frogs and toads during night surveys. The location(s) of any herpetofauna species of conservation importance encountered was recorded, along with notable behaviours, such as feeding, nesting or breeding and the associated habitats. The nomenclature and conservation status follow Karsen *et al*. (1998) and Chan *et al*. (2005).

Butterfly and Odonate

9.3.3.9 Butterfly and odonate surveys were conducted by transect count method (**Appendix 9.1**). All the butterflies and odonates encountered and their abundance were recorded. Butterfly and odoante species encountered outside transects but within the assessment area were also recorded. Surveys for overwintering butterflies were undertaken at/near SLS Butterfly Habitat and SSSI. The location(s) of any butterfly and odoante species of conservation importance encountered were recorded, along with notable behaviours if any. The nomenclature and conservation status for butterflies and odonates follow Chan *et al*. (2011) and Tam *et al*. (2011) respectively.

Freshwater Community

9.3.3.10 Aquatic fauna, including freshwater macro-invertebrates (e.g. freshwater crabs, shrimps, freshwater molluscs and aquatic insect larvae) and fishes, in the channels and watercourses were studied by direct observation and active searching, at representative habitats within the assessment area. Sampling locations are shown in **Appendix 9.1**. Organisms were recorded and identified to the lowest possible taxon, and their relative abundance were reported. The location(s) of any freshwater fauna species of conservation importance encountered was recorded, along with notable behaviours if any. Nomenclature for fish follows Lee *et al.* (2004), while those for the macro-invertebrates follows Dudgeon (1999).

Intertidal Community

9.3.3.11 The intertidal surveys consist of both qualitative walk-through surveys and quantitative transect surveys along the accessible coastlines at TLT and North Lantau, so as to produce a comprehensive species lists as well as the corresponding relative abundance of intertidal fauna. The surveys were conducted during low tide. Different habitat types and ecological conditions were described. Organisms encountered were recorded and their relative abundance were noted. For quantitative transect surveys, one 50m horizontal transect along the coastline was surveyed at each of the three tidal levels: high, middle and low above Chart Datum (CD). On each transect, three quadrats (50cm × 50cm) were placed randomly to assess the abundance and diversity of flora and fauna. The locations of quantitative transect survey depended on the accessibility of the coastlines. Sampling locations for intertidal survey are shown in **Appendix 9.1**. All organisms found in each quadrat were identified and recorded to the lowest possible taxonomic level to calculate density. Sessile species, such as algae (encrusting, foliose and filamentous), barnacles and oysters, in each quadrat were identified to the lowest possible taxonomic level and their abundance was expressed as percentage cover on the rock surface. In addition, should the transect locations prove to be soft shore, all organisms found in the top 50cm × 50cm × 5cm layer (length x width x depth) of the substrate were identified to the lowest possible taxonomic level and recorded. The conservation status (including local, regional and international such as China Red List and IUCN Red List of Threatened Species) of the recorded biota were provided.

Coral Community

9.3.3.12 The shallow subtidal zone at TLT and North Lantau, in particular proposed reclamation footprint at TLT and the vicinity, was checked by reconnaissance dive survey to verify

whether any corals and other marine organisms with conservation importance are present. Sampling locations for the dive survey are shown in **Appendix 9.1** and **Appendix 9.1A**. Rapid Ecological Assessment (REA) was conducted in accordance with EIAO GN No. 11/2010, if corals were found in the reconnaissance survey to record and verify the habitat types and ecological value by Self-Contained Underwater Breathing Apparatus (SCUBA) diving and the application of REA approach. The REA survey aimed at assessing the relative cover of corals, other major benthic groups and taxon abundance, as well as providing an inventory of sessile benthic taxa used to define community types. The length of REA transect was 100m and the range of water depths depended on the result of reconnaissance survey.

Benthic Community

9.3.3.13 Benthic survey was conducted at the sampling locations in the subtidal soft-bottom habitats at TLT and North Lantau within the assessment area (**Appendix 9.1**). At each sampling location, three grab samples were collected. Benthic sediments were sampled using a grab sampler to collect representative amount of sediments. Sediments from the grab samples were sieved on board of the survey vessel, washed onto a sieve stack and gently rinsed with seawater to remove all fine material, in order to collect macrobenthos (>0.5mm). Following rinsing any materials remaining on the sieve, they were combined and carefully rinsed using a minimal volume of seawater into pre-labelled thick triple-bagged Ziploc plastic bags. A 5% solution of formalin containing Rose Bengal in seawater was then added to the bag to ensure tissue preservation. Care was taken to ensure the concentration of solution was not adversely diluted through rinsing into the bags. Samples were sealed in plastic containers for transfer to the laboratory for sorting and identification. Taxonomic identifications were performed using stereo dissecting and high-power compound microscopes. Taxa were identified to the lowest practicable level. The careful sampling procedure was employed to minimize fragmentation of organisms. If breakage of soft-bodied organisms occurred, only anterior portions of fragments were counted, although all fragments were retained and weighed for biomass determinations (wet weight).

9.4 Ecological Baseline Conditions

9.4.1 Habitat

9.4.1.1 Twelve types of habitats were identified within the assessment area, namely agricultural land, artificial backshore, channel, developed area, fung shui woodland, intertidal habitat (seawall and natural coastline), mixed woodland, plantation, reservoir, sea, shrubland/grassland and watercourse. A habitat map based on recent aerial photographs and detailed ground-truthing is given in **Figure 9.4**. Photos of each habitat within the assessment area are enclosed in **Appendix 9.2**.

9.4.1.2 The size and length of habitats within the assessment area, where applicable, and that within the Project footprint are tabulated in **Table 9.5**. Description of all types of habitats within the assessment area is given in **Section 9.4.1.3** to **Section 9.4.1.20**.

Table 9.5 Approximate Size and/or Length of Habitats within the Assessment Area

Habitat	Approximate size/length of habitats (ha)/(m)						
	Alignment			Haul road	Temporary works areas, magazine sites, barging points and marine works area	5m perimeter works area for at-grade roads, viaduct, tunnel portals and slope works	Within the assessment area
	Underground section	Above sea section	Aboveground sections				
	Tunnel	Bridge and reclamation site	At-grade roads, slope works, viaduct, tunnel portals and administration & ventilation buildings				
Agricultural land	/	/	/	/	/	/	10.18ha
Backshore	/	/	0.16ha	/	0.01ha	0.07ha	2.48ha
Channel	203m	/	257m	/	/	64m	14,470m
Developed area	0.12ha	/	24.60ha	0.14ha	11.35ha	5.36ha	496.21ha
Fung shui woodland	/	/	0.25ha	/	/	0.08ha	3.38ha
Intertidal habitat (Natural coastline)	/	91m	/	/	/	/	4,840m
Intertidal habitat (Seawall)	/	122m	/	/	/	/	4,254m
Mixed woodland	5.86ha	/	17.54ha	2.42ha	0.98ha	3.14ha	389.58ha
Plantation	1.73ha	/	13.93ha	1.00ha	2.35ha	2.53ha	138.76ha
Reservoir	/	/	/	/	/	/	10.86ha
Sea	/	8.83ha	/	/	13.25ha	/	300.60ha
Shrubland/ Grassland	32.35ha	/	16.46ha	0.31ha	3.97ha	1.45ha	874.42ha
Watercourse	1,288m	/	357m	11m	/	125m	35,668m
Total area (ha) (excluding channel and watercourses)	40.06ha	8.83ha	72.94ha	3.87ha	31.91ha	9.53ha	2,226.47ha

Notes
- "/" is used where no habitat falls within the aboveground works areas of the Project.

Agricultural Land

9.4.1.3 Agricultural land patches were found near Fu Tei Ha Tsuen and SKW San Tsuen. Cultivated by villagers nearby, wide areas of cultivated food crop (e.g. *Lycopersicon esculentum* and *Vigna unguiculata* subsp. *sesquipedalis*) and fruit tree species (e.g. *Artocarpus heterophyllus* and *Carica papaya*) were observed.

Backshore

9.4.1.4 Backshore refers to the inland area behind the intertidal zone that is not influenced by tidal movement. A stripe of backshore was found along the coast at TLT formed by remnant of backshore and man-made slopes beneath the upgraded Castle Peak Road. Backshore area along TLT is exposed to different levels of human modification, mainly contributed by the construction of the Castle Peak Road – TLT section. For example, part of the backshore area outside Ka Loon Tsuen are exposed to relatively less human disturbance and modification, when compared to the backshore area on both sides of TLT Ferry Pier that are under relatively a higher level of human modification with paved road. Backshore area located in the vicinity of the reclamation site of TLB was found highly modified with paths, roads, man-made slopes with backshore planting and residential structures. TLB will overpass the backshore in TLT and a small portion of the backshore will overlap with the reclamation extent.

Channel

9.4.1.5 Channels within the assessment area include drainage channels near villages and WSD's catchwater channels. Receiving rainwater from the hills and channelized to facilitate the discharge of stormwater and alleviate flooding issue, the narrow width, coupled with concrete bed and straightened banks, unfavour flora and fauna from colonizing and utilizing respectively. Viaducts will overpass channels in SKW, Siu Lam (SL), Tai Lam (TL) and NL areas.

9.4.1.6 3 catchwater tunnels serving as bat roosting grounds and managed by WSD, as described in **Section 9.2.3.6** to **Section 9.2.3.15**, i.e. TLC Catchwater Tunnel Nos. 5, 6 and 8, were identified in SKW and TLC areas.

Developed Area

9.4.1.7 Developed area includes expressways, private residential estates, roads and public facilities. They were intensively and incessantly disturbed. Generally concrete-paved, landscaping and ornamental species were prevalently grown, and weedy herbs prospered in limited growing space. Developed area is found within the boundaries of most major works elements.

Fung Shui Woodland

9.4.1.8 **LUFSW** – Only the western edge of LUFSW falls within the assessment area (**Figure 9.4**). The western edge of LUFSW was of more disturbed nature compared to the entire LUFSW and was lined with native tree species, such as *Microcos nervosa*.

9.4.1.9 **THTFSW** – A FSW stand with closed canopy and conspicuous layer stratification was present at the immediate east of THT in SKW Tsuen Road (**Figure 9.4**). It was largely dominated by *Ixonanthes reticulata* reaching as tall as 20 metres and other common native tree species in Hong Kong, while the understorey was densely recruited with native tree, shrub and climber species also commonly found in other lowland woodlands in Hong Kong, including the mixed woodlands within the assessment area.

9.4.1.10 **CUTFSW** – The viaduct connecting LTT and SKWLR will overpass part of the eastern patch of CUTFSW (**Figure 9.4**) with headroom clearance. Notably, the canopy of the CUTFSW was dominated by *I. reticulata* and other lowland secondary woodland dominants, such as *Aporusa dioica*. Shade-tolerant *Psychotria asiatica* was abundantly found in the understorey. Fruit tree species, such as *Artocarpus heterophyllus* and *Litchi chinensis*, were also abundantly found. Most of the plant species recorded within CUTFSW could also be found in other mixed woodlands within the assessment area.

Intertidal Habitat

9.4.1.11 Two types of intertidal habitats occur within the assessment area, namely natural coastline and seawall (**Figure 9.4**). Natural coastline refers to intertidal zone that has not been subject to artificial modification and has remained in its natural state, which can be identified as rocky shore and sandy shore based on the composition of sediments. Natural coastline was mainly identified along part of the coast in North Lantau near the TLB and TLT. Seawall refers to intertidal zone that has been modified from its natural condition and mainly consists of artificial vertical seawall and riprap seawall along the coastline. Examples of vertical seawall can be found at Pillar Point and To Kau Wan, where riprap seawall can be found at SL and Sunny Bay. The reclamation site at TLT for TLB will encroach on a section of artificial seawall and a section of natural coastline along the coastline of TLT. The section of natural coastline within the reclamation site at TLT for TLB is considered at semi-natural condition, as it is highly modified and disturbed. There is a massive man-made building structure present and occupying much of the high shore portion of the original natural coastline, leading to a significant degradation of the natural condition of the coastline. When comparing with other natural coastline within the assessment area, this section is considered semi-natural.

Mixed Woodland

9.4.1.12 Mixed woodland stands scattered throughout the assessment area (**Figure 9.4**). Compared to plantation, the mixed woodland was dominated by native tree species and interspersed with exotic tree species. The dominant flora is typical of lowland secondary forests in Hong Kong (e.g. *Aporusa dioica*, *Garcinia oblongifolia*, *Macaranga tanarius* var. *tomentosa*, *Schefflera heptaphylla*, *Schima superba* and *Sterculia lanceolata*). Where the canopy was dense enough, the understorey was dominated by shade-tolerant native shrub species (e.g. *Psychotria asiatica*) and saplings of native tree species found at the canopy level. A closed canopy was not contiguously observed and where light gaps were available, light-demanding shrub species (e.g. *Eurya* nitida and *Litsea rotundifolia* var. *oblongifolia*) and climber species (e.g. *Desmos chinensis*) were readily observed. On the other hand, due to the close proximity to existing villages, self-regenerated fruit tree species, such as *Dimocarpus longan* and *Litchi chinensis*, were also commonly encountered.

Plantation

9.4.1.13 Plantations stands were established on engineered slopes or hillslopes maintained by different government departments for landscaping screening and soil erosion prevention purposes (**Figure 9.4**). Monodominant stands of fast-growing exotic tree species, like *Acacia confusa*, *Casuarina equisetifolia* and *Pinus elliottii*, were established. Besides, the available growing space beneath the exotic trees were colonized by naturally recruited native tree, shrub, climber and herb species dispersed from nearby habitats. In TLCP, plantation dominated by *Acacia confusa* was found near LT Quarry and along Tuen Mun Road, while those in SKW area (including Pak Shek Hang) were stands composed of *Casuarina equisetifolia*, *Eucalyptus* spp., *Lophostemon confertus* and *Pinus elliottii*.

Reservoir

9.4.1.14 Reservoirs within the assessment area include LT Irrigation Reservoir, Hung Shui Hang (HSH) Irrigation Reservoir and TLC Reservoir (**Figure 9.4**), which are all situated within TLCP. They are man-made waterbodies and mainly serve the purpose of storage of rainfall. Water level was maintained and droughting did not occur during the survey period.

9.4.1.15 The reservoirs adjoined the mixed woodland and shrubland/grassland nearby. The periphery of these reservoirs was bounded by rows of *Melaleuca cajuputi* subsp. *cumingiana*, underneath which patches of *Nepenthes mirabilis* could be observed. They may have native freshwater fish species discharged from nearby natural watercourses and released exotic freshwater fish species.

Sea

9.4.1.16 Sea includes marine waters between TLT and NL, offshore to SKW and Pillar Point (**Figure 9.4**). Being part of the NL waters, these marine waters are influenced by estuarine waters. The reclamation footprint for constructing the footing of TLB is situated in TLT.

Shrubland/Grassland

9.4.1.17 Shrubland/grassland was prominent in the exposed hillside (**Figure 9.4**) and was dominated by native shrub and herb species, particularly *Baeckea frutescens*, *Dicranopteris pedata*, *Rhodomyrtus tomentosa*. Scarce self-sown exotic trees, especially *Acacia confusa*, were also observed. *B. frutescens* and *D. pedata*, in particular, formed dense thickets.

Watercourse

9.4.1.18 Watercourses include those with natural bed and substrate. The upper sections, mostly within TLCP, were largely unmodified and scattered with boulders, discharging clear water flow to the lower or lowland sections subject to more frequent sewage discharge by villagers and more intensive pollution. In general, the watercourses were lined with riparian vegetation/woodland which, at most, formed a semi-closed canopy. In most cases, the entire length of the watercourses was exposed to sunlight, except in their lowest reaches near villages.

9.4.1.19 A perennial semi-natural watercourse outside TLCP, namely W4 (**Figures 9.4B** and **9.4D**), was dominated by large boulders, was situated in the vicinity of existing villages in SKW and falls within the at-grade section and slope works extent in SKW. In general, the watercourse was shaded by a semi-closed canopy dominated by trees, such as *Ficus hispida* and *Syzygium jambos*. It was connected to its upstream sections in TLCP. The water was generally clear with good quality. The substrate of the watercourse was large boulders.

9.4.1.20 Watercourses W22, W23 and W24, all outside TLCP (**Figures 9.4B** and **9.4D**) and of natural origin, fall within the aboveground works areas in SL and SKW. While the quality of water is good, these watercourses are generally of shallow water depth (**Appendix 9.2**) in the absence of spates, and their widths were also narrow.

9.4.1.21 Besides watercourse, a narrow open ditch without observable origin, was found falling within the at-grade section and slope works extent in SKW area outside TLCP (**Figures 9.4B** and **9.4D**). This ditch ran alongside a few village houses and might be formed by previous village house earthwork. An outlet was found next to the ditch and sewage effluent was discharged directly to the ditch, where water was turbid and the quality of water was poor. The margins of the ditch, especially along its downstream section, were heavily colonized by weedy species, such as *Alocasia macrorrhizos* and *Persicaria chinensis* and some cultivated species (e.g. *Manihot esculenta*).

9.4.2 Vegetation

9.4.2.1 A total of 520 plant species were recorded within the assessment area, among which 334, 166 and 20 are known to be native, exotic and of unknown origin to Hong Kong respectively (**Appendix 9.4**). Among the plant species recorded within the assessment

area, 218 of them could be found within the aboveground works areas of the Project. 21 plant species of conservation importance were recorded within the assessment area and 5 of them could be found within the aboveground works areas of the Project. Locations of the species of conservation importance are shown in **Figure 9.4** to **Figure 9.5**, where appropriate. Photos of selected plant species of conservation importance are enclosed in **Appendix 9.3**. Plant species and their relative abundance within each habitat are listed in **Appendix 9.4**. The following sections discuss the 5 flora species of conservation importance, which fall within the aboveground works areas to be directly impacted and outside TLCP.

9.4.2.2 8 likely cultivated saplings of *Aquilaria sinensis* ranging from 1 to 2m were recorded in a plantation north of Tuen Mun Road, which is within slope works extent in SKW (**Figures 9.4B** and **9.4D**). *A. sinensis* is common in the lowland forests and fung shui woods of Hong Kong (Corlett *et al*. 2000) and was included in the book "Rare and Precious Plants of Hong Kong" (Hu *et al.* 2003). In South China, particularly Hong Kong, it is threatened by illegal felling and over-exploitation and is listed in Appendix II of CITES (CITES 2023) and is protected under the Protection of Endangered Species of Animals and Plants Ordinance (Cap. 586) in Hong Kong. Moreover, it is included in China Plant Red Data Book (Fu and Chin 1992) and Illustration of Rare & Endangered plant in Guangdong Province (Wu and Hu 1988), and wild individuals are listed in Category II of the List of Wild Plants under the State Priority Protection (National Forestry and Grassland Administration and the Ministry of Agricultural and Rural Affairs 2021). It is also categorized as vulnerable in China Red Data Book – Rare and Endangered Plants (Fu and Chin 1992), the Threatened Species List of China's Higher Plants (Qin *et al*. 2017) and the IUCN Red List of Threatened Species (IUCN 2023).

9.4.2.3 Tens of *Diospyros vaccinoides* were recorded within the aboveground works areas to be directly impacted (**Figures 9.4B, 9.4D, 9.4E 9.4F, 9.4G, 9.4H** and **9.4I**). *D. vaccinioides* is a native shrub species that is very common in the shrublands of Hong Kong (Corlett et al. 2000). Globally, it is heavily exploited for ornamental uses, especially in Taiwan, and was categorized as critically endangered in the IUCN Red List of Threatened Species (IUCN 2023). However, it is not known to be significantly exposed to any conservation threat in Hong Kong.

9.4.2.4 Patches of *Gnetum luofuense* were recorded within the aboveground works areas in SKW, SL and TLT. *G. luofuense* is a native climber species which is very common in the forests and shrublands of Hong Kong (Corlett *et al*. 2000). Despite being considered near threatened in the IUCN Red List of Threatened Species (IUCN 2023), it is not known to be significantly exposed to any conservation threat in Hong Kong.

9.4.2.5 63 individuals of *Ixonanthes reticulata*, being a common native tree species in forests in Hong Kong (Corlett *et al*. 2000), was recorded in the eastern patch of CUTFSW as well as the mixed woodland in the area (**Figure 9.5**). *I. reticulata* was assessed as a vulnerable species in the China Red Data Book (Fu and Chin 1992), IUCN Red List of Threatened Species (IUCN 2023), "Rare and Precious Plants of Hong Kong" (Hu *et al*. 2003) and Threatened Species List of China's Higher Plants (Qin *et al*. 2017). Globally, this species had suffered from habitat loss and destruction in massive scale (IUCN 2023) but is not known to be exposed to any significant conservation threat in Hong Kong.

9.4.2.6 *Nepenthes mirabilis* was recorded in aboveground works areas in TLT and at the road verge of NL Highway, which is beneath the viaduct section in NL (**Figure 9.4G**). *N. mirabilis* is listed in Appendix II of CITES and is protected under the Forestry Regulations, the subsidiary legislation of the Forests and Countryside Ordinance (Cap. 96) and Protection of Endangered Species of Animals and Plants Ordinance (Cap. 586).

In addition, *N. mirabilis* was assessed as a vulnerable species in "Rare and Precious Plants of Hong Kong" (Hu et al. 2003).

9.4.3 Mammal

9.4.3.1 22 mammal species were recorded within the assessment area, 18 of which are considered of conservation importance (**Appendix 9.5** and **Appendix 9.6**). Locations of these species are shown in **Figures 9.4A** to **9.4I**. Photos of selected mammal species of conservation importance are enclosed in **Appendix 9.3**. The abundance of each mammal species recorded in each habitat within the assessment area is summed throughout the ecological survey period and tabulated in **Appendix 9.5**. Bat roost, acoustics and emergence survey results are described in detail as follows and tabulated in **Appendix 9.6**.

9.4.3.2 2 mammal species of conservation importance were recorded within the Project footprint, namely Leopard Cat and Red Muntjac (**Figure 9.4G**, **Figure 9.4H** and **Appendix 9.5**). Individuals of Leopard Cat were recorded in plantation southwest of Hong Kong Garden in TLT (**Figure 9.4G**), which is within the extent of at-grade alignment and slope works in TLT, whereas Red Muntjac was aurally recorded in shrubland/grassland falling within the administration building and slope works extent in NKL (**Figure 9.4H**).

Tai Lam Chung Catchwater Tunnel No. 6

9.4.3.3 Combining the results of bat roost, acoustics and emergence surveys conducted in non-overwintering season, overwintering season and breeding season, a total of 6 cave-dwelling bat species were recorded inside or in the vicinity of TLC Catchwater Tunnel No. 6 (**Appendix 9.6**). While the overall number of bats only reached double figures in non-overwintering season and breeding season (**Appendix 9.6**), no breeding/maternity behaviour was exhibited by the observed bat species and only 4 overwintering bats were observed therein during the overwintering bat survey.

Tai Lam Chung Catchwater Tunnel No. 8

9.4.3.4 Combining the results of bat roost, acoustics and emergence survey conducted in non-overwintering season, overwintering season and breeding season, a total of 4 cave-dwelling bat species were recorded inside or in the vicinity of TLC Catchwater Tunnel No. 8 throughout the survey period (**Appendix 9.6**). A population of Leschenault's Rousette (approximately 350-500 individuals) was observed therein during both overwintering and breeding seasons (**Appendix 9.6**). Around 200 juveniles of Leschenault's Rousette were observed during the breeding season (**Appendix 9.6**). No breeding/maternity behaviour was observed therein. Near the eastern portal of TLC Catchwater Tunnel No. 8, which falls outside the assessment area, two additional bat species were recorded by bat detector on 19 January 2023, namely Lesser Bamboo Bat and an unidentified bat species. They flew outside TLC Catchwater Tunnel No. 8, produced echolocation calls for foraging purpose and were unlikely to be associated with TLC Catchwater Tunnel No. 8.

Tai Lam Chung Catchwater Tunnel No. 5

9.4.3.5 Though not known as a roosting ground of bats from the reviewed literature, roosting bats were recorded from acoustics and emergence surveys for TLC Catchwater Tunnel No. 5. Combining the results of bat acoustics and emergence survey, 3 bat species, namely Chinese Horseshoe Bat, Intermediate Horseshoe Bat and Least Horseshoe Bat, were the only bat species noted emerging from TLC Catchwater Tunnel No. 5 and detected acoustically on the survey dates (**Appendix 9.6)**.

9.4.4 Avifauna

9.4.4.1 74 bird species were recorded within the assessment area, 24 of which are of conservation importance. Among the 74 species recorded, 33 of them were recorded within the Project footprint, 10 of which are of conservation importance. Photos of selected bird species of conservation importance are enclosed in **Appendix 9.3**. Most of the recorded bird species are common and widespread in Hong Kong (**Appendix 9.7**). No breeding record, nesting or roosting location or behaviour was exhibited by the observed bird species. All wild birds are protected under WAPO (Cap. 170). Locations of these species are shown in **Figure 9.4A** to **Figure 9.4I**. The abundance of each avifauna species recorded in each habitat within the assessment area is summed throughout the ecological survey period and tabulated in **Appendix 9.7**.

9.4.5 Ardeid Flight-line

9.4.5.1 MW Egretry, Day Roost and Night Roost was active in 2022 and six major flight-lines were identified and are illustrated in **Figure 9.6**. The respective usage of each major flight path is tabulated in **Table 9.6**.

9.4.5.2 A total of 206 flight-lines were recorded and seven ardeid species, namely Little Egret, Great Egret, Eastern Cattle Egret, Intermediate Egret, Black-crowned Night Heron, Grey Heron and Chinese Pond Heron, were recorded. The majority of the flight-lines (around 80.5%) adopted a southern-southwest direction towards intertidal or marine habitats in NL or a short-distance flight to forage at MWFCZ (i.e. major flight path nos. 1 and 6 respectively). There were also fewer ardeids flying towards the middle of TLT and Sham Tseng, woodland to the northeast of MW Egretry, Day Roost and Night Roost, and urban areas in MW respectively (i.e. major flight path nos. 2, 3 and 4 respectively). Only a small portion (around 4.5%) of the flight-lines, adopted a western-southwest direction towards the mainline alignment of the Project (i.e. TLB) across the sea (i.e. major flight path no. 5).

9.4.5.3 The majority of the flight-lines recorded (over 91%) were estimated to be flying at or below 15m above ground. The majority of the height of flight-lines is within 5-10m, accounting for 61.3% of the total number of flight-lines. The percentage of flight lines at different heights is listed in **Table 9.6**.

Table 9.6 Major Flight Paths Adopted by the Observed Ardeids at or near Ma Wan Egretry, Day Roost and Night Roost

Major flight paths	Approximate height class (m)	Ardeid species involved	No. of ardeids utilizing	Percentage of flightlines (%)
1	1-5	Black-crowned Night Heron, Little Egret and Great Egret	23	41.1
	6-10	Black-crowned Night Heron, Chinese Pond Heron, Eastern Cattle Egret, Great Egret and Little Egret	35	
	11-15	Black-crowned Night Heron, Great Egret, Little Egret and Grey Heron	76	
	16-20	Great Egret and Little Egret	10	
	21-25	Black-crowned Night Heron, Great Egret and Little Egret	29	
2	0-5	Black-crowned Night Heron	1	7.2
	6-10	Great Egret and Little Egret	2	
	11-15	Little Egret	3	
	16-20	Black-crowned Night Heron, Chinese Pond Heron, Little Egret and Great Egret	21	

Major flight paths	Approximate height class (m)	Ardeid species involved	No. of ardeids utilizing	Percentage of flightlines (%)
	21-25	Great Egret and Little Egret	3	
	26-30	Great Egret and Little Egret	5	
3	≥30	Black-crowned Night Heron, Great Egret and Little Egret	30	6.2
4	6-10	Black-crowned Night Heron	1	1.6
	16-20	Black-crowned Night Heron	1	
	≥30	Black-crowned Night Heron and Little Egret	6	
5	1-5	Chinese Pond Heron	2	4.5
	6-10	Great Egret and Little Egret	2	
	11-15	Black-crowned Night Heron, Chinese Pond Heron and Little Egret	3	
	16-20	Little Egret	9	
	21-25	Chinese Pond Heron and Little Egret	2	
	≥30	Little Egret	4	
6	1-5	Black-crowned Night Heron, Chinese Pond Heron, Great Egret, Intermediate Egret and Little Egret	106	39.4
	6-10	Black-crowned Night Heron, Chinese Pond Heron, Grey Heron and Little Egret	79	
	11-15	Chinese Pond Heron, Great Egret and Little Egret	5	
Total			484	100

9.4.5.4 The abandoned egretries in SPT and TKW were not found active during the survey period.

9.4.6 Herpetofauna

9.4.6.1 40 herpetofauna species were recorded within the assessment area, 12 of which are of conservation importance (**Table 9.23** and **Appendix 9.8**). Among the recorded species, 9 herpetofauna species were found within the Project footprint, 3 of which are of conservation importance. Locations of the herpetofauna fauna species of conservation importance recorded during the ecological surveys are shown in **Figure 9.4A** to **Figure 9.4I**. Photos of selected herpetofauna species of conservation importance are enclosed in **Appendix 9.3**. The abundance of each herpetofauna species recorded in each habitat within the assessment area is summed throughout the ecological survey period and tabulated in **Appendix 9.8**.

9.4.7 Butterfly

9.4.7.1 85 butterfly species were recorded within the assessment area in total, 7 of which are considered of conservation importance (**Table 9.23** and **Appendix 9.9**). 11 butterfly species were found within the Project footprint, encompassing 1 of conservation importance. Locations of the butterfly species of conservation importance recorded during the ecological surveys are shown in **Figure 9.4A** to **Figure 9.4I**. Photos of selected butterfly species of conservation importance are enclosed in **Appendix 9.3**. The abundance of each butterfly species recorded in each habitat within the assessment area is summed throughout the ecological survey period and tabulated in **Appendix 9.9**.

9.4.7.2 Population of overwintering danaid was neither noted from SLS Butterfly Habitat nor SLS SSSI on the dates of survey.

9.4.8 Odonate

9.4.8.1 42 odonate species were recorded within the assessment area in total, comprising 10 odonate species of conservation importance (**Table 9.23** and **Appendix 9.10**). 7 odonate species could be found within the Project footprint, encompassing 3 of conservation importance. Most of the recorded odonate species are common/abundant and widespread in Hong Kong. The locations of these species of conservation importance are shown in **Figure 9.4A** to **Figure 9.4I**. Photos of selected odonate species of conservation importance are enclosed in **Appendix 9.2**. The abundance of each odonate species recorded in each habitat within the assessment area is summed throughout the ecological survey period and tabulated in **Appendix 9.10**.

9.4.9 Freshwater Community

9.4.9.1 22 freshwater fauna species were recorded within the assessment area, 4 of which are of conservation importance (**Table 9.23** and **Appendix 9.11**). The locations of these freshwater fauna species of conservation importance are shown in **Figure 9.4A** to **Figure 9.4H**. Photos of selected freshwater fauna species of conservation importance are enclosed in **Appendix 9.3**. The relative abundance of each freshwater fauna species recorded in channels or watercourses within the assessment area throughout the ecological survey period is tabulated in **Appendix 9.10**.

9.4.9.2 Out of the 22 freshwater fauna species recorded within the assessment area, 5 of them could be found in the sections of channels or watercourses falling within the Project footprint (**Appendix 9.11**). They are mostly common and widespread in Hong Kong and none of them is considered of conservation importance.

9.4.10 Intertidal Community

9.4.10.1 67 intertidal species were recorded in all the sampling locations during the qualitative survey throughout the survey period (**Appendix 9.12**). *Reishia clavigera* and *Saccostrea cucullata* were the dominant species recorded in NKL, while *Ligia exotica* and *Patelloida saccharina* were the dominant species recorded in TLT. All species recorded are considered common and widespread as in other intertidal shores in Hong Kong. No species of conservation importance was recorded. The results of this qualitative survey showed that the shorelines along the survey locations mainly comprised artificial seawall and rocky shore.

9.4.10.2 A transect was deployed at each location in NKL and TLT. The transects covered high-shore, mid-shore and low-shore. Dominant species among the transects were found to be quite similar to the qualitative survey described above except for the mobile species.

9.4.10.3 52 intertidal species were recorded during the quantitative survey throughout the survey period (**Appendix 9.13**). Dominant species found were typical species in that particular site as described in the qualitative survey.

9.4.10.4 **Table 9.7** shows the number of species (S), density (D, i.e. individual/m^2), evenness (J) and Shannon Diversity (H') of intertidal organisms recorded in the survey locations (results of both qualitative and quantitative surveys are presented). The number of species and Shannon Diversity are higher in NKL among the two sampling locations.

Table 9.7 Number of Species (S), Density (D, i.e. individual/m^2), Evenness (J) and Shannon Diversity (H') of Intertidal Organisms Recorded from Qualitative and Quantitative Surveys at the Survey Locations within the Assessment Areas

Sampling Location/Parameter	Qualitative Survey		Quantitative Survey							
	S		S		D		J		H'	
	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry
Ng Kwu Leng	49	48	34	39	151	155	0.17	0.21	0.74	0.91
Tsing Lung Tau	36	46	17	29	68	103	0.18	0.33	0.75	1.43

9.4.11 Benthic Community

9.4.11.1 Subtidal benthic surveys at 6 sampling locations, including 3 sampling locations at each of NKL and TLT, showed that 105 and 146 individuals of organisms, in 8 and 8 phyla, 39 and 50 families, and 42 and 57 species respectively, from 18 grab samples during wet and dry seasons (**Table 9.8**). Full lists of benthic data for abundance and biomass are shown in **Appendix 9.14**. All of the species recorded are common and widespread in Hong Kong except amphioxus *Branchiostoma belcheri*, which is a species of conservation importance, recorded in sampling locations Tsing Lung Tau-Middle (TLT-M) which is located within the reclamation site in TLT and Tsing Lung Tau-Right (TLT-R), which are over 250m away from the Project footprint (**Appendix 9.1 and 9.1A**).

9.4.11.2 Amphioxus is of conservation importance because of its primitive morphology and of its over-exploitation as a fishery resource in coastal waters of the South China Sea, especially near Xiamen (Lu *et al*. 1998). Amphioxus is classified as a Class II protected species in China (Huang 2006).

9.4.11.3 There was one individual of amphioxus recorded in sampling location TLT-M during the dry season only. Also, there was one individual of amphioxus recorded in sampling location TLT-R during the dry season only. The density at both sampling locations is 1 individual/m^2, which is considered very low compared to some specific locations in Tai Long Wan and Pak Lap Wan, with a maximum of 460 and 290 individuals/m2, respectively (Chen 2007).

9.4.11.4 Amphioxus is not likely to occur within or in the vicinity of the Project footprint as the substrates within the Project footprint were mainly composed of boulders and gravel embedded in sediments. It is not a typical habitat for amphioxus, which is usually found on sandy seabed. While amphioxus was recorded in dry season in sampling locations TLT-M and TLT-R respectively, but none was found in the 9 grab samples of the sampling location within the assessment area during the entire wet season.

9.4.11.5 In terms of infaunal abundance in NKL, the majority of the organisms recorded in the subtidal soft bottom habitat were from the phylum annelida in wet (~59.6%) and in dry (~58%) seasons (**Table 9.8**). Annelida *Aglaophamus dibranchis* and Annelida *Notomastus latericens* were the dominant species recorded in the wet season, while Arthropoda *Alpheus* sp. and Annelida *Aglaophamus dibranchis* were the dominant species recorded in the dry season.

9.4.11.6 In terms of infaunal abundance in TLT, the majority of the organisms recorded in the subtidal soft bottom habitat were from the phylum annelida in wet (~46.7%) and in dry (~47.4%) seasons (**Table 9.9**. Annelida *Eunice indica* and Echinodermata *Amphioplus laevis* were the dominant species recorded in the wet season, while Annelida *Eunice indica* and Echinodermata *Amphioplus laevis* were the dominant species recorded in the dry season.

9.4.11.7 In terms of infaunal biomass in NKL, organisms from the phylum Arthropoda contributed to about 83.5% in dry season, and about 51.2% of the total biomass in wet season (**Table 9.8**).

9.4.11.8 In terms of infaunal biomass in TLT, organisms from the phylum Mollusca contributed to about 48.7% in dry season, and Annelida contributed to about 41% of the total biomass in wet season (**Table 9.9**).

9.4.11.9 Benthic Shannon Diversity Index (H') ranged from 1.02 to 1.34 during wet season and from 1.18 to 1.45 during dry season (**Table 9.10**). Pielou's Evenness Index (*J*) was relatively low for all sampling locations for both seasons, which means the organisms were not evenly distributed.

Table 9.8 Benthic Fauna Composition in Ng Kwu Leng Grab Samples

Phylum	No. of families		No. of species		No. of individuals		Percentage of abundance (%)		Biomass (g)		Percentage of biomass (%)	
	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry
Annelida	10	17	10	19	28	29	59.6	58	0.59	0.49	10.8	11.4
Arthropoda	4	8	4	8	8	15	17	30	2.8	3.59	51.2	83.5
Echinodermata	1	1	1	1	1	1	2.1	2	0.4	0.1	7.3	2.3
Mollusca	4	1	4	1	4	1	8.5	2	0.95	0.09	17.4	2.1
Nemertinea	1	1	1	1	3	3	6.4	6	0.68	0.02	12.4	0.5
Sipuncula	1	1	1	1	3	1	6.4	2	0.05	0.01	0.9	0.2
Total	21	29	21	31	47	50	100	100	5.47	4.3	100	100

Table 9.9 Benthic Fauna Composition in Tsing Lung Tau grab samples

Phylum	No. of families		No. of species		No. of individuals		% of abundance		Biomass (g)		% of biomass	
	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry
Annelida	10	15	11	18	27	46	47.4	47.9	5.71	1.68	41.1	17
Arthropoda	9	9	9	10	17	23	29.8	24	3.49	2.67	25.1	27.1
Echinodermata	1	1	1	1	1	1	1.8	1	0.01	0.01	0.1	0.1
Mollusca	2	3	2	3	2	4	3.5	4.2	0.21	0.04	1.5	0.4
Nemertinea	1	3	1	3	5	10	8.8	10.4	3.22	0.66	23.2	6.7
Sipuncula	3	6	4	8	5	12	8.8	12.5	1.26	4.81	9.1	48.7
Total	26	27	28	43	57	96	100	100	13.9	9.87	100	100

Table 9.10 Summary Information from Subtidal Benthic Survey in Dry and Wet Seasons (replicates of sub-locations are pooled together)

Location	No. of species		Abundance		Wet weight (g)		Evenness		Shannon diversity	
	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry
NKL	21	31	47	50	1.82	1.43	0.24	0.28	1.02	1.18
TLT	29	43	58	96	4.6	3.28	0.32	0.34	1.34	1.45

9.4.12 Coral Community

9.4.12.1 Dive survey was conducted along the coastline of NKL and the coastline at the reclamation site in TLT respectively, by SCUBA diving for any presence of coral communities and associated marine fauna. The sampling location is shown in **Appendix 9.1** and **9.1A**.

Ng Kwu Leng

9.4.12.2 Two hard coral species, namely *Oulastrea crispata* and ahermatypic cup coral *Balanophyllia* sp., were recorded scattered on the natural boulders and bed rocks on the seabed (**Appendix 9.14**). All recorded hard coral species are dominant and commonly found in the Hong Kong waters, where the coverage of hard coral communities was less than 1%. One gorgonian species, *Guaiagorgia* sp., was recorded within the surveyed area, with a coverage of less than 1%.

9.4.12.3 Most of the subtidal bottom seabed within the surveyed area in NKL were of sandy substrate, with bed rocks, boulders and cobbles. A natural coastline with natural boulders and bedrocks was observed, with a relatively higher coverage of boulders. Low diversity and abundance of subtidal organisms were recorded. With the geographical location of exposure to the fairway, strong current and wave actions were observed.

9.4.12.4 Rapid Ecological Assessment (REA) dive survey was conducted at the locations with presence of hard coral in NKL. The results of REA are shown in **Appendix 9.15**.

Tsing Lung Tau

9.4.12.5 Similar to the dive survey result in NKL, two hard coral species, namely *Oulastrea crispata* and ahermatypic cup coral *Balanophyllia* sp., were recorded scattered on the natural boulders and bed rocks on the seabed (**Appendix 9.14**). All recorded hard coral species are dominant and commonly found in the Hong Kong waters, where the coverage of hard coral communities was less than 1%. One gorgonian species, *Guaiagorgia* sp., was also recorded within the surveyed area, with a coverage of less than 1%.

9.4.12.6 Most of the subtidal bottom seabed within the surveyed area in TLT were scattered with bed rocks, boulders and cobbles. Similar to NKL, the coastline of TLT also exposed to the fairway with strong current and wave actions observed. However, the coastline in TLT is mostly artificial riprap seawall instead of natural coastline. Artificial riprap boulders were the major substrate observed within the surveyed area, with a low diversity and abundance of subtidal organisms recorded.

9.4.12.7 REA dive survey was conducted at the locations with presence of hard coral in TLT. The results of REA are shown in **Appendix 9.15**.

9.4.13 Ecological Evaluation of Habitats and Species

9.4.13.1 The ecological importance of all terrestrial, freshwater and marine habitats within the assessment area was evaluated with reference to the criteria stipulated in Annex 8 of EIAO-TM (**Table 9.11** to **Table 9.22**).

Table 9.11 Evaluation of Agricultural Land within the Assessment Area

Criterion	Description
Naturalness	Man-made
Size	About 10.18ha
Diversity	Low floral and faunal diversity
Rarity	2 fauna species of conservation importance were recorded during the ecological surveys: Greater Coucal and Chinese Bullfrog

Criterion	Description
Re-creatability	Readily re-created
Fragmentation	Disconnected agricultural land occurred as distinct patches
Ecological linkage	No significant ecological linkage with the remaining habitats within the assessment area
Potential value	Low under the current farming practices
Nursery/breeding ground	No significant nursery or breeding ground known or observed
Age	Ecologically non-applicable
Abundance/richness of wildlife	Low faunal abundance
Overall ecological value	Low

Table 9.12 Evaluation of Backshore within the Assessment Area

Criterion	Description
Naturalness	Man-made areas/slopes and remnant of natural backshore habitat
Size	About 2.48ha
Diversity	Low floral and faunal diversity
Rarity	1 fauna species of conservation importance was recorded during the ecological surveys: Little Egret
Re-creatability	Readily re-created for the man-made areas/slopes
Fragmentation	None observed
Ecological linkage	No significant ecological linkage with the remaining terrestrial habitats within the assessment area, and limited linkage with the marine habitats, given its high proportion with man-made and engineering nature, and limited size beneath Castle Peak Road.
Potential value	Low, unless with significant ecoshoreline enhancement
Nursery/breeding ground	No significant nursery or breeding ground known or observed
Age	Ecologically non-applicable
Abundance/richness of wildlife	Low faunal abundance
Overall ecological value	Low

Table 9.13 Evaluation of Channel within the Assessment Area

Criterion	Description	
	Channels other than WSD's Catchwater Tunnels	**WSD's Catchwater Tunnels**
Naturalness	Man-made	
Size	About 14.47km	About 970m

Criterion	Description	
	Channels other than WSD's Catchwater Tunnels	**WSD's Catchwater Tunnels**
Diversity	Low floral and faunal diversity	**All catchwater tunnels without vegetation** **TLC Catchwater Tunnel No. 5**: Low faunal diversity, including cave-dwelling bat species **TLC Catchwater Tunnel No. 6**: Medium to high diversity of cave-dwelling bat species, but low diversity of remaining faunal groups **TLC Catchwater Tunnel No. 8**: Medium to high diversity of cave-dwelling bat species, but low diversity of remaining faunal groups
Rarity	4 flora species of conservation importance was recorded during the ecological surveys: *Arundina graminifolia*, *Ceratopteris thalictroides*, *Gnetum luofuense* and *Nepenthes mirabilis* 19 faunal species of conservation importance were recorded during the ecological surveys: Black-crowned Night Heron, Striated Heron, Chinese Pond Heron, Little Egret, White-throated Kingfisher, Brown Fish Owl, Copperhead Racer, Four-clawed Gecko, Hong Kong Cascade Frog, Chinese Bullfrog, Lesser Spiny Frog, Brown Wood Frog, Romer's Tree Frog, Plain Hedge Blue, Danaid Eggfly, Emerald *Cascader*, *Parazacco spilurus*, *Cryptopotamon anacoluthon* and *Nanhaipotamon hongkongense*	7 faunal species of conservation importance were recorded during the ecological surveys: Himalayan Leaf-nosed Bat, Leschenault's Rousette, Intermediate Horseshoe Bat, Chinese Horseshoe Bat, Unidentified Bent-winged Bat, Rickett's Big-footed Myotis and Chinese Myotis
Re-creatability	Readily re-created	Readily re-created but its suitability as favourable roosting sites for population of bat species (e.g. Leschenault's Rousette) remains uncertain and unpredictable

Criterion	Description	
	Channels other than WSD's Catchwater Tunnels	**WSD's Catchwater Tunnels**
Fragmentation	Characteristically found in the downstream sections of major watercourses to alleviate flooding risk near urban areas	None observed
Ecological linkage	Hydrologically connected to the unmodified upstream and downstream watercourses	Hydrologically connected to the catchwater channels
Potential value	Low given its current engineering design, unless more diverse and natural substrate and banks are used and ecological enhancement features, such as natural substrate and fish ladder, are applied	Low enhancement value for TLC Catchwater Tunnel Nos. 5, 6 and 8, as their length, and the composition and length of different linings therein are expected to remain unchanged
Nursery/breeding ground	None observed	TLC Catchwater Tunnel No. 5: Not known as a recognized nursery/breeding ground of bats TLC Catchwater Tunnel No. 6: No nursery/breeding activity of bat was observed and not known as a recognized nursery/breeding ground of bats TLC Catchwater Tunnel No. 8 • Juveniles and nursery activity of Leschenault's Rousette were observed therein in May 2023 • Juveniles of Himalayan Leaf-nosed Bat and Leschenault's Rousette therein were recorded by AFCD • Not known as a breeding ground of bats
Age	Ecologically non-applicable	
Abundance/richness of wildlife	Low to medium abundance of amphibians and low abundance of the remaining terrestrial fauna groups	Low abundance of bats inside TLC Catchwater Tunnel No. 5 Low to medium abundance of bats inside TLC Catchwater Tunnel No. 6 Medium abundance of bats inside TLC Catchwater Tunnel No. 8

Criterion	Description	
	Channels other than WSD's Catchwater Tunnels	**WSD's Catchwater Tunnels**
Overall ecological value	Low	Low for TLC Catchwater Tunnel No. 5 Low to medium for TLC Catchwater Tunnel No. 6 during breeding and overwintering seasons, as nursery/breeding activity was not observed during breeding season and the number of overwintering bats therein was fewer than 10 in the overwintering surveys performed from 2020 to 2023 Medium to high for TLC Catchwater Tunnel No. 8**,** due to the consistent population of Leschenault's Rousette observed/reported from 2020 to 2023 and its functioning as a nursery ground for Leschenault's Rousette (noted from the bat roost survey conducted in breeding season and from AFCD) and Himalayan Leaf-nosed Bat (noted from AFCD)

Table 9.14 Evaluation of Developed Area within the Assessment Area

Criterion	Description
Naturalness	Man-made and subject to intensive and incessant anthropogenic disturbance
Size	About 496.21ha
Diversity	Medium floral diversity, comprising a high proportion of exotic flora species Low faunal diversity, mainly consisting of disturbance-tolerant and locally widespread fauna species
Rarity	5 floral species of conservation importance were recorded during the ecological surveys: *Cyclobalanopsis edithiae, Diospyros vaccinioides, Nepenthes mirabilis, Pavetta hongkongensis* and *Scirpus ternatus* 20 faunal species of conservation importance were recorded during the ecological surveys: Pallas's Squirrel, Chinese Pipistrelle, Chinese Noctule, Japanese Pipistrelle, Unidentified bat, Black-crowned Night Heron, Little Egret, Black Kite, Eastern Buzzard, Slaty-legged Crake, Greater Coucal, Collared Scops Owl, White-throated Kingfisher, Black-throated Laughingthrush, Four-clawed Gecko, Lesser Spiny Frog, Danaid Eggfly, Small Cabbage White, Scarlet Basker and Dancing Shadow-emerald
Re-creatability	Readily re-created
Fragmentation	Developed area was found in different parts of the assessment area but is usually not functionally linked to adjacent habitats
Ecological linkage	Ecologically non-applicable
Potential value	Very low, given the intensive and incessant anthropogenic disturbance
Nursery/breeding ground	No significant nursery or breeding ground known or observed
Age	Ecologically non-applicable
Abundance/richness of wildlife	Low abundance in general, comprising mainly locally widespread and disturbance-tolerant species
Overall ecological value	Very low

Table 9.15 Evaluation of Fung Shui Woodland within the Assessment Area

Criterion	Description
Naturalness	Semi-natural, mainly comprising fruit tree species likely cultivated by villagers nearby and naturally recruited plant species
Size	About 3.38ha
Diversity	Low to medium floral diversity and low faunal diversity
Rarity	4 floral species of conservation importance were recorded during the ecological surveys: *Aquilaria sinensis, Ixonanthes reticulata, Ormosia emarginata* and *Pavetta hongkongensis* 4 fauna species of conservation importance were recorded during the ecological surveys: Greater Coucal, Metallic Cerulean, Danaid Eggfly and Dingy Dusk-hawker
Re-creatability	While planting is feasible, the in-planted species would take several decades to establish in the absence of both natural and artificial disturbance (e.g. hill fires)
Fragmentation	Fragmented by villages in SKW area
Ecological linkage	Partial resemblance and interchange of certain native flora species with nearby mixed woodland. Non-preferential use of these two habitats by terrestrial fauna (e.g. mammals, butterflies and reptiles) as well.
Potential value	Low to medium, as they have remained largely undisturbed over the last 70 years and the canopy dominants have reached their mature size
Nursery/breeding ground	No significant nursery or breeding ground observed
Age	At least 70 years of age
Abundance/richness of wildlife	Low abundance of different groups of terrestrial fauna
Overall ecological value	Low to medium for the western edge of LUFSW, which is of disturbed nature. Medium to high for THTFSW and both patches of CUTFSW.

Table 9.16 Evaluation of Intertidal Habitat within the Assessment Area

Criterion	Description	
	Natural coastline	**Seawall**
Naturalness	Natural	Man-made
Size	About 4,840m	About 4,254m
Diversity	Low intertidal faunal diversity	
Rarity	1 faunal species of conservation importance was recorded during the ecological surveys: Great Egret	No faunal species of conservation importance was recorded during the ecological surveys:
Re-creatability	Not re-creatable	Readily re-created
Fragmentation	Natural coastline at TLT was fragmented owing to the improvement works of Castle Peak Road No fragmentation of the natural coastline in NL was observed	None observed
Ecological linkage	Ecologically connected to the sea	
Potential value	Low	Low, unless with ecoshoreline enhancement
Nursery/breeding ground	No significant nursery or breeding ground known or observed	

Criterion	Description	
	Natural coastline	Seawall
Age	Ecologically non-applicable	
Abundance/richness of wildlife	Low faunal abundance	
Overall ecological value	Low	Very low

Table 9.17 Evaluation of Mixed Woodland within the Assessment Area

Criterion	Description
Naturalness	More natural for the mixed woodland within TLCP Semi-natural for mixed woodland outside TLCP, comprising naturally recruited native plant species, cultivated and naturally dispersed fruit tree species, and self-sown exotic tree species. Its fringes in LT, SKW, SL, TL and TLT areas have been subject to frequent disturbance, owing to its vicinity of villages.
Size	About 389.58ha
Diversity	Medium floral diversity and low to medium faunal diversity
Rarity	13 floral species of conservation importance were recorded during the ecological surveys: *Ania hongkongensis*, *Aquilaria sinensis*, *Artabotrys hongkongensis*, *Cibotium barometz*, *Cyclobalanopsis chungii*, *Diospyros vaccinioides*, *Geodorum densiflorum*, *Ixonanthes reticulata*, *Malaxis latifolia*, *Gnetum luofuense*, *Ormosia emarginata*, *Ormosia semicastrata* and *Pavetta hongkongensis* 29 fauna species of conservation importance were recorded during the ecological surveys: Himalayan Leaf-nosed Bat, Intermediate Horseshoe Bat, Least Horseshoe Bat, Pallas's Squirrel, Japanese Pipistrelle, Chinese Noctule, Masked Palm Civet, Unidentified bat, Black-crowned Night Heron, Crested Serpent Eagle, Black Kite, Greater Coucal, Collared Scops Owl, Rufous-capped Babbler, Siberian Blue Robin, Black-throated Laughingthrush, Grey Nightjar, Common Rat Snake, Four-clawed Gecko, Indian Forest Skink, Hong Kong Cascade Frog, Chinese Bullfrog, Lesser Spiny Frog, Romer's Tree Frog, Danaid Eggfly, Swallowtail, Emerald Cascader, White-banded Shadowdamsel and Dancing Shadow-emerald
Re-creatability	Re-creatable but need time to mature
Fragmentation	Mixed woodland occurs as separated stands near/in developed areas are subject to fragmentation, while those at hillside valleys have certain connection with adjacent habitats, including those in TLCP
Ecological linkage	Partial resemblance and interchange of certain native flora species with shrubland/grassland. Non-preferential use of these habitats by terrestrial fauna (e.g. mammals, butterflies and reptiles) as well.
Potential value	Low to medium for mixed woodland within and outside TLCP, acknowledging the protection status of those within TLCP but limited by the heavy fragmentation and absence of shade-tolerant tree species indicative of more mature woodlands in Hong Kong
Nursery/breeding ground	No significant nursery or breeding ground known or observed for all mixed woodland within the assessment area
Age	Vary, some may be over 30 years of age
Abundance/richness of wildlife	Low abundance of different groups of terrestrial fauna, possibly because the mixed woodland stands within the assessment area are highly fragmented and its edges in LT, SKW, SL, TL and TLT areas are subject to frequent anthropogenic disturbance, thereby unfavouring terrestrial fauna from inhabiting

Criterion	Description
Overall ecological value	Low to medium on the overall, fragmentation observed for some patches especially those outside TLCP. Potentially be higher for the mixed woodland within TLCP, which has been protected under the Country Parks Ordinance (Cap. 208) since 1979 and under management

Table 9.18 Evaluation of Plantation within the Assessment Area

Criterion	Description
Naturalness	Artificial and relatively disturbed for roadside plantations and those in the vicinity of developed area, including those within TLCP. Exotic trees were planted but native plant species in the understorey were naturally recruited from habitats nearby.
Size	About 138.76ha
Diversity	Medium floral diversity. The canopy and edges were dominated by exotic tree and herb species respectively but diverse naturally recruited native species were frequently encountered in the understorey. Low fauna diversity, as the dominating exotic trees do not offer suitable foraging rewards for local fauna, while naturally recruited native flora offer suitable foraging rewards (e.g. nectar and fruits) for them
Rarity	4 floral species of conservation importance was recorded during the ecological surveys: *Aquilaria sinensis*, *Diospyros vaccinioides*, *Gnetum luofuense* and *Nepenthes mirabilis* 18 faunal species of conservation importance recorded during the ecological surveys: Masked Palm Civet, Unidentified bat, Leopard Cat, Crested Serpent Eagle, Black Kite, Common Emerald Dove, Collared Scops Owl, White-throated Kingfisher, Siberian Blue Robin, Black-throated Laughingthrush, Indochinese Yuhina, Burmese Python, Romer's Tree Frog, Metallic Cerulean, Broad Spark, Swallowtail, Blue Chaser and Emerald Cascader
Re-creatability	Re-creatable
Fragmentation	Fragmented by developed area
Ecological linkage	No significant ecological linkage known or observed, although native plant species were possibly dispersed from nearby habitats, especially mixed woodland
Potential value	Low. Potential may increase if progressive and selective thinning of aging and dying exotic tree species is executed and time is given for the establishment of native tree species.
Nursery/breeding ground	Not known or observed as a significant nursery or breeding ground
Age	Vary, some might be over 30 years of age
Abundance/richness of wildlife	Low abundance in general, complexed by the dominance of exotic flora deterring local fauna from utilization but naturally recruited native flora offer foraging ground for them
Overall ecological value	Low for those outside TLCP. Low to medium for those within TLCP, which has been protected and managed under the Country Parks Ordinance (Cap. 208) since 1979.

Table 9.19 Evaluation of Reservoir within the Assessment Area

Criterion	Description
Naturalness	Man-made
Size	About 10.86ha
Diversity	Low floral and faunal diversity

Criterion	Description
Rarity	1 flora species of conservation importance recorded during the ecological surveys: *Gnetum luofuense* 11 faunal species of conservation importance recorded during the ecological surveys: Black Kite, Collared Scops Owl, White-throated Kingfisher, Chinese Bullfrog, Two-striped Grass Frog, Guangdong Hooktail, Chinese Hooktail, Sapphire Flutterer, Emerald Cascader, *Nanhaipotamon hongkongense* and *Somanniathelphusa zanklon*
Re-creatability	Readily re-created
Fragmentation	Occurred as separate reservoirs
Ecological linkage	Hydrologically connected to the upstream and downstream channels and/or watercourses
Potential value	Low
Nursery/breeding ground	Potentially nursery and breeding ground of amphibians, odonates and freshwater fauna, although no significant breeding behaviour was exhibited by those observed during surveys
Age	Opened in 1957, but ecologically not applicable
Abundance/richness of wildlife	High abundance of amphibians, odonates and freshwater fauna which are common and widespread in Hong Kong
Overall ecological value	Low to medium

Table 9.20 Evaluation of Sea within the Assessment Area

Criterion	Description
Naturalness	Natural
Size	About 300.60ha
Diversity	Low faunal diversity
Rarity	10 faunal species of conservation importance recorded during the ecological surveys: Black-crowned Night Heron, Great Egret, Little Egret, Pacific Reef Heron, Black Kite, White-bellied Sea Eagle, *Branchiostoma belcheri*, *Oulastrea crispata*, *Guaiagornia* sp. and *Balanophyllia* sp.
Re-creatability	Difficult to re-create
Fragmentation	Unfragmented
Ecological linkage	Connected to other marine waters and intertidal habitats
Potential value	Low
Nursery/breeding ground	Potentially nursery and breeding ground of marine fauna, but no significant nursery or breeding ground known or observed
Age	Not ecologically applicable
Abundance/richness of wildlife	Very low faunal abundance observed
Overall ecological value	Low

Table 9.21 Evaluation of Shrubland/Grassland within the Assessment Area

Criterion	Description
Naturalness	A natural habitat commonly found in the hillside of Hong Kong. Formed by natural succession from bare ground, with those outside TLCP and in the vicinity of developed area subject to more frequent disturbance and exhibiting lower naturalness, except those in NL.
Size	About 874.42ha

Criterion	Description
Diversity	Low to medium diversity of flora and butterflies Low diversity of the remaining terrestrial fauna groups
Rarity	7 floral species of conservation importance was recorded during the ecological surveys: *Diospyros vaccinioides, Enkianthus quinqueflorus, Gnetum luofuense, Nepenthes mirabilis, Pavetta hongkongensis, Rhododendron simsii* and *Thysanotus chinensis* 31 faunal species of conservation importance were recorded during the ecological surveys: Red Muntjac, East Asian Porcupine, Japanese Pipistrelle, Short-nosed Fruit Bat, Leschenault's Rousette, Chinese Horseshoe Bat, Masked Palm Civet, Japanese Quail, Black-crowned Night Heron, Black Kite, Eastern Buzzard, Greater Coucal, Lesser Coucal, Collared Scops Owl, Pacific Swift, White-throated Kingfisher, Rufous-capped Babbler, Black-throated Laughingthrush, Mountain Water Snake, Taiwan Kukri Snake, Four-clawed Gecko, Hong Kong Cascade Frog, Chinese Bullfrog, Lesser Spiny Frog, Romer's Tree Frog, Danaid Eggfly, Painted Lady, Swallowtail, South China Grappletail, Emerald Cascader and Dancing Shadow-emerald
Re-creatability	Readily re-created
Fragmentation	Shrubland/grassland in LT, SKW, SL and TL is fragmented by developed area (e.g. villages). Shrubland/grassland in NKL is fragmented by NL Highway.
Ecological linkage	Contiguous shrubland/grassland connected to other habitats within TLCP (e.g. mixed woodland) and potentially providing corridor function among different areas Shrubland/Grassland in NKL is ecologically connected to the coastal woodland in Kwai Shek and SPT Partial resemblance and interchange of certain native flora species with mixed woodland. Non-preferential use of these two habitats by terrestrial fauna (e.g. mammals, butterflies and reptiles) as well.
Potential value	Low for the shrubland/grassland outside TLCP, as its extent has largely remained unchanged and natural succession has been arrested as a result of topographical limitations (e.g. granitic substrate does not favour the colonization and establishment of many native tree species) and lack of seed sources of native tree species. Potentially comparatively higher for those within TLCP, given the protection status and hill fire control may facilitate natural succession
Nursery/breeding ground	No significant nursery or breeding ground known or observed
Age	Extent and condition have largely remained unchanged at least over the last 30 years
Abundance/richness of wildlife	Low abundance in general
Overall ecological value	Low in general. Low to medium for the contiguous shrubland/grassland within TLCP, which has been protected under the Country Parks Ordinance (Cap. 208) since 1979, and also those in NL.

Table 9.22 Evaluation of Watercourse within the Assessment Area

Criterion	Description	
	Within TLCP	Outside TLCP
Naturalness	Mostly natural	More natural upstream connected to modified downstream to alleviate flood flow
Size	About 35.7km	

Criterion	Description	
	Within TLCP	**Outside TLCP**
Diversity	Low floral diversity and low to medium faunal diversity	Low floral and faunal diversity
Rarity	4 floral species of conservation importance: *Arundina graminifolia*, *Begonia hongkongensis*, *Nepenthes mirabilis* and *Selenodesmium siamense* 6 faunal species of conservation importance: Hong Kong Cascade Frog, Lesser Spiny Frog, Brown Wood Frog, Emerald Cascader, *Cryptopotamon anacoluthon* and *Nanhaipotamon hongkongense*	1 floral species of conservation importance: *Nepenthes mirabilis* 4 fauna species of conservation importance: White-throated Kingfisher, Chinese Bullfrog, *Parazacco spilurus* and *Cryptopotamon anacoluthon*
Re-creatability	Natural sections are difficult to re-create, while modified sections can be re-created	
Fragmentation	The lower courses of the watercourses are fragmented by modified section, although the stream flow is still maintained	
Ecological linkage	Mostly connected to the downstream section, channel and reservoir	Mostly connected to the upstream section, channel and reservoir
Potential value	Low to medium, no obvious sign suggesting that a higher diversity of freshwater-associated fauna, including amphibian, odonate and freshwater fauna species, can be supported	Low to medium, as the watercourses outside TLCP are generally modified and more susceptible to sewage and effluent discharge
Nursery/breeding ground	No significant nursery or breeding ground known or observed	
Age	Not ecologically applicable	
Abundance/richness of wildlife	Medium abundance of amphibians and freshwater fauna	
Overall ecological value	Medium	Low to medium in general Low for the ditch within the aboveground works area in SKW

9.4.13.2 With reference to Table 3, Annex 8 of EIAO-TM, the ecological value of species recorded within the assessment area was assessed in terms of protection/conservation status (e.g. fauna protected under WAPO (except birds), and flora and fauna protected under regional/global legislation/conventions), species distribution (e.g. endemic), and rarity (e.g. rare or restricted). Flora and fauna species of conservation importance recorded within the assessment area were evaluated with reference to EIAO-TM.

Table 9.23 Evaluation of Species of Conservation Importance Recorded within the Assessment Area

Species	Location			Rarity and distribution in Hong Kong [1 2 3 4 5 6 7 8 9]	Protection or conservation status [6 7 8 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26]
	Within the Project footprint[27]		Outside the Project footprint but within the assessment area		
	Within the aboveground works areas (i.e. outside TLCP)	Outside the aboveground works areas			
Flora					
Purple Bulb Orchid *Ania hongkongensis*	/	/	Within TLCP 1. Mixed woodland south of the eastern upstream leading to HSH Irrigation Reservoir 2. Mixed woodland near TLC Catchwater Tunnel No. 5 Outside TLCP Mixed woodland west of LT Quarry	Very common. Found in lowland to montane forest.	Cap. 96A Cap. 586 CITES Appendix II
Incense Tree *Aquilaria sinensis*	Outside TLCP Individuals likely cultivated were present in a plantation north of Tuen Mun Road, which is within the slope works extent at the western portal of SKWLR	/	Outside TLCP 1. Mixed woodland south of TLT Catchwater (C6) 2. THTFSW	Common. Found in lowland forest and fung shui woods.	IUCN Red List of Threatened Species (2023): VU Appendix II of CITES Threatened Species List of China's Higher Plants: VU China Plant Red Data Book: VU Included in Illustrations of Rare & Endangered Plant in Guangdong Province Listed in "Rare and Precious Plants of Hong Kong" Cap. 586 State Protection (Category II)
Hong Kong Eagle's Claw *Artabotrys hongkongensis*	/	/	Within TLCP Mixed woodland south of LT Irrigation Reservoir	Restricted. Distributed in lowland forest.	Rare and Precious Plants of Hong Kong
Bamboo Orchid *Arundina graminifolia*	/	/	Within TLCP 1. Watercourse downstream of HSH Irrigation Reservoir 2. Catchwater in TLC (C5) 3. Catchwater in TLT(C6)	Very common. Distributed in grassland and streamsides.	Cap. 96A Cap. 586 CITES Appendix II

Species	Location			Rarity and distribution in Hong Kong [1 2 3 4 5 6 7 8 9]	Protection or conservation status [6 7 8 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26]
	Within the Project footprint[27]		Outside the Project footprint but within the assessment area		
	Within the aboveground works areas (i.e. outside TLCP)	Outside the aboveground works areas			
Hong Kong Begonia *Begonia hongkongensis*	/	/	Within TLCP In rock crevices of two watercourses (The location is not specified amid concerns over potential collection by illegal poachers)	Very rare. Found in streamsides.	Endemic to Hong Kong
Water Fern *Ceratopteris thalictroides*	/	/	Outside TLCP A branch of a channel in SKW San Tsuen (C1)	Rare. Found in wetlands.	Rare and Precious Plants of Hong Kong: VU State Protection (Category II)
Lamb of Tartary *Cibotium barometz*	/	/	Outside TLCP Mixed woodland northeast of CUT in SKW	Very common. Found in forest and shrubland.	Rare and Precious Plants of Hong Kong: VU in China State Protection (Category II) Appendix II of CITES Cap. 586
Thick-leaved Oak *Cyclobalanopsis edithiae*	/	/	Outside TLCP Along MacLehose Trail Section 10 in SKW	Restricted; also planted. Found in forest.	IUCN Red List of Threatened Species (2023): EN
Chung's Oak *Cyclobalanopsis chungii*	/	/	Within TLCP Mixed woodland next to the upstream section of W4	Rare. Distributed in forest.	/

Species	Location			Rarity and distribution in Hong Kong [1 2 3 4 5 6 7 8 9]	Protection or conservation status [6 7 8 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26]
	Within the Project footprint[27]		Outside the Project footprint but within the assessment area		
	Within the aboveground works areas (i.e. outside TLCP)	Outside the aboveground works areas			
Small Persimmon *Diospyros vaccinioides*	1. Plantation southwest of Hong Kong Garden, which is within the haul road extent in TLT 2. Shrubland/Grassland west of TLC, which is within the slope works extent in TL 3. Mixed woodland south of MacLehose Trail Section 10, which is within the at-grade section and slope works area in SKW 4. Shrubland/Grassland within slope works area at NKL 5. Mixed woodland south of MacLehose Trail, which is within the at-grade section and slope works area in SKW	Within TLCP 1. Shrubland/Grassland west of TLT Catchwater, which is above the TLCT 2. Shrubland/Grassland west of Right Kau Kwun Hang, which is above the tunnel section of SKWLR 3. Mixed woodland east of Right Kau Kwun Hang, which is above the tunnel section of SKWLR	Within TLCP 1. Near LT Irrigation Reservoir 2. Mixed woodland east of LT Irrigation Reservoir 3. Mixed woodland south of the eastern upstream leading to HSH Irrigation Reservoir 4. Shrubland/Grassland to the east of the western upstream of HSH Irrigation Reservoir 5. Plantation southwest of TLT Catchwater 6. Shrubland/Grassland southwest of TLC Reservoir 7. Shrubland/Grassland adjacent to MacLehose Trail Section 10 8. Mixed woodland north of SKW Road 9. Shrubland/Grassland north of Pak Shek Hang Outside TLCP 1. Shrubland/Grassland at Kwai Shek 2. Shrubland/Grassland south of NL Highway 3. Shrubland/Grassland at Yi Chuen 4. Mixed woodland south of TLT Catchwater 5. Choi Yuen Tsuen in TLT 6. Developed area southwest of TLC Reservoir 7. Mixed woodland north of SKW Road 8. Shrubland/Grassland adjacent to MacLehose Trail Section 10 9. Mixed woodland south of eastern patch of CUTFSW	Very common. Found in shrubland.	IUCN Red List of Threatened Species (2023): CR
Chinese New Year Flower *Enkianthus quinqueflorus*	/	/	Within TLCP Shrubland/Grassland north of Pak Shek Hang	Common. Distributed in shrubland and forest.	Cap. 96A

Species	Location			Rarity and distribution in Hong Kong [1 2 3 4 5 6 7 8 9]	Protection or conservation status [6 7 8 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26]
	Within the Project footprint[27]		Outside the Project footprint but within the assessment area		
	Within the aboveground works areas (i.e. outside TLCP)	Outside the aboveground works areas			
Dense-flowered Geodorum *Geodorum densiflorum*	/	/	Within TLCP Mixed woodland west of HSH Irrigation Reservoir Outside TLCP Mixed woodland northeast of LT Irrigation Reservoir	Restricted. Distributed in grassland and forest edges.	Cap. 96A Cap. 586 CITES Appendix II
Luofushan Joint-fir *Gnetum luofuense*	SKW, SL, TL and TLT	Shrubland/Grassland within TLCP, which is above the tunnel section of LTT and SKWLR	Channel, developed area, mixed woodland, plantation, reservoir and shrubland/grassland in LT, SKW, SL, TL, TLT and NL	Very common. Distributed in forests and shrublands.	IUCN Red List of Threatened Species (2023): NT
Ixonanthes *Ixonanthes reticulata*	Outside TLCP 1. Eastern patch of CUTFSW, where a viaduct overpasses 2. Mixed woodland north and south of the eastern patch of CUTFSW, which is within the haul road extent in SKW	/	Outside TLCP 1. Mixed woodland northeast of TLC Tsuen 2. Eastern patch of CUTFSW 3. THTFSW 4. Mixed woodland northeast of western patch of CUTFSW	Common. Distributed in forests.	China Red Data Book: VU IUCN Red List of Threatened Species (2023): VU Rare and Precious Plants of Hong Kong: VU Threatened Species List of China's Higher Plants: VU
Broad-leaved Addermouth Orchid *Malaxis latifolia*	/	/	Within TLCP Mixed woodland south of the eastern upstream leading to HSH Irrigation Reservoir	Restricted. Distributed in streamsides in forest.	Cap. 96A Cap. 586 CITES Appendix II

Species	Location			Rarity and distribution in Hong Kong [1 2 3 4 5 6 7 8 9]	Protection or conservation status [6 7 8 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26]
	Within the Project footprint[27]		Outside the Project footprint but within the assessment area		
	Within the aboveground works areas (i.e. outside TLCP)	Outside the aboveground works areas			
Pitcher Plant *Nepenthes mirabilis*	<u>Outside TLCP</u> 1. Plantation adjacent to Tuen Mun Road – TLT, which is within the aboveground works area in TLT 2. NL Highway, which is beneath a viaduct in NL	<u>Within TLCP</u> Shrubland/Grassland east of Right Kau Kwun Hang, which is above the tunnel section of SKWLR	<u>Within TLCP</u> 1. Mixed woodland southwest of HSH Irrigation Reservoir 2. Watercourse downstream of HSH Irrigation Reservoir 3. Shrubland/Grassland adjacent to MacLehose Trail Section 10 in SKW 4. MacLehose Trail Section 10 in SKW 5. Shrubland/Grassland north of MacLehose Trail Section 10 in SKW 6. Plantation slope north of MacLehose Trail Section 10 in SKW 7. Catchwater besides MacLehose Trail Section 10 in SKW (C1) 8. Pak Shek Hang (W8) <u>Outside TLCP</u> 1. Shrubland/Grassland north of Pillar Point Magazine Site 2. Shrubland/Grassland north of catchwater in TLT (C6) 3. Catchwater in TLT (C6) 4. Plantation southwest of catchwater in TLT (C6) 5. Plantation near the northern entrance of TLC Catchwater Tunnel No. 6 6. Plantation slope north of catchwater in SKW (C1) 7. Left Pak Shek Hang (W7) in SKW	Common. Distributed in wet, open places on granite and sedimentary rocks.	Cap. 96A Cap. 586 Appendix II of CITES Rare and Precious Plants of Hong Kong: Vulnerable

Species	Location			Rarity and distribution in Hong Kong [1 2 3 4 5 6 7 8 9]	Protection or conservation status [6 7 8 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26]
	Within the Project footprint[27]		Outside the Project footprint but within the assessment area		
	Within the aboveground works areas (i.e. outside TLCP)	Outside the aboveground works areas			
Emarginate-leaved Ormosia *Ormosia emarginata*	/	/	Within TLCP Mixed woodland east of Right Kau Kwun Hang (W5) Outside TLCP: Western patch of CUTFSW	Common. Distributed in shrubland and forest.	State Protection (Category II)
Soft-fruited Ormosia *Ormosia semicastrata*	/	/	Outside TLCP: Mixed woodland east of catchwater in TLC (C5)	Restricted. Distributed in forest.	State Protection (Category II)
Hong Kong Pavetta *Pavetta hongkongensis*	/	/	Outside TLCP 1. Shrubland/Grassland at Kwai Shek 2. THTFSW 3. Developed area northeast of THTFSW 4. Mixed woodland northwest of western patch of CUTFSW 5. Western patch of CUTFSW	Common. Distributed in fung shui woods and lowland forest.	Cap. 96A
Red Azalea *Rhododendron simsii*	/	/	Within TLCP Shrubland/Grassland south of LT Quarry	Very common. Distributed in shrubland.	Cap. 96A
Ternate Bulrush *Scirpus ternatus*	/	/	Outside TLCP Developed area northeast of CUT	Rare. Distributed in wet places in forest.	/
Siamense Selenodesmium *Selenodesmium siamense*	/	/	Within TLCP Watercourse next to TLC Catchwater	Rare. Distributed in forest.	Rare and Precious Plants of Hong Kong
Chinese Frienge Lily *Thysanotus chinensis*	/	/	Outside TLCP Shrubland/Grassland northwest and north of Pillar Point Magazine Site	Rare. Distributed in grassland.	/

Species	Location			Rarity and distribution in Hong Kong [1 2 3 4 5 6 7 8 9]	Protection or conservation status [6 7 8 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26]
	Within the Project footprint[27]		Outside the Project footprint but within the assessment area		
	Within the aboveground works areas (i.e. outside TLCP)	Outside the aboveground works areas			
Mammal					
Red Muntjac *Muntiacus muntjak*	Outside TLCP Shrubland/Grassland falling within the slope works extent in NL	/	Within TLCP 1. Shrubland/Grassland southwest of LT Irrigation Reservoir 2. Shrubland/Grassland north of catchwater besides MacLehose Trail Section 10 in SKW (C1) 3. Shrubland/Grassland east of Left Pak Shek Hang (W7) Outside TLCP 1. Shrubland/Grassland west of TLC Reservoir	Very common. Very widely distributed in countryside areas throughout Hong Kong.	Fellowes et al. (2002): PRC
Leopard Cat *Prionailurus bengalensis*	Outside TLCP Plantation southwest of Hong Kong Garden, which falls within the extent of at-grade alignment and slope works at TLT	/	/	Uncommon. Widely distributed in countryside areas throughout Hong Kong, except for Lantau Island	China Red Data Book: VU Cap. 170 Red List of China's Vertebrate: VU
Himalayan Leaf-nosed Bat *Hipposideros armiger*	/	/	Within TLCP TLC Catchwater Tunnel Nos. 6 and 8 Outside TLCP Mixed woodland near the northern entrance of TLC Catchwater Tunnel No. 6	Very common. Widely distributed in countryside areas throughout Hong Kong.	Fellowes et al. (2002): (LC) Cap. 170
East Asian Porcupine *Hystrix brachyura*	/	/	Outside TLCP Shrubland/Grassland south of MacLehose Trail Section 10 in SKW	Very common. Very widely distributed in countryside areas throughout Hong Kong, except for Lantau Island.	Fellowes et al. (2002): PGC Cap. 170
Leschenault's Rousette *Rousettus leschenaultii*	/	/	Within TLCP 1. TLC Catchwater Tunnel No. 8 2. Shrubland/Grassland near TLC Catchwater Tunnel No. 8	Common. Fairly widely distributed in countryside areas throughout Hong Kong.	Fellowes et al. (2002): (LC) Cap. 170

Species	Location			Rarity and distribution in Hong Kong [1 2 3 4 5 6 7 8 9]	Protection or conservation status [6 7 8 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26]
	Within the Project footprint[27]		Outside the Project footprint but within the assessment area		
	Within the aboveground works areas (i.e. outside TLCP)	Outside the aboveground works areas			
Short-nosed Fruit Bat *Cynopterus sphinx*	/	/	Outside TLCP Shrubland/Grassland south of NL Highway	Very common. Very widely distributed in urban and countryside areas throughout Hong Kong.	Cap. 170
Intermediate Horseshoe Bat *Rhinolophus affinis*	/	/	Within TLCP 1. TLC Catchwater Tunnel Nos. 5 and 6 2. Mixed woodland near the northern entrance of TLC Catchwater Tunnel Nos. 6	Uncommon. Widely distributed in forested areas throughout Hong Kong.	Fellowes et al. (2002): (LC) Cap. 170
Least Horseshoe Bat *Rhinolophus pusillus*	/	/	Within TLCP 1. TLC Catchwater Tunnel No. 5 2. Mixed woodland near the northern entrance of TLC Catchwater Tunnel No. 6	Uncommon. Widely distributed in countryside areas throughout Hong Kong.	Fellowes et al. (2002): PRC, (RC) Cap. 170
Chinese Horseshoe Bat *Rhinolophus sinicus*	/	/	Within TLCP 1. TLC Catchwater Tunnel Nos. 5, 6 and 8 2. Shrubland/Grassland near TLC Catchwater Tunnel No. 8	Very common. Widely distributed in forested areas throughout Hong Kong.	Cap. 170
Rickett's Big-footed Myotis *Myotis pilosus*	/	/	Within TLCP TLC Catchwater Tunnel No. 6	Common. Fairly widely distributed in countryside areas throughout Hong Kong.	Fellowes et al. (2002): (LC) Cap. 170
Chinese Myotis *Myotis chinensis*	/	/	Within TLCP TLC Catchwater Tunnel No. 6	Uncommon. Fairly widely distributed in countryside areas throughout Hong Kong.	China Red Data Book: EN Fellowes et al. (2002): (LC) Cap. 170
Unidentified Bent-winged Bat *Miniopterus* sp.	/	/	Within TLCP TLC Catchwater Tunnel No. 8	/	Cap. 170

Species	Location			Rarity and distribution in Hong Kong [1 2 3 4 5 6 7 8 9]	Protection or conservation status [6 7 8 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26]
	Within the Project footprint[27]		Outside the Project footprint but within the assessment area		
	Within the aboveground works areas (i.e. outside TLCP)	Outside the aboveground works areas			
Pallas's Squirrel *Callosciurus erythraeus*	/	/	Outside TLCP 1. Mixed woodland south of MacLehose Trail Section 10, which is in the vicinity of the slope works extent in SKW 2. Mixed woodland southeast of Pillar Point Magazine Site 3. Developed area east and west of SKW Tsuen Channel 4. Mixed woodland west of downstream of TLC Reservoir	Common. Fairly widely distributed. Recent records of the styani subspecies have been found in New Territories, such as at Tai Lam, Shing Mun, and Tai Po Kau, while the thai subspecies have been found on the Hong Kong Island, e.g. Tai Tam and Pok Fu Lam.	Cap. 170
Japanese Pipistrelle *Pipistrellus abramus*	/	/	Within TLCP 1. Shrubland/Grassland west of LT Irrigation Reservoir 2. Mixed woodland south of MacLehose Trail Outside TLCP SKW San Tsuen	Very common. Widely distributed throughout Hong Kong	Cap. 170
Chinese Pipistrelle *Hypsugo pulveratus*	/	/	Outside TLCP SKW San Tsuen	Rare/Species of Conservation Concern. Only several records in the countryside areas at Ting Kau, Ma On Shan and Lin Ma Hang, and several records of stray individuals inside buildings.	Fellowes et al. (2002): (LC) Cap. 170
Chinese Noctule *Nyctalus pliancy*	/	/	Outside TLCP 1. Mixed woodland northwest of LT Irrigation Reservoir 2. SKW San Tsuen	Common. Fairly widely distributed in countryside areas throughout Hong Kong.	Fellowes et al. (2002): PRC, (RC) Cap. 170

Species	Location			Rarity and distribution in Hong Kong [1 2 3 4 5 6 7 8 9]	Protection or conservation status [6 7 8 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26]
	Within the Project footprint[27]		Outside the Project footprint but within the assessment area		
	Within the aboveground works areas (i.e. outside TLCP)	Outside the aboveground works areas			
Masked Palm Civet *Paguma larvata*	/	/	Within TLCP 1. Shrubland/Grassland west of LT Irrigation Reservoir 2. Mixed woodland to the western upstream of HSH Irrigation Reservoir 3. Plantation slope north of SKW catchwater 4. Shrubland/Grassland north of SKW Catchwater	Common. Widely distributed in countryside areas throughout Hong Kong, except for Lantau Island and northwestern New Territories.	Fellowes et al. (2002): PRC Cap. 170
Unidentified bat	/	/	Within TLCP MacLehose Trail Section 10 Outside TLCP 1. Plantation east of LT Quarry 2. Mixed woodland north of LT Irrigation Reservoir	/	Cap. 170
Avifauna					
Japanese Quail *Coturnix japonica*	/		Outside TLCP Shrubland/Grassland south of NL Highway	Uncommon autumn passage migrant and rare winter visitor. Found in Long Valley, Mai Po, Kam Tin, Lam Tsuen, Tin Shui Wai.	Fellowes *et al*. (2002): LC

Species	Location			Rarity and distribution in Hong Kong [1 2 3 4 5 6 7 8 9]	Protection or conservation status [6 7 8 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26]
	Within the Project footprint[27]		Outside the Project footprint but within the assessment area		
	Within the aboveground works areas (i.e. outside TLCP)	Outside the aboveground works areas			
Black-crowned Night Heron *Nycticorax nycticorax*	Outside TLCP 1. Mixed woodland southwest of Hong Kong Garden, which is within the at-grade alignment and slope works extent in TLT 2. Castle Peak Road – TLT, which is beneath the viaduct section at TLT 3. Sea opposite to TLT, which is above the seabed works area in TLT 4. Catchwater besides MacLehose Trail Section 10 in SKW (C1), which is above the tunnel section of SKWLR	/	Within TLCP 1. Catchwater besides MacLehose Trail Section 10 in SKW (C1) Outside TLCP 1. Sea opposite to SKW 2. Sea opposite to TLT	Common resident and migrant. Widely distributed in Hong Kong.	Fellowes *et al*. (2002): (LC)
Striated Heron *Butorides striata*	/	/	Outside TLCP Channel west of Tan Kwai Tsuen	Common summer visitor. Widely distributed in Hong Kong.	Fellowes et al. (2002): (LC)
Chinese Pond Heron *Ardeola bacchus*	/	/	Outside TLCP Channel in SKW Tsuen (C1)	Common resident. Widely distributed in Hong Kong.	Fellowes et al. (2002): PRC, (RC)
Great Egret *Ardea alba*	/	/	Outside TLCP 1. Sea opposite to Kwai Shek 2. Intertidal habitat west of NKL	Common resident, migrant and winter visitor. Widely distributed in Hong Kong.	Fellowes et al. (2002): PRC, (RC)

Species	Location			Rarity and distribution in Hong Kong [1 2 3 4 5 6 7 8 9]	Protection or conservation status [6 7 8 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26]
	Within the Project footprint[27]		Outside the Project footprint but within the assessment area		
	Within the aboveground works areas (i.e. outside TLCP)	Outside the aboveground works areas			
Little Egret *Egretta garzetta*	Outside TLCP Barging point west of NKL	/	Within TLCP 1. Catchwater besides MacLehose Trail Section 10 in SKW (C1) Outside TLCP 1. Backshore in TLT 2. Sea opposite to SKW 3. Sea opposite to the coast of NL 4. LU in SKW	Common resident, migrant and winter visitor. Widely distributed in coastal area throughout Hong Kong.	Fellowes et al. (2002): PRC, (RC)
Pacific Reef Heron *Egretta sacra*	/	/	Outside TLCP Sea opposite to the coast of NL	Common resident. Widely distributed in coastal area throughout Hong Kong.	Class 2 Protected Animal of China China Red Data Book: Rare Fellowes et al. (2002): (LC)
Crested Serpent Eagle *Spilornis cheela*	/	/	Within TLCP 1. Mixed woodland east of the eastern upstream leading to HSH Irrigation Reservoir 2. Shrubland/Grassland northwest of TLT Catchwater 3. Plantation north of The Laguna 4. Shrubland/Grassland northwest of Pillar Point magazine site	Common resident. Widely distributed in shrublands on hillsides throughout Hong Kong.	China Red Data Book: VU Fellowes et al. (2002): (LC) Appendix 2 of CITES Cap. 586

Black Kite *Milvus migrans*	Outside TLCP 1. Developed area southwest of Hong Kong Garden, which falls within the at-grade section and slope works at TLT 2. Mixed woodland southwest of Hong Kong Garden, which falls within the at-grade section and slope works at TLT 3. Castle Peak Road – TLT, which falls within the viaduct at TLT 4. Sea opposite to TLT, which is above TLB	/	Within TLCP 1. Shrubland/Grassland east of the upstream leading to LT Irrigation Reservoir 2. Shrubland/Grassland east of the eastern upstream leading to HSH Irrigation Reservoir 3. Mixed woodland north of TLT Catchwater 4. Shrubland/Grassland west of TLT Catchwater 5. Shrubland/Grassland east of TLC Catchwater 6. TLC Reservoir 7. Mixed woodland southwest of TLC Reservoir 8. Shrubland/Grassland adjacent to MacLehose Trail Section 10 9. Shrubland/Grassland east of Right Kau Kwun Hang 10. Shrubland/Grassland west of Pak Shek Hang Outside TLCP 1. Mixed woodland west of LT Quarry 2. Sea opposite to the coast of NL Highway 3. Shrubland/Grassland at Kwai Shek 4. Plantation north of NL Highway 5. Shrubland/Grassland south of NL Highway 6. Shrubland/Grassland north of PIllar Point Magazine Site 7. Mixed woodlnd west of TLC Catchwater Tunnel No. 6 8. Shrubland/Grassland northwest of Treatment Centre - Glorious Praise Fellowship (Hong Kong) 9. Plantation immediate east of SL Fresh Water Supplies Reservoir 10. Developed area south of Siu Lam Fresh Water Supplies Reservoir 11. Sea opposite to SKW 12. Shrubland/Grassland south of MacLehose Trail Section 10	Common resident and winter visitor. Widely distributed in Hong Kong.	Fellowes et al. (2002): (RC) Appendix 2 of CITES

Species	Location			Rarity and distribution in Hong Kong [1 2 3 4 5 6 7 8 9]	Protection or conservation status [6 7 8 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26]
	Within the Project footprint[27]		Outside the Project footprint but within the assessment area		
	Within the aboveground works areas (i.e. outside TLCP)	Outside the aboveground works areas			
			13. Shrubland/Grassland northeast of CUT 14. Shrubland/Grassland northwest of Pillar Point magazine site		
White-bellied Sea Eagle *Haliaeetus leucogaster*	/	/	Outside TLCP Sea northwest of NL Highway	Locally common resident. Widely distributed in coastal areas throughout Hong Kong.	Fellowes et al. (2002): (RC) Appendix 2 of CITES Red List of China's Vertebrates: VU Cap. 586
Eastern Buzzard *Buteo japonicus*	Outside TLCP Developed area within the largest temporary works area in SL	/	Within TLCP Shrubland/Grassland northwest of TLC Reservoir Outside TLCP Shrubland/Grassland northwest of Pillar Point magazine site	Common winter visitor. Widely distributed in Hong Kong.	Appendix 2 of CITES Cap. 586
Slaty-legged Crake *Rallina eurizonoides*	/	/	Outside TLCP Developed area near Tuen Mun Road	Locally common breeding season visitor, migrant and scarce winter visitor. Found in Shuen Wan, Tai Mei Tuk catchment, Kadoorie Agricultural Research Centre and Kadoorie Farm & Botanic Garden, Kau To Shan, Ting Kok, Mong /Tseng, Lung Fu Shan, Shing Mun Country Park, Hok Tau, Tai Tam Country Park.	Red List of China's Vertebrates: VU
Common Emerald Dove *Chalcophaps indica*	/	/	Within TLCP Plantation slope north of the catchwater besides MacLehose Trail Section 10 (C1) Outside TLCP Mixed woodland at Kwai Shek	Uncommon but widespread resident. Widely distributed in woodland throughout Hong Kong.	China Red Data Book: VU

Species	Location			Rarity and distribution in Hong Kong [1 2 3 4 5 6 7 8 9]	Protection or conservation status [6 7 8 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26]
	Within the Project footprint[27]		Outside the Project footprint but within the assessment area		
	Within the aboveground works areas (i.e. outside TLCP)	Outside the aboveground works areas			
Greater Coucal *Centropus sinensis*	Outside TLCP 1. Mixed woodland in slope works area in LT 2. Shrubland/Grassland at NKL, which is within the administrative building and slope works extent in NL	/	Outside TLCP 1. Shrubland/Grassland west of Pillar Point Magazine Site 2. Mixed woodland west of TLC 3. Mixed woodland east of Siu Lam (SL) Road 4. Mixed woodland south of SKW catchwater 5. SKW Road 6. Agricultural land northeast of THTFSW 7. Developed area east of Right Kau Kwun Hang 8. Shrubland/Grassland south of MacLehose Trail Section 10 9. THTFSW 10. Shrubland/Grassland south of MacLehose Trail Section 10 11. Shrubland/Grassland northeast of CUT 12. Shrubland/Grassland south of MacLehose Trail Section 10, which is in the vicinity of the slope works area in SKW 13. Mixed woodland south of MacLehose Trail Section 10	Common resident. Widely distributed in Hong Kong.	Class 2 Protected Animal of China China Red Data Book: VU
Lesser Coucal *Centropus bengalensis*	/	/	Outside TLCP Shrubland/Grassland west of Left Kau Kwun Hang in SKW	Uncommon resident. Widely distributed in Hong Kong.	Class 2 Protected Animal of China China Red Data Book: VU

Species	Location			Rarity and distribution in Hong Kong [1 2 3 4 5 6 7 8 9]	Protection or conservation status [6 7 8 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26]
	Within the Project footprint[27]		Outside the Project footprint but within the assessment area		
	Within the aboveground works areas (i.e. outside TLCP)	Outside the aboveground works areas			
Collared Scops Owl *Otus lettia*	Outside TLCP Shrubland/Grassland northeast of CUTFSW, which is within the haul road extent in SKW	/	Within TLCP 1. Mixed woodland east of TLC Catchwater 2. TLC Reservoir 3. Mixed woodland northwest of TLC Reservoir 4. Plantation north of SKW Catchwater 5. Mixed woodland adjacent to MacLehose Trail Section 10 6. Plantation slope north of SKW catchwater Outside TLCP 1. TLC Tsuen 2. Mixed woodland northwest of channel downstream of TLC Reservoir 3. Mixed woodland northwest of Treatment Centre - Glorious Praise Fellowship (Hong Kong) 4. Shrubland/Grassland south of MacLehose Trail Section 10	Common resident. Widely distributed in shrubland throughout Hong Kong.	Class 2 Protected Animal of China Appendix 2 of CITES
Pacific Swift *Apus pacificus*	/	/	Outside TLCP Shrubland/Grassland south of NL Highway	Uncommon spring migrant and summer visitor. Mainly found in Deep Bay area and islands.	Fellowes et al. (2002): (LC)

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	Within the Project footprint[27]		Outside the Project footprint but within the assessment area		
	Within the aboveground works areas (i.e. outside TLCP)	Outside the aboveground works areas			
White-throated Kingfisher *Halcyon smyrnensis*	Outside TLCP 1. Developed area in barging pint west of NKL 2. Plantation southwest of Tuen Mun Road, which is within the slope works extent in TLT	/	Within TLCP 1. LT Irrigation Reservoir 2. Shrubland/Grassland west of the watercourse western upstream of HSH Reservoir Outside TLCP 1. Shrubland/Grassland at Kwai Shek 2. TLC 3. TLC Reservoir 4. Shrubland/Grassland southwest of TLC Reservoir 5. SL Road 6. Catchwater besides Maclsehose Trail Section 10 in SKW (C1)	Common resident. Widely distributed in coastal areas throughout Hong Kong.	Fellowes et al. (2002): (LC)
Rufous-capped Babbler *Stachyridopsis ruficeps*	/	Within TLCP Shrubland/Grassland adjacent to MacLehose Trail Section 10, which is above the tunnel section in SKW	Within TLCP 1. Mixed woodland east of TLC Catchwater 2. Shrubland/Grassland north of SKW Catchwater Outside TLCP 1. Mixed woodland west of LT Quarry 2. Mixed woodland southwest of TLC Reservoir 3. Mixed woodland west of TLC Reservoir	Common resident. Found in Shing Mun, Tai Po Kau, Tai Mek Tuk, Ng Tung Chai, Fo Tan, Tai Mo Shan, The Peak, Kadoorie Agricultural Research Centre.	Fellowes et al. (2002): LC

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	Within the aboveground works areas (i.e. outside TLCP)	Outside the aboveground works areas			
Black-throated Laughingthrush *Garrulax chinensis*	Outside TLCP 1. SL Road, which is within the at-grade section in SL 2. Developed area south of SKW Village Channel, which is within the haul road extent in SKW	/	Within TLCP 1. Mixed woodland west of LT Reservoir 2. Shrubland/Grassland east of the upstream leading to LT Irrigation Reservoir 3. Mixed woodland west of HSH Irrigation Reservoir 4. Shrubland/Grassland east of TLC Catchwater 5. Shrubland/Grassland northwest of TLC Reservoir Outside TLCP 1. Plantation west of TLC Catchwater Tunnel No. 6 2. Mixed woodland east of TLC Tsuen 3. Mixed woodland east of TLC Wong Uk 4. Shrubland/Grassland southwest of TLC Reservoir 5. Mixed woodland southwest of TLC Reservoir 6. Developed area southwest of TLC Reservoir 7. SL Road 8. Mixed woodland south of MacLehose Trail Section 10 9. Mixed woodland west of CUT 10. Mixed woodland northeast of eastern patch of CUTFSW 11. Developed area south of MacLehose Trail Section 10 12. Mixed woodland northeast of CUT 13. Mixed woodland southeast of CUT 14. Mixed woodland west of TLC Reservoir	Common resident. Widely distributed in woodland and shrubland throughout Hong Kong.	Class 2 Protected Animal of China

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	Within the aboveground works areas (i.e. outside TLCP)	Outside the aboveground works areas			
Siberian Blue Robin *Larvivora cyane*	Outside TLCP Plantation immediate east of SL Fresh Water Supplies Reservoir, which is within the largest temporary works area in SL	/	Within TLCP Mixed woodland adjacent to MacLehose Trail No. 10	Scarce passage migrant. Widely distributed in woodland throughout Hong Kong.	Fellowes et al. (2002): LC
Grey Nightjar *Caprimulgus jotaka*	/	/	Within TLCP Mixed woodland south of LT Irrigation Reservoir	Scarce passage migrant. Widely distributed in Hong Kong.	Fellowes *et al*. (2002): LC
Brown Fish Owl *Ketupa zeylonensis*	/	/	Outside TLCP SKW Village Channel (C2)	Scarce resident. Widely distributed in Hong Kong.	Fellowes *et al*. (2002): RC Cap. 586 List of Wild Animals under State Priority Conservation: Class II Red List of China's Vertebrates: EN Appendix II of CITES
Indochinese Yuhina *Yuhina castaniceps*	/	/	Outside TLCP Plantation immediate north and southeast of Pillar Point magazine site	Uncommon but increasing winter visitor, scarce and localised in summer.	Fellowes *et al*. (2002): (LC)
Herpetofauna					
Spotted Narrow-mouthed Frog *Kalophrynus interlineatus*	/	/	Within TLCP Mixed woodland northeast of the eastern patch of CUTFSW and near the southern entry of TLC Catchwater Tunnel No. 6	Widely distributed from low to moderate altitudes in northern and central New Territories.	Red List of China's Vertebrates: NT

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Hong Kong Cascade Frog *Amolops hongkongensis*	Outside TLCP Mixed woodland south of MacLehose Trail Section 10, which is within the at-grade section and slope works area in SKW	/	Within TLCP 1. Watercourse to the western upstream of HSH Irrigation Reservoir 2. Shrubland/Grassland north of TLT Catchwater 3. Shrubland/Grassland north of MacLehose Trail Section 10 4. Catchwater besides MacLehose Trail Section 10 in SKW (C1) 5. Shrubland/Grassland east of Right Kau Kwun Hang in SKW 6. Left Pak Shek Hang in SKW (W7)	Widely distributed in mountain streams in Hong Kong, except Lantau Island.	Fellowes et al. (2002): PGC IUCN Red List of Threatened Species (2023): EN Cap. 170 Red List of China's Vertebrates: EN
Chinese Bullfrog *Hoplobatrachus chinensis*	/	/	Within TLCP 1. HSH Irrigation Reservoir Outside TLCP 1. Mixed woodland northwest of LT Irrigation Reservoir 2. Watercourse downstream of LT Irrigation Reservoir 3. Agricultural land north of SKW San Tsuen 4. Shrubland/Grassland south of MacLehose Trail 5. Channel next to SKW Village (C1)	Widely distributed in Hong Kong.	Class 2 Protected Animal of China Fellowes et al. (2002): PRC Red List of China's Vertebrates: EN

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	Within the aboveground works areas (i.e. outside TLCP)	Outside the aboveground works areas			
Lesser Spiny Frog *Quasipaa exilispinosa*	Outside TLCP Channel downstream of TLC Reservoir, which is beneath the viaduct section in TL	/	Within TLCP 1. Shrubland/Grassland south of LT Irrigation Reservoir 2. Watercourse upstream of LT Irrigation Reservoir 3. Watercourse to the western upstream of HSH Irrigation Reservoir 4. Catchwater in TLT (C6) 5. Watercourse next to TLC Catchwater 6. Shrubland/Grassland next to TLC Catchwater 7. Catchwater in TLC (C5) 8. Channel downstream of TLC Reservoir 9. Shrubland/Grassland east of Right Kau Kwun Hang in SKW 10. MacLehose Trail Section 10 in SKW 11. Channel next to SKW Village (C5) 12. Left Pak Shek Hang in SKW (W7) 13. Shrubland/Grassland east of Right Kau Kwun Hang (W5) 14. Mixed woodland west of TLC Reservoir Outside TLCP 1. Mixed woodland south of MacLehose Trail Section 10 2. Channel next to SKW Village (C1) 3. Shrubland/Grassland south of MacLehose Trail Section 10	Widely distributed in upland forest streams throughout Hong Kong.	Fellowes et al. (2002): PGC IUCN Red List of Threatened Species (2023): VU Red List of China's Vertebrates: VU
Brown Wood Frog *Hylarana latouchii*	/	/	Within TLCP 1. Catchwater in TLC (C5) 2. Left Pak Shek Hang (W7)	Distributed in woodlands in western and central New Territories.	Fellowes et al. (2002): LC
Two-striped Grass Frog *Hylarana taipehensis*	/	/	Within TLCP HSH Irrigation Reservoir	Distributed in Sai Kung, northern New Territories. and Tai A Chau.	Fellowes et al. (2002): LC

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Romer's Tree Frog *Liuixalus romeri*	/	/	Within TLCP Mixed woodland west of TLC Catchwater Outside TLCP: 1. Mixed woodland at Kwai Shek 2. Channel west of NKL 3. Plantation southwest of NKL 4. Plantation north of NL Highway	Distributed in woodlands on Lantau Island, Po Toi Island, Lamma Island, Hong Kong Island and New Territories.	Fellowes et al. (2002): PGC IUCN Red List of Threatened Species (2023): EN Cap. 170 Red List of China's Vertebrates: VU
Burmese Python *Python bivittatus*	/	/	Within TLCP Plantation slope adjacent to MacLehose Trail Section 10	Widely distributed throughout Hong Kong.	Class 1 Protected Animal of China China Red Data Book: CR Fellowes et al. (2002): PRC IUCN Red List of Threatened Species (2023): VU Appendix 2 of CITES Cap. 170
Copperhead Racer *Coelognathus radiatus*	/	/	Within TLCP Catchwater in TLT (C6)	Widely distributed throughout Hong Kong.	China Red Data Book: EN Fellowes et al. (2002): PRC Red List of China's Vertebrates: EN
Common Wolf Snake *Lycodon capucinus*	/	/	Within TLCP Mixed woodland near the southern entry of TLC Catchwater Tunnel No. 6	Widely distributed at low elevations throughout Hong Kong Island, Lantau Island and Lamma Island. Several individuals recorded in New Territories.	Red List of China's Vertebrates: NT
Taiwan Kukri Snake *Oligodon formosanus*	/	/	Outside TLCP Shrubland/Grassland north of watercourse W23	Widely distributed throughout Hong Kong.	Red List of China's Vertebrates: NT
White-spotted Slug Snake *Pareas margaritophorus*	/	/	Within TLCP Mixed woodland downslope of the catchwater in TLT (C6)	Distributed in woodland or shrubland throughout Hong Kong.	Red List of China's Vertebrates: NT

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Common Rat Snake *Ptyas mucosus*	/	/	Within TLCP Mixed woodland near TLC Catchwater Tunnel No. 5	Widely distributed throughout Hong Kong.	China Red Data Book: EN Fellowes et al. (2002): PRC Appendix 2 of CITES Red List of China's Vertebrates: EN
Mountain Water Snake *Sinonatrix percarinata*	/	/	Within TLCP Shrubland/Grassland southern of the southern entrance of TLC Catchwater Tunnel No. 6	Distributed in streams in central New Territories (Shing Mun Country Park, Tai Po Kau Nature Reserve, TLCP).	Fellowes et al. (2002): LC Red List of China's Vertebrates: VU
Four-clawed Gecko *Gehyra mutilate*	Outside TLCP 1. Mixed woodland south of SKW Village Channel, which is within the haul road extent in SKW 2. Developed area within the barging point west of NKL	/	Within TLCP 1. Catchwater besides MacLehose Trail Section 10 in SKW (C1) Outside TLCP 1. Mixed woodland south of MacLehose Trail Section 10 in SKW 2. Developed area west of NKL 3. NL Highway 4. Shrubland/Grassland at Yi Chuen	Widely distributed throughout Hong Kong.	Red List of China's Vertebrates: VU
Indian Forest Skink *Sphenomorphus indicus*	/	/	Outside TLCP 1. Mixed woodland west of CUT	Distributed in woodlands in eastern and central New Territories.	Fellowes *et al*. (2002): LC
Banded Krait *Bungarus fasciatus*	/	/	Outside TLCP Mixed woodland northwest of LT Irrigation Reservoir	Locally restricted in Hong Kong.	Fellowes *et al*. (2002): RC Red List of China's Vertebrates: EN China Red Data Book: EN
Butterfly					
Plain Hedge Blue *Celastrina lavendularis*	/	/	Within TLCP Catchwater besides MacLehose Trail Section 10 in SKW (C1)	Very rare/Species of conservation concern. Chuen Lung, Kap Lung, Tai Po Kau, Shing Mun Country Park, Tai Lam Country Park, Kadoorie Farm and Botanic Garden, Ngau Ngak Shan.	Fellowes *et al*. (2002): LC

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Metallic Cerulean *Jamides alecto*	/	/	Outside TLCP 1. Plantation east of Pillar Point Magazine Site 2. THTFSW	Very rare. Victoria Peak, Fung Yuen, Chuen Lung, Mui Wo.	/
Broad Spark *Sinthusa chandrana*	/	/	Outside TLCP 1. Plantation north of NL Highway	Rare. Widely distributed throughout Hong Kong.	/
Danaid Eggfly *Hypolimnas misippus*	Within TLCP 1. Shrubland/Grassland east of the upstream leading to LT Irrigation Reservoir, which is above LTT 2. Shrubland/Grassland falling within the slopes works extent in NKL	/	Within TLCP 1. Shrubland/Grassland south of LT Quarry 2. Shrubland/Grassland east of the upstream leading to LT Irrigation Reservoir 3. Shrubland/Grassland west of TLC Catchwater 4. Mixed woodland west of TLC Reservoir 5. Channel downstream of TLC Catchwater Tunnel No. 6 Outside TLCP 1. THTFSW 2. CUT in SKW 3. Developed area south of SKW Village Channel	Uncommon. Ngau Ngak Shan, Lung Kwu Tan, Hong Kong Wetland Park, Mount Parker, Cloudy Hill, Lin Ma Hang.	Fellowes *et al*. (2002): LC
Painted Lady *Vanessa cardui*	/	/	Outside TLCP Shrubland/Grassland south of NL Highway	Rare. Widely distributed throughout Hong Kong.	Fellowes *et al*. (2002): LC
Swallowtail *Papilio xuthus*	/	/	Within TLCP 1. Mixed woodland southwest of LT Quarry 2. Shrubland/Grassland east of the upstream leading to LT Irrigation Reservoir 3. Plantation south of TLT Catchwater 4. Shrubland/Grassland west of TLC Reservoir Outside TLCP 1. Shrubland/Grassland south of NL Highway	Rare. Kap Lung, Ma On Shan, Tai Tam, Sha Lo Wan, Kat O, Lung Kwu Tan, Wu Kau Tang, Lung Kwu Chau.	/

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Small Cabbage White *Pieris rapae*	/	/	Outside TLCP Developed area north of SKW Village Channel (C2)	Rare. Shep Mun Kap, Fan Lau, Ngong Ping, Kam Tin, Ho Chung, Luk Keng, Tuen Mun Ash Lagoon.	/
Odonate					
Chinese Hooktail *Ophiogomphus sinicus*	/	/	Within TLCP HSH Irrigation Reservoir	Common. Found mainly in fast-flowing gravel or cobble streams in woodland in the central and east New Territories.	Reels (2019): Dragonfly species of conservation interest
Dingy Dusk-hawker *Gynacantha subinterrupta*	/	/	Outside TLCP Western patch of CUTFSW	Common. Found in well-shaded woodlands. Recorded in Hong Kong Wetland Park, Lantau Island, Ping Shan Chai, Sha Lo Tung and Tai Mo Shan.	Fellowes et al. (2002): LC
South China Grappletail *Heliogomphus scorpio*	/	/	Within TLCP Shrubland/Grassland next to TLC Catchwater	Common. Widely distributed in fast-flowing woodland streams throughout the New Territories.	Fellowes et al. (2002): LC
Guangdong Hooktail *Melligomphus guangdongensis*	/	/	Within TLCP HSH Irrigation Reservoir	Common. Found in woodland streams with substrates of sand and gravel. Population scattered throughout Hong Kong.	Fellowes et al. (2002): GC
Blue Chaser *Potamarcha congener*	/	/	Within TLCP A plantation slope adjacent to MacLehose Trail Section 10 in SKW	Common. Found in small weedy ponds, puddles and marshes. Widely distributed in the New Territories.	Fellowes et al. (2002): LC
Sapphire Flutterer *Rhyothemis triangularis*	/	/	Within TLCP HSH Irrigation Reservoir	Common. Widely distributed in weedy ponds, sluggish rivers and marshes.	Fellowes et al. (2002): LC
Scarlet Basker *Urothemis signata*	Outside TLCP Developed area within the largest temporary works area in SL	/	/	Common. Common in areas with abandoned fish ponds throughout Hong Kong.	Fellowes et al. (2002): LC

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	Within the Project footprint[27]		Outside the Project footprint but within the assessment area		
	Within the aboveground works areas (i.e. outside TLCP)	Outside the aboveground works areas			
Emerald Cascader *Zygonyx iris*	Outside TLCP Channel in SKW Village (C1) falling within the haul road extent in SKW	/	Within TLCP 1. HSH Irrigation Reservoir 2. Watercourse to the western upstream of HSH Irrigation Reservoir (W2) 3. Plantation at LT Quarry 4. Shrubland/Grassland north of MacLehose Trail Section 10 in SKW 5. Mixed woodland south of catchwater in TLC (C5) 6. TLC Reservoir Outside TLCP 1. Branch of channel in SKW Village Channel (C1) 2. Channel in SKW Village (C1) 3. Channel downstream of TLC Reservoir (C3) 4. Mixed woodland south of catchwater in TLT (C6)	Abundant. Widely distributed in moderately clean, rapidly flowing forested streams throughout Hong Kong.	Fellowes *et al*. (2002): PGC
White-banded Shadowdamsel *Protosticta taipokauensis*	/	/	Within TLCP Mixed woodland south of the eastern upstream leading to HSH Irrigation Reservoir	Common. Found on mossy slopes with seepages in woodlands or small shady forest streams. Widely distributed in mature forests with permanent streams throughout Hong Kong.	Fellowes *et al*. (2002): GC
Dancing Shadow-emerald *Idionyx victor*	Outside TLCP Shrubland/Grassland within the slope works extent in SKW	/	Within TLCP 1. Mixed woodland northwest of TLC Reservoir Outside TLCP 1. SKW San Tsuen - CUT 2. Mixed woodland northeast of CUT 3. Shrubland/Grassland northeast of CUT, which is in the vicinity of viaduct and slope works area in SKW	Common. Found high in the forest canopy or over wooded streams. Widely distributed in wooded streams throughout Hong Kong.	Fellowes *et al*. (2002): LC

Species	Location			Rarity and distribution in Hong Kong [1 2 3 4 5 6 7 8 9]	Protection or conservation status [6 7 8 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26]
	Within the Project footprint[27]		Outside the Project footprint but within the assessment area		
	Within the aboveground works areas (i.e. outside TLCP)	Outside the aboveground works areas			
Freshwater community					
Predaceous Chub *Parazacco spilurus*	/	/	Within TLCP Catchwater besides MacLehose Trail Section 10 in SKW (C1) Outside TLCP 1. Watercourse downstream of LT Irrigation Reservoir 2. Watercourse downstream of Left Kau Kwun Hang in SKW (W4)	A widespread species occurring in most unpolluted hill streams in both upper and lower courses.	China Red Data Book: VU
Somanniathelphusa zanklon	/	/	Within TLCP 1. LT Irrigation Reservoir 2. HSH Irrigation Reservoir	Distributed quite widely in the northern and western New Territories and Lantau Island of Hong Kong	Fellowes et al. (2002): GC IUCN Red List of Threatened Species (2023): EN Endemic to Hong Kong
Cryptopotamon anacoluthon	/	/	Within TLCP 1. Watercourse upstream of LT Irrigation Reservoir (W1) 2. Watercourse western upstream of HSH Irrigation Reservoir (W2) 3. Catchwater besides MacLehose Trail Section 10 in SKW (C1) 4. Kam Sha Hang in SKW (W6) 5. Pak Shek Hang in SKW (W8) Outside TLCP 1. Unnamed watercourse 2. A channel in Tsing Chau Tsai	Widely distributed within Hong Kong; recorded throughout the New Territories, Hong Kong and Lantau Islands	IUCN Red List of Threatened Species (2023): VU Fellowes et al. (2002): PGC Endemic to Hong Kong

Species	Location			Rarity and distribution in Hong Kong [1 2 3 4 5 6 7 8 9]	Protection or conservation status [6 7 8 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26]
	Within the Project footprint[27]		Outside the Project footprint but within the assessment area		
	Within the aboveground works areas (i.e. outside TLCP)	Outside the aboveground works areas			
Nanhaipotamon hongkongense	/	/	Within TLCP 1. Watercourse upstream of LT Irrigation Reservoir (W1) 2. HSH Irrigation Reservoir 3. Catchwater in TLT (C6) 4. Left Pak Shek Hang in SKW (W7) Outside TLCP Channel in SKW Village (C1)	Widely distributed within Hong Kong; recorded throughout the New Territories, Hong Kong, Lamma and Lantau Islands	Fellowes et al. (2002): PGC Endemic to Hong Kong
Marine fauna					
Branchiostoma belcheri	Within the seabed works area in TLT	/	Sea opposite to TLT	Recorded in limited sites of Hong Kong. Distributed in eastern waters of Hong Kong.	Endemic to China
Oulastrea crispata	Sea opposite to TLT	/	Sea opposite to NKL	Common. Tolerant to extreme environment, can be found in many places in Hong Kong.	Appendix II of CITES Cap. 586
Guaiagornia sp.	Sea opposite to TLT	/	Sea opposite to NKL	Common. Common in western waters.	Appendix II of CITES Cap. 586
Balanophyllia sp.	Sea opposite to TLT	/	Sea opposite to NKL	Common. Common in western waters.	Appendix II of CITES Cap. 586

Notes:

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4. Corlett *et al*. (2000). Hong Kong vascular plants: distribution and status.
5. Shek (2006). A Field Guide to the Terrestrial Mammals of Hong Kong.
6. Stanton *et al*. (2018). Distribution of *Nanhaipotamon hongkongense* (Shen, 1940) (Crustacea: Brachyura: Potamidae), a freshwater crab endemic to Hong Kong.
7. Stanton & Leven. (2016). Distribution, habitat utilisation and conservation status of the freshwater crab, *Somanniathelphusa zanklon* Ng & Dudgeon, 1992 (Crustacea: Brachyura: Gecarcinucidae) endemic to Hong Kong.
8. Stanton *et al*. (2017). Distribution of *Cryptopotamon anacoluthon* (Kemp, 1918) (Crustacea: Brachyura: Potamidae), a freshwater crab endemic to Hong Kong.
9. Tam *et al*. (2011). The Hong Kong Dragonflies.
10. Convention on International Trade in Endangered Species of Wild Fauna and Flora (2023). Appendices I, II and III.
11. Fellowes et al. (2002). Wild animals to watch: Terrestrial and freshwater fauna of conservation concern in Hong Kong.
    - For conservation status listed by Fellowes et al. (2002), letters in parentheses indicate that the assessment is on the basis of restrictedness in breeding and/or roosting sites rather than in general occurrence.
12. Forestry Regulations, the subsidiary legislation of the Forests and Countryside Ordinance (Cap. 96)

13. Fu & Chin (1992). China Plant Red Data Book – Rare and Endangered Plants.
14. Hu *et al*. (2003). Rare and Precious Plants of Hong Kong.
15. International Union of Conservation for Nature. (2023). The IUCN Red List of Threatened Species. Version 2022-2.
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17. National Forestry and Grassland Administration and the Ministry of Agricultural and Rural Affairs. (2021). List of Wild Plants under the State Priority Protection.
18. National Forestry and Grassland Administration and the Ministry of Agricultural and Rural Affairs. (2021). List of Wild Animals under State Priority Conservation.
19. Protection of Endangered Species of Animals and Plants Ordinance (Cap. 586)
20. Qin *et al*. (2017). Threatened Species List of China's Higher Plants.
21. Reels (2019). An Annotated Checklist of Hong Kong Dragonflies and Assessment of Their Local Conservation Signficance.
22. Wang (1998). China Red Data Book of Endangered Animals: Mammalia.
23. Wild Animals Protection Ordinance (Cap. 170)
24. Wu *et al*. (1988). Illustration of Rare & endangered plant in Guangdong Province.
25. Xing *et al*. (2005). *Begonia hongkongensis* (Begoniaceae), a new species from Hong Kong.
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27. Zheng and Wang. (1998). China Red Data Book of Endangered Animals: Aves.

- There is no aboveground works in TLCP and hence no direct impact on fauna/flora species of conservation importance in TLCP.

Abbreviations:

- Conservation Status: EN = Endangered; GC = Global Concern; LC = Local Concern; NT = Near Threatened; PGC = Potential Global Concern; PRC = Potential Regional Concern; RC = Regional Concern; VU = Vulnerable

9.5 Impact Evaluation for Terrestrial Ecology

9.5.1 Project Descriptions

9.5.1.1 The whole Project consists of 3 sections, including Northern Section (LT to SKW), Central Section (SKW to TLC), and Southern Section (TLC to NL). The Northern Section mainly includes the Lam Tei Quarry Interchange (LTQI) and Lam Tei Tunnel (LTT). The LTQI is required to connect with the existing Kong Sham Western Highway and Yuen Long Highway, as well as the proposed TMB. The Central Section includes the mainline between the northern section and the southern section, as well as the So Kwun Wat Interchange (SKWI) and the So Kwun Wat Link Road (SKWLR). A part of the mainline at this section (between the southern portal of LTT and the northern portal of TLCT) will be in the form of an open highway. SKWI comprises slip roads and elevated viaducts to allow for SKWLR to access with LTT and Tai Lam Chung Tunnel (TLCT). SKWLR will connect the mainline with Tuen Mun Road and So Kwun Wat Road. The current alignment has avoided encroachment upon Tai Lam Country Park and MacLehose Trail, which might occur in the preferred alignment in Feasibility Study stage by the eastern tunnel portal of SKWLR. It has also avoided most of the impact on FSWs when compared with the original alignment.

9.5.1.2 The Southern Section is between TLC and NL through TLT, and includes the land section between TLC and Tuen Mun Road (mainly TLCT and the remaining open highway form along the mainline) and the marine section crossing Ha Pang Fairway, together with an interchange to connect with Tuen Mun Road, and North Lantau Interchange (NLI) which is at the southern end of the Project. The NLI is required to connect with the existing NL Highway and Lantau Link, as well as the proposed TYLL, HKIW-NEL Link, and Road P1. Compared with the original alignment, this alignment could avoid encroachment to TLCP due to southern portal of TLCT and avoid reclamation at NL shore for TLB.

9.5.1.3 The key construction elements of the Project comprise tunnels, a suspension bridge of TLB, reclamation for the northern tower of TLB, viaducts, at-grade roads and buildings for ventilation and administration.

9.5.2 Construction Phase – Terrestrial Direct Impacts

Overall Terrestrial Habitat Loss

Approach of Estimating Habitat loss

9.5.2.1 Direct impact on terrestrial habitats will be imposed by aboveground works of land section of the Project and associated works areas. A conservative approach has been adopted for the estimation of direct terrestrial habitat loss. Firstly, these habitats are considered not available for wildlife use during the entire construction programme, though the commencement of site formation may vary in different locations. Secondly, though viaduct will be supported by piers, all areas covered by the viaduct width on plan are included as part of the permanent direct habitat loss, except the watercourses underneath which will be preserved onsite and part of the eastern patch of CUTFSW underneath the viaduct, where the design has been optimized such that no direct impact would occur.

9.5.2.2 The estimated terrestrial habitat loss is summarized in **Table 9.24**.

Table 9.24 Terrestrial Habitat Loss Arising from the Project

Terrestrial habitats	Approximate size/length of terrestrial habitats within the aboveground works areas of the Project (ha)/(m)				
	Permanent loss	Temporary loss			
	At-grade road, viaduct, tunnel portals, ventilation buildings, administration buildings and slope works areas [1]	Haul road [2]	Temporary works area, magazine sites and barging points	5m Perimeter works areas for at-grade roads, viaduct, tunnel portals and slope works [5]	Subtotal of temporary loss
Agricultural land	/	/	/	/	/
Backshore	0.16ha	/	0.01ha	0.08ha	0.09ha
Channel [2]	257m	/	26m	64m	90m
Developed area	24.60ha	0.14ha	11.35ha	5.36ha	16.85ha
Fung shui woodland	/ [4]	/	/	/ [4]	/ [4]
Mixed woodland	17.54ha	2.42ha	0.98ha	3.14ha	6.54ha
Plantation	13.93ha	1.00ha	2.35ha	2.53ha	5.88ha
Reservoir	/	/	/	/	/
Shrubland/Grassland	16.47ha	0.31ha	3.97ha	1.44ha	5.72ha
Watercourse [3]	164m out of the 357m [3]	None of the 11m [3]	None of the 360m [3]	None of the 125m [3]	None of the 496m [3]
Total area (excluding channels and watercourses)	72.70ha	3.87ha	18.66ha	12.55ha	35.08ha

Notes/Abbreviations

1. At-grade road, viaduct and haul road works overlapping with at-grade road and/or viaduct, as well as slope works will constitute to permanent habitat loss, while the usage of magazine sites, temporary works areas and haul roads not overlapping with at-grade roads and/or viaducts will result in temporary habitat loss. Tunnelling works, including those within TLCP, will be conducted underground hence would not result in any habitat loss under the Project.
2. For haul roads, as the extent of haul roads largely overlaps with the main alignment (i.e. at-grade and viaduct sections) and to avoid double counting the size of habitat loss, only the habitat loss incurred by haul road which is not overlapping with the main alignment is expressed.
3. There will only be direct encroachment onto the ditch near the western portal of SKWLR and watercourses W4, W22, W23 and W24. The channel(s) and/or watercourse(s) downstream of Pak Shek Hang in SKW, TLC Reservoir, TLC and at NL Highway will not be directly impacted.
4. The viaduct will span over the eastern patch of CUTFSW and thus there will neither be permanent nor temporary loss of FSW.
5. A stripe of perimeter works areas from all aboveground works areas is assumed to allow manoeuvre of mechanical equipment. The width is in general 5m unless there is space constraint or it is adjacent to recognized sites of conservation importance such as TLCP, where the width will be adjusted to avoid the perimeter works areas from falling within TLCP.

Permanent Habitat Loss

9.5.2.3 The aboveground works elements constituting direct and permanent habitat loss fall entirely outside TLCP and include the construction of the parts of open highway form of the Project (either at-grade roads or viaduct), interchanges (which comprises slip roads and viaducts), associated cut slopes, portals for tunnels, ventilation and administrative buildings. At-grade road/viaduct sections and slope works areas will encroach on mixed woodland, plantation and/or shrubland/grassland in LT, SKW, SL, TL, TLT and NKL areas. Administrative building in LT falls with a plantation surrounding LT Quarry, and that in NKL will encroach on mixed woodland edge and shrubland/grassland. Ventilation buildings in LT, SKW, SL, TL and TLT will encroach on patches of plantation, shrubland/grassland and/or mixed woodland. There will be direct habitat loss of

around 0.16ha of backshore, 257m of channel, 24.60ha of developed area, 17.54ha of mixed woodland, 13.93ha of plantation, 16.47ha of shrubland/grassland and 164m of watercourse (out of the 357m of which are mostly underneath viaduct and will be preserved onsite) during the construction phase (**Table 9.24**).

9.5.2.4 A small area of FSW (i.e. part of the eastern patch of CUTFSW) is overlapping with the viaduct alignment (about 70m in length) in SKW, for which the design of the viaduct has been adjusted (**Section 2.8.4** refers), including to maximize the clearance distance from ground surface, the gradient of the alignment and the spanning interval distance, to avoid direct encroachment onto this small area of FSW (**Section 9.8.1**), and thus the overlapping extent is not included in the calculation of the size of habitats to be directly impacted.

Temporary Habitat Loss

9.5.2.5 The Project will nonetheless temporarily affect habitats outside TLCP and in locations outside the main alignment but related to construction works, including haul roads for access to the works areas, the magazine sites for storage of explosives, temporary works areas for stockpiling of construction materials/storage of equipment, and barging points. Besides, a stripe of perimeter works areas from all aboveground works areas is assumed to allow manoeuvre of mechanical equipment. Its width is in general 5m, unless there is space constraint or it is adjacent to recognized sites of conservation importance, such as TLCP, where its width will be adjusted to avoid the perimeter works area from falling within TLCP. The explosive magazine sites, temporary works areas and barging points mostly are existing disturbed areas which have been used for similar purposes under other projects or shrubland/grassland and plantation ranked with low ecological value. They will temporarily affect a total of about 0.09ha of backshore, 90m of channel, 16.85ha of developed area, 6.54ha of mixed woodland, 5.88ha of plantation, and 5.72ha of shrubland/grassland (**Table 9.24**). 496m of watercourse falling within these areas with temporary habitat loss will be preserved onsite and no temporary loss of watercourse is anticipated (**Table 9.24**). It is anticipated that only **minor** impact would arise from the temporary loss of 0.09ha of backshore, 90m of channel, 5.88ha of plantation and 5.72ha of shrubland/grassland, while **minor to moderate** impact would arise from the temporary loss of 6.54ha of mixed woodland. The temporary loss of 16.85ha of developed area would only bring about **insignificant** impact.

9.5.2.6 Due consideration has been paid to reduction of additional habitat loss solely arising from the construction of haul road. Overall, the extent of haul road overlaps with that of the main alignment as far as possible, except at the eastern patch of CUTFSW where the viaduct will span over and the haul road will bypass to avoid direct impact on it. The overlapping extent of at-grade road and/or viaduct with haul road has been considered as part of permanent habitat loss, while only the remaining haul roads not able to follow the main alignment will cause temporary habitat loss. With this approach, the temporary habitat loss incurred from the construction of haul roads would be significantly reduced to about 3.87ha in total (**Table 9.24**). Upon to the completion of works, these magazine sites/temporary works areas/barging points/haul roads will be decommissioned and reinstated where feasible. No further habitat loss due to the Project is anticipated. Prior to habitat reinstatement works, controlled decompaction of the upper layer of soil to provide an evenly textured, friable planting medium with sufficient air penetration

and water retention to favour plant growth, will be undertaken to facilitate reinstatement.

Overall Impact Assessment and Ranking

9.5.2.7 The majority of the affected habitat would be developed area and mixed woodland, followed by plantation and shrubland/grassland. They are either evaluated with low or low to medium ecological value. Some of the permanent habitat loss will occur in the vicinity of existing villages which have been subject to incessant anthropogenic disturbance.

9.5.2.8 The permanent loss of about 24.60ha of developed area, which will be replaced by development areas of the Project, would be **insignificant**, whereas impact significance of the loss of around 0.16ha of backshore, 257m of channel, 13.93ha of plantation and 16.47ha of shrubland/grassland evaluated with low ecological value is considered **minor**, owing to their relatively simple floristic composition, low habitat complexity and low abundance of wildlife including those of conservation importance.

9.5.2.9 The mixed woodlands to be directly impacted are mostly located in the vicinity of existing roads and/or villages and have been subject to incessant and intensive disturbance. The flora and fauna species recorded therein mainly comprise locally common and widespread species which are also readily found in other lowland secondary woodlands in Hong Kong. Judging from the floristic composition of the observed mixed woodlands, their canopy and understorey were dominated by light-demanding tree species (e.g. *Daphniphyllum* spp., *Macaranga tanarius* var. *tomentosa* and *Mallotus paniculatus*) but not shade-tolerant tree species indicative of more mature woodlands (e.g. *Cryptocarya* and Fagaceae spp.) in Hong Kong. Tendency of succession to become more mature woodlands was not observed, due to the lack of shade-tolerant tree species with potential overriding the dominance of the light-demanding ones and apparent lack of signs of significant succession to more mature woodlands as noted from the reviewed aerial photos. Thus, only low to medium ecological value is given to the mixed woodland outside TLCP, including those to be directly impacted. **Moderate** impact is expected to arise from the permanent loss of approximately 17.54ha of mixed woodland. The permanent loss of mixed woodland will be mitigated by compensatory woodland planting. While the habitats beneath the viaducts. which are not occupied by the piers, have been conservatively assumed to be permanently lost and the impact will be mitigated as needed, reinstatement will still be provided after construction.

9.5.2.10 As stated in **Section 5.5.8**, due to engineering constraints and geological conditions, it is unavoidable that the Project would clash with or overpass watercourses falling within the aboveground works areas. With the efforts to minimize the impacts, only a ditch and watercourse sections at four locations outside TLCP would be subject to direct impact, removal or diversion involving excavation and construction works. A ditch and four watercourses (i.e. W4, W22, W23 and W24) falling within the aboveground works areas in SKW are in the vicinity of existing village settlements and was subject to effluent discharge by villagers nearby. The diversity of freshwater fauna was relatively low when compared to its upstream sections or other watercourses north of MacLehose Trail Section 10 within TLCP. As such, **minor** and **minor to moderate** impact would arise from the direct impact on the ditch evaluated with low ecological value and W4, W22, W23 and W24 (around 164m in total) evaluated with low to medium

ecological value respectively. To mitigate the impact, the sections of the watercourses to be directly impacted will be diverted to maintain water flow downstream and provide suitable habitats for freshwater and associated fauna. The headstream of W22 will be relocated to maintain rainwater flow downstream. Pre-construction detailed survey on aquatic and water-dependent fauna species of conservation importance will be conducted for the ditch, W4, W22, W23 and W24 to be directly impacted and translocation exercise will be performed prior to watercourse diversion and site formation works, if aquatic and water-dependent fauna species of conservation importance is identified in the pre-construction detailed survey.

9.5.2.11 The impact significance of the temporary loss of about 16.85ha of developed area, which will be readily reinstated, would be **insignificant**, whereas that of the temporary loss of around 0.09ha of backshore, 90m of channel, 5.88ha of plantation and 5.72ha of shrubland/grassland evaluated with low ecological value is considered **minor**, owing to their relatively simple floristic composition, low habitat complexity, and low abundance of wildlife recorded, including those of conservation importance. A summary of the condition of mixed woodlands to be directly impacted, including those to be temporarily affected, is given in **Section 9.5.2.9**. The temporary loss of 6.54ha of mixed woodland is considered **minor to moderate**. Upon the completion of works, reinstatement will be conducted for the areas to be temporarily affected. Mixed woodland to be temporarily affected will be reinstated onsite where feasible, or compensated at the compensatory woodland planting site if reinstatement is found not feasible with justification.

Harm/Mortality to Species of Conservation Importance/Wildlife

9.5.2.12 Within the aboveground works areas, flora species of conservation importance and fauna species of conservation importance of comparatively lower mobility recorded and expected to be directly impacted include *Aquilaria sinensis*, *Diospyros vaccinioides*, *Gnetum luofuense*, *Ixonanthes reticulata*, *Nepenthes mirabilis* and Hong Kong Cascade Frog.

Flora Species of Conservation Importance

9.5.2.13 The locations of the aforesaid flora species of conservation importance are listed in **Table 9.23**. They are all common and widely distributed in Hong Kong and only a small number of individuals/patches of *Aquilaria sinensis*, *Diospyros vaccinioides*, *Gnetum luofuense*, *Ixonanthes reticulata* and *Nepenthes mirabilis* is anticipated to be directly affected. The impact on these flora species of conservation importance is anticipated to be **minor to moderate**, if unmitigated. As the Project adopts full tunnel option within the area of TLCP, no direct impact will be exerted on the flora species of conservation importance recorded within TLCP (implications to TLCP also refer to **Section 9.5.4.1**). A pre-construction detailed vegetation survey with a focus on plant species of conservation importance, including those recorded in the literature review and ecological surveys of this EIA study, will be conducted within and in the vicinity of the aboveground works areas to identify and count the number of the individuals of plant species of conservation importance to be potentially directly impacted. The identified individuals should be labelled onsite. In the case of unavoidable direct impact on the plant species of conservation importance, transplantation should be implemented to minimize the resulting impact, should onsite preservation be deemed impractical or unfeasible. For climber species (i.e. *G. luofuense* and *N.*

mirabilis), in the case that onsite preservation and transplantation are considered not feasible during the detailed design stage, seedling planting of both species as a compensation measure would be considered and implemented where appropriate.

9.5.2.14 Direct encroachment onto FSW habitat has been avoided by alignment and viaduct design. The eastern patch of CUTFSW will be spanned over by the viaduct. With reference to individual tree survey conducted in the eastern patch of CUTFSW, 8 trees of *Ixonanthes reticulata* ranging from 11 to 22m will be in direct conflict with the viaduct due to the topographic elevation of their locations (**Appendix 11.1** under **Section 11**). Felling of these 8 individual trees of *I. reticulata* will be unavoidable, not only due to their conflict with the viaduct above, but also because of their low "Suitability for Transplanting" based on preliminary assessment at this stage (**Appendix 11.1** under **Section 11**). Owing to their mature size, as well as the difficulty of transplanting tree(s) on inaccessible areas, such as steep slopes and/or areas without proper vehicular/machinery access, transplantation is not considered feasible and compensatory planting of *I. reticulata* will be undertaken within and/or in the vicinity of CUTFSW as far as practicable.

Fauna Species of Conservation Importance

9.5.2.15 The relatively less mobile Hong Kong Cascade Frog was recorded in the mixed woodland adjacent to the directly impacted watercourse within the western portal of SKWLR (i.e. W4), ventilation building and slope works extent in SKW, and the potential impact on this species of conservation importance is considered as **minor to moderate** if without mitigation. A pre-construction detailed survey for aquatic and water-dependent fauna species of conservation importance, including but not limited to Hong Kong Cascade Frog, will be conducted at the ditch, W4, W22, W23 and W24 to update their abundance and distribution. Should any aquatic or water-dependent fauna species of conservation importance be recorded during the pre-construction survey, translocation of aquatic or water-dependent fauna species of conservation importance would be required and a translocation proposal detailing the translocation methodology, recipient site and monitoring programme should be submitted to the AFCD for agreement in advance of any translocation works. The recipient site(s) would preferably be those where records of aquatic or water-dependent fauna species are known and in the vicinity of the ditch and watercourses to be directly impacted as close as possible. Preliminarily proposed recipient site includes watercourse W7, where relatively more aquatic and water-dependent fauna species were recorded during the ecological survey stage (e.g. Hong Kong Cascade Frog and other amphibian and freshwater crab species of conservation importance) and which is subject to further review and confirmation in the translocation plan to be prepared, should aquatic and water-dependent fauna species of conservation importance be recorded in the ditch and sections of W4, W22, W23 and W24 to be directly impacted during the pre-construction detailed survey for aquatic and water-dependent fauna species of conservation importance to be conducted.

9.5.2.16 Other terrestrial fauna species of conservation importance within the Project footprint, except cave-dwelling bat species inside the identified catchwater tunnels, include Red Muntjac, Leopard Cat, Black-crowned Night Heron, Little Egret, Eastern Buzzard, Greater Coucal, Lesser Coucal, White-throated Kingfisher, Rufous-capped Babbler, Siberian Blue Robin, Black-throated Laughingthrush, Four-clawed Gecko, Danaid Eggfly, Scarlet Basker and Emerald Cascader. While

bird, butterfly and odonate species of conservation importance are relatively more mobile and can readily use the same type of or similar habitat nearby and none of them exhibited fidelity to the habitats where they were found, the entry of mammal and reptile species, including those of conservation importance, to the construction sites will be prevented by erection of construction hoardings around the aboveground works areas properly and thus no direct impact will be exerted on them. As the Project adopts full tunnel option within the area of TLCP, no direct impact will be exerted on the fauna species recorded in the extent of TLCP, including those of conservation importance, within the assessment area (implications to TLCP also refer to **Section 9.5.4.1**). Thus, it is not expected that they will be significantly affected by the construction works. The impact on the terrestrial fauna species of conservation importance recorded, except cave-dwelling bat species inside the identified catchwater tunnels, is considered **minor**.

9.5.2.17 Upon to the adoption of suitable measures, the magnitude of any unavoidable direct impact to be imposed on plant and amphibian species of conservation importance will be mitigated to a **minor** level.

9.5.3 Construction Phase – Terrestrial Indirect Impacts

9.5.3.1 Terrestrial indirect impacts arising from the construction phase of the Project are described below.

Habitat Fragmentation during Construction

9.5.3.2 Fragmentation is the appearance of discontinuities in habitat that render it less attractive to flora or fauna or isolate populations of a species, potentially leading to reduced viability of a population. Habitat fragmentation is largely minimized by the adoption of tunnelling design in major parts of the alignment and considerable length of viaducts in both the main alignment and slip roads. Tunnel sections would not affect any linkage or connectivity in the habitats above their alignment, including during construction. During the construction phase, the locations of piers will be cleared for vegetation to facilitate construction works. For the areas between the piers, vegetation will be cleared on as-needed basis if space is required for manoeuvring or haul roads. While haul roads would not pose obstruction to fauna after working hours, the remaining vegetation along viaduct alignment would still provide passage for fauna during construction.

9.5.3.3 Habitats within the major aboveground works areas located in LT, SKW, SL, TL, TLT and NKL will be directly impacted due to slope cutting, site formation works, construction of at-grade roads, interchanges, slip roads, tunnel portals, bridge tower, administration buildings, ventilation buildings, bus-bus interchange and/or associated facilities. Though these aboveground works areas have comparatively higher potential to cause fragmentation impact, they only account for small proportion of the Project footprint and are spatially segregated from each other. They are also strategically located on the edge of the habitats to be directly impacted, and thus do not considerably impair habitat and ecological connectivity. Besides, no notable ecological corridor or flight path was noted across the aboveground works areas during the ecological surveys. Alternative passages for fauna, such as the habitats above tunnel alignments and areas beneath viaducts as alternative for the aboveground works areas of tunnel portals and interchanges respectively, are also available nearby. Thus, habitat fragmentation impact in LT, SKW, SL, TL, TLT and NKL during construction phase is considered **minor**.

9.5.3.4 Although some of the aboveground works areas are located close to boundaries of TLCP and would be directly impacted during the construction phase, they fall outside TLCP and the aboveground works will not result in fragmentation impact on habitats within TLCP. Habitats and potential ecological corridor within TLCP will not be fragmented and wildlife may still adopt similar trails to access their habitats within TLCP.

Construction Disturbance

Aboveground Construction Disturbance

9.5.3.5 The construction of interchanges (comprising slip roads and viaducts) at LT (LTQI), SKW, SL (SKWI), TLC, TLT and NL (TLTI, TLB and NLI), associated cut slope works, administration and ventilation buildings and portals of tunnels as well as construction and use of haul roads, temporary works areas and magazine sites would increase human activities, noise disturbance from traffic and construction machinery, and dust generated during construction activities, indirectly impacting nearby habitats and the fauna, including those within TLCP. Potential impacts include deterred animal usage in habitats in the vicinity of the aboveground works areas and subsequent decrease in wildlife density. Given the proximity to the existing developed areas, any significant increase in disturbance impacts from the construction activities is not anticipated. Nonetheless, while complete avoidance of construction disturbance is impractical, following the general disturbance minimization approach listed in **Section 9.8.2.16** to **Section 9.8.2.18**, the increase in disturbance during construction phase is considered **insignificant**.

Ground-borne Vibration on the Identified Bat Roosts inside Catchwater Tunnels

9.5.3.6 The Project will involve the construction of tunnels. The primary method of construction for the tunnels is expected to be by drill and blast method which utilizes controlled blasting. While tunnelling works will be undertaken in and contained within underground works areas, the impact of ground-borne vibration due to blasting works on catchwater tunnels with known bat roosts is required to be explored. Under the Project, there are three major tunnels to be constructed, namely LTT, SKWLR and TLCT (North Section and South Section). Five bat roosts, all inside existing catchwater tunnels, were recorded or noted within or near the assessment area, i.e. TLC Catchwater Tunnel Nos. 1, 5, 6, 7 and 8. As described in previous sections of literature review (**Section 9.2.3.11**, **Section 9.2.3.14** and **Section 9.2.3.15**) and ecological baseline (**Section 9.4.3.4**), these catchwater tunnels are of various significance as bat roosting ground, particularly TLC Catchwater Tunnel Nos. 1, 7 and 8 with records of juveniles. The tunnels to be constructed are generally aligned away from the catchwater tunnels, except TLC Catchwater Tunnel No. 6, which will unavoidably be located above the tunnelling works. Ground-borne vibration resulting from the tunnelling works near the foregoing catchwater tunnels, if unmitigated, may cause disturbance to the roosting bats therein, particularly during the nursing/breeding and overwintering months when the bats are relatively more sensitive.

9.5.3.7 On the other hand, these catchwater tunnels are also sensitive receiver of ground-borne vibration according to WSD's guidelines. Ground-borne vibration is often expressed in terms of peak particle velocity (PPV) (e.g. in the unit of mm/s). A ground-borne vibration limit of 13mm/s has been imposed on their catchwater

tunnels by WSD when there is construction works including blasting nearby. Therefore, in the construction of LTT, SKWLR and TLCT (South Section) near the concerned catchwater tunnels, the maximum ground-borne vibration level at these bat roosts inside catchwater tunnels would also be 13mm/s, which is lower than the PPV level under normal blasting works without such WSD requirements (as a reference, vibration limit for railway structure due to blasting vibration is 25mm/s (MTR Corporation Limited 2023)). Complying with ground-borne vibration limit set by WSD, the potential ground-borne vibration impact on the roosting bats would be significantly reduced. Nevertheless, these bat roosts would still be subject to transient ground-borne vibration (i.e. 13mm/s at maximum) impact caused by blasting during the construction of tunnels under the Project.

9.5.3.8 An extensive search for relevant publicly available literature about the effect of blasting on caves with roosting bats or hibernacula was made. Most of the reviewed literature reported empirical data collected from monitoring of bat roosts near or at quarries with on-going blasting, while only limited studies involved experiments or trials to test the responses of bats upon to blasting with different magnitudes.

9.5.3.9 The measured ground-borne vibration levels reported from these studies, where significant disturbance to a concerned bat roost/hibernaculum was absent, vary and range from 6.1mm/s (Martin 2018) to 12.2mm/s (Martin 2012). Arbitrary ground-borne vibration limits imposed on capping ground-borne vibration suggested in the reviewed literature were 2.54mm/s to hibernating bats (Besha 1984) and 10mm/s (Martin 2012). A more frequently reported level of ground-borne vibration without significant impact on bat roosts/hibernacula is near 6mm/s (Besha 1984; Heggies SLR, undated; Martin 2018).

9.5.3.10 Though ground-borne vibration level ranging from 10 to 12.2mm/s were reported not causing disturbance to roosting bats, a conservative approach will be adopted and the ground-borne vibration level for works near the catchwater tunnels will be further minimized and controlled below 6mm/s to address potential impacts on roosting bats. To ensure practicability and effectiveness of the selected ground-borne vibration limit, a robust and adaptive monitoring programme will be implemented (see **Section 9.8** on mitigation measures and EM&A Manual).

9.5.3.11 **Tai Lam Chung Catchwater Tunnel Nos. 1, 5 & 7** – These three catchwater tunnels are far away from the alignment of the Project (the shortest distances between the main alignment and TLC Catchwater Tunnels Nos. 1, 5 and 7 are over 1300m, over 400m and over 800m respectively). Considering the distance between these catchwater tunnels and tunnels of the Project to be constructed, including LTT, SKWLR and TLCT (South Section) and the experience gained under similar tunnelling projects in Hong Kong, the predicted ground-borne vibration levels would be about 0.42mm/s, 1.6mm/s and 0.8mm/s respectively even if a full charge weight was adopted during the blasting activity. It is anticipated that the potential impact of ground-borne vibration to the roosting bats inside TLC Catchwater Tunnel No. 5 is **minor**, while that to TLC Catchwater Tunnel Nos. 1 and 7 is considered **insignificant**, in the absence of mitigation.

9.5.3.12 **Tai Lam Chung Catchwater Tunnel No. 6** – The major source of ground-borne vibration impact on the roosting bats inside TLC Catchwater Tunnel No. 6 arises from the excavation of TLCT (South Section) by drill and blast method. Given all the constraints as stipulated in **Section 2.6.5** about alignment selection, the

alignment of TLCT (South Section) would pass underneath and inevitably cross the alignment of TLC Catchwater Tunnel No. 6 perpendicularly. With the effort in maximizing the separation of TLCT (South Section) and TLC Catchwater Tunnel No. 6, the vertical distance between TLCT (South Section) and TLC Catchwater Tunnel No. 6 has been increased from the original 6m to approximately 20m, which is the maximum practicable vertical separation. It is noted from the bat roost surveys that the abundance of bats recorded in TLC Catchwater Tunnel No. 6 in 2021 to 2023 ranges from 4 to fewer than 40. Compared to other catchwater tunnels known to support hundreds and even thousands of bats in Hong Kong, TLC Catchwater Tunnel No. 6 considerably supports far fewer bats, regardless of seasonal variation. Besides, no sign of breeding or nursery activities was noted and the overall ecological value of TLC Catchwater Tunnel No. 6 is evaluated as low to medium (**Table 9.13**). In view of the foregoing and availability of alternative roosting sites (e.g. TLC Catchwater Tunnel Nos. 1, 5 and 7) within and near the assessment area, the significance of the unmitigated ground-borne vibration impact on the roosting bats inside TLC Catchwater Tunnel No. 6, based upon the ground-borne vibration limit of 13mm/s for catchwater tunnels imposed by WSD, are evaluated as "**minor to moderate**". Mitigation is recommended. Meanwhile, the noise and ground-borne vibration produced from other construction works inside TLCT (South Section) not involving blasting are expected to be far less than that due to blasting. The impact of post-blasting construction works is anticipated to be **insignificant** to the bats roosting inside TLC Catchwater Tunnel No. 6.

9.5.3.13 **Tai Lam Chung Catchwater Tunnel No. 8** – The major source of ground-borne vibration impact on the roosting bats inside TLC Catchwater Tunnel No. 8 arises from the excavation of LTT and the tunnel section of SKWLR by drill and blast method. The length of TLC Catchwater Tunnel No. 8 is approximately 480m, while its western and eastern portals are about 115m and 570m from the nearest point of LTT (i.e. near the southern portal of LTT) respectively. The range of ground-borne vibration at TLC Catchwater Tunnel No. 8, resulting from the adoption of a combination of drill and blast method for the majority of LTT and SKWLR and drill and break method near the southern portal of LTT and SKWLR, would be lower than 13mm/s. In the absence of mitigation and in view of the consistently observed population of Leschenault's Rousette therein (approximately 350-500 individuals during the ecological survey stage and **Section 9.4.3.5** refers), the magnitude of the unmitigated ground-borne vibration impact on the roosting bats inside TLC Catchwater Tunnel No. 8, no matter in non-overwintering season or overwintering season, is evaluated as **minor to moderate** based upon the ground-borne vibration limit of 13mm/s for catchwater tunnels imposed by WSD. Mitigation is recommended. Meanwhile, the noise and ground-borne vibration produced from other construction works inside LTT and SKWLR not involving blasting are expected to be far less than that due to blasting. The impact of post-blasting construction works is anticipated to be **insignificant** to the bats roosting inside TLC Catchwater Tunnel No. 8.

Light Glare Impact

9.5.3.14 During the construction phase, artificial lighting will be deployed within and in the vicinity of the aboveground works areas for illumination purpose. Light glare impact on nearby mixed woodland, plantation and shrubland/grassland, including those within TLCP, may affect the distribution and behaviour of nocturnal

terrestrial mammals, birds and herpetofauna. Nocturnal bird species of conservation importance which were more frequently recorded within the assessment area during the ecological surveys include Black-crowned Night Heron and Collared Scops Owl. Both outside and within TLCP, Collared Scops Owls were recorded in mixed woodland and shrubland/grassland habitats both within and outside the aboveground works areas. Black-crowned Night Heron can be found in urban areas, whereas Collared Scops Owl is known to occur in gardens and city parks (Carey *et al*. 2001), and hence could tolerate artificial lighting to a certain extent. Both species did not apparently rely heavily on the habitats to be directly impacted and may still forage in the remaining shrubland/grassland and mixed woodland habitats nearby during the construction phase. For other light-sensitive and nocturnal fauna species recorded in TLCP, they are located some distances away from the aboveground works areas and the construction lightings there. Besides, there are existing light sources nearby and thereby the nocturnal mammal and herpetofauna species, including those of conservation importance, are likely accustomed to the impact to be posed by artificial light sources. The potential impact on these species due to artificial lightings is ranked as **minor**. Specific mitigation measure is not required. The potential impact of lightings could be further minimized by orienting lightings towards target areas with lower fauna usage only.

Water Quality Impact and Groundwater Drawdown

Water Quality Impact

9.5.3.15 During the construction phase, water quality impact may arise from construction runoff, sewage from site workforce, suspended solid induced by tunnelling and underground works, and dredging and filling works for the reclamation at TLT as detailed in **Section 5**. Potential water pollution sources during the construction phase of the Project are given in **Section 5.6.2**.

9.5.3.16 Potential water pollution sources from construction site run-offs and construction activities are detailed in **Section 5.5.2**. Furthermore, the construction of ventilation buildings and administration buildings by open cut excavation method is described in **Section 5.5.5**. Sewage generated by sanitary facilities (i.e. chemical toilets) provided for the onsite construction workforce containing high levels of BOD_5, ammonia and *E. coli* counts, release of construction waste containing high concentrations of suspended solids and elevated pH, groundwater from potential contaminated areas and contaminated site run-off, activities at the barging point (e.g. uncontrolled surface run-off containing high concentrations of suspended solids, oil, grease and chemicals) and accidental spillage of chemicals like engine oil and lubricants entering waterbodies may result in water quality impact. The adverse impacts due to construction site-run off containing high concentrations of suspended solids, in turn indirectly affecting turbidity, discolouration and pH levels of nearby waterbodies, could be minimized with the implementation of good construction site practices as described in **Section 5.5**.

9.5.3.17 With these mitigation measures such as providing adequate chemical toilets as described in **Section 5.11** in place, no adverse water quality impacts are anticipated.

Groundwater Drawdown

9.5.3.18 The proposed drill and blast tunnelling works which may result in groundwater infiltration, groundwater table drawdown, with secondary effects in ground

settlement and dewatering of surface waterbodies (i.e. LT Irrigation Reservoir, HSH Irrigation Reservoir, TLC Reservoir and nearby streams) are discussed in **Section 5.5.4**. However, as the drill and blast tunnel section would be in granite stratum and with sufficient depth below ground, together with the good practices and mitigation measures as described in **Section 5.10**, adverse impacts from the change in groundwater level and suspended solids would be **insignificant**.

9.5.4 Potential Construction Phase Impacts on Recognized Sites of Conservation Importance, Important Habitats, Roosting Ground and Species of Conservation Importance on Terrestrial Ecology

Recognized Sites of Conservation Importance

9.5.4.1 Recognized sites of conservation importance identified within or in the vicinity of the assessment area include "CA", TLCP and SLS SSSI. All aboveground works areas have avoided direct impact on recognized sites of conservation importance. There will be no aboveground works or loss of natural habitats within TLCP during the construction phase of the Project. The footprint of the viaducts and aboveground works areas located nearer TLCP are relatively disturbed and no notable ecological corridor or flight path was noted under the study. Meanwhile, "CA" and SLS SSSI are situated at around 350m and 600m from the nearest aboveground works areas, i.e. slope works in LT and Pillar Point magazine site respectively. Besides, the Pillar Point magazine site had been partially formed by other previous projects and hence the works required for this magazine site would be relatively minor. During the construction phase, indirect disturbance posed to the recognized sites of conservation importance would be temporary and it is anticipated that based on the distance between the recognized sites of conservation importance and the aboveground works areas, the construction disturbance impact on TLCP would be **minor**, while that to "CA" and SLS SSSI would be **insignificant**.

Important Habitats

9.5.4.2 Important habitats within or in the vicinity of the assessment area include SLS Butterfly Habitat, FSWs in SKW and MW Egretry, Day Roost and Night Roost. Indirect impacts on them may arise from the dust generated from construction and increase in human disturbance such as noise and light glare. FSWs in SKW were not found supporting substantial numbers of fauna, whereas MW Egretry, Day Roost and Night Roost is situated at 1.5km away from the mainline of the Project (i.e. TLB) and SLS Butterfly Habitat is located at 700m away from the Pillar Point magazine site. The construction disturbance impact on FSWs in SKW is considered **minor**, while that to SLS Butterfly Habitat and MW Egretry, Day Roost and Night Roost is considered **insignificant**.

Roosting Grounds

9.5.4.3 TLC Catchwater Tunnel Nos. 5, 6 and 8 are the identified roosting grounds within the assessment area. Aside from the abovementioned types of construction disturbance, air-borne noise will be produced by the at-grade construction works and drill and blast tunnelling method to be adopted for the construction of LTT, SKWLR and TLCT respectively. While air-borne noise impact on TLC Catchwater Tunnel Nos. 5 and 6 is not anticipated from the underground drill and blast works for TLCT (South Section), the existing topography will screen TLC Catchwater Tunnel No. 8 from the air-borne noise produced by the at-grade

construction works near the southern portal of LTT and SKWLR. As air-borne noise dissipates at a much greater rate than ground-borne vibration over distance, the impact of air-borne noise to TLC Catchwater Tunnel Nos. 6 and 8 is considered **insignificant**, while that to TLC Catchwater Tunnel No. 5 is assessed as **negligible**. The impact of ground-borne vibration to the identified roosting bats inside TLC Catchwater Tunnel Nos. 1, 5, 6, 7 and 8 have been assessed in **Section 9.5.3.6** to **Section 9.5.3.13**.

Species of Conservation Importance Other than Cave-dwelling Bat Species Found inside Catchwater Tunnels

9.5.4.4 The potential impact on flora species of conservation importance during the construction phase has been described and evaluated in **Section 9.5.2.13** above.

9.5.4.5 The fauna species of conservation importance recorded within and/or in the vicinity of the aboveground works areas may be indirectly impacted by construction disturbance. Outside TLCP, the fauna species of conservation importance recorded within or in the vicinity of the aboveground works areas include Japanese Pipistrelle, Short-nosed Fruit Bat, Black-crowned Night Heron, Black-throated Laughingthrush, Greater Coucal, Black Kite, Collared Scops Owl, White-throated Kingfisher, Chinese Bullfrog, Hong Kong Cascade Frog, Lesser Spiny Frog, Romer's Tree Frog, Four-clawed Gecko, Danaid Eggfly, Swallowtail, Dancing Shadow-emerald, Emerald Cascader, *Parazacco spilurus* and *Nanhaipotamon anacoluthon*. Those recorded within TLCP include Japanese Pipistrelle, an unidentified bat species, Pallas's Squirrel, Black-crowned Night Heron, Rufous-capped Babbler, Siberian Blue Robin, Hong Kong Cascade Frog, Blue Chaser and Emerald Cascader, but they were recorded outside the aboveground works areas and will not be directly impacted.

9.5.4.6 Japanese Pipistrelle, an unidentified bat species, Short-nosed Fruit Bat, Pallas's Squirrel, Black-crowned Night Heron, Black-throated Laughingthrush, Greater Coucal, Rufous-capped Babbler, Siberian Blue Robin, Black Kite, Collared Scops Owl, White-throated Kingfisher, Four-clawed Gecko, Danaid Eggfly, Swallowtail, Blue Chaser, Dancing Shadow-emerald and Emerald Cascader are relatively mobile and are free to utilize habitats of the same kind in the surroundings. The impact of construction disturbance to them will be temporary and **minor**.

9.5.4.7 Chinese Bullfrog, Hong Kong Cascade Frog, Lesser Spiny Frog, Romer's Tree Frog and *Nanhaipotamon anacoluthon* exhibit a certain degree of dependence on aquatic or riparian habitats, whereas *Parazacco spilurus* inhabits aquatic environment. All at-grade roads/viaducts/haul roads will avoid direct encroachment onto channels and/or watercourses, except the ditch and watercourse W4 near the western portal of SKWLR and watercourses W22, W23 and W24. Thus, it is anticipated that Chinese Bullfrog, Hong Kong Cascade Frog, Lesser Spiny Frog, Romer's Tree Frog and *N. anacoluthon* recorded in habitats other than that near the western portal of SKWLR will only be temporarily affected by construction disturbance. It is not anticipated that the increase in disturbance during the construction phase would severely impair their survival and habitat usage. The impact of construction disturbance to them will be temporary and **minor**. The potential impact on Hong Kong Cascade Frog, which was recorded in mixed woodland near the western portal of SKWLR, has been discussed in **Section 9.5.2.15**.

9.5.5 Operational Phase – Terrestrial Direct Impacts

9.5.5.1 Terrestrial direct ecological impact during operational phase would be the habitats to be impacted directly during the construction, to be occupied by the Project footprint and to be turned into permanent habitat loss in operational phase. This is more significant for the habitats originally covered by vegetation and of least significance for developed area which will be replaced by the same habitat.

9.5.5.2 For viaduct, the piers will occupy ground surface but the areas beneath the viaducts will be reinstated where feasible after construction, subject to operation need. The exception is the part of the eastern patch of CUTFSW, where the viaduct has been designed to span over to retain the FSW, and thus its preservation has been confirmed. Reinstatement of aboveground works areas beneath viaduct will thus be subject to further investigation during the detailed design and construction stage. Direct impact on TLCP, meanwhile, will also be avoided during the operational phase. The aboveground works areas to be physically occupied by the structures and ancillary facilities of the Project (i.e. at-grade roads, interchanges, ventilation buildings and administration areas, cut slopes and tunnel portals) will be permanently lost.

9.5.6 Operational Phase – Terrestrial Indirect Impacts

Operational Disturbance

Noise Disturbance

9.5.6.1 During the operational phase, noise along the tunnel sections will be contained but noise due to traffic on open highway may impose potential disturbance to nearby habitats, including the mixed woodland, plantation and shrubland/grassland within and outside TLCP and fauna therein, and roosting ground, including the bat roost grounds within the assessment area. However, in some locations, such as SKW and NKL, landscape areas along open highway will partly screen off the noise from traffic. Furthermore, the interchanges are mainly located at the edge of developed area, mixed woodland, plantation and shrubland/grassland to be directly impacted. Besides, constant traffic and disturbance have been in place in the habitats within the aboveground works areas, including the area of TLCP near the tunnel portals, administration building and ventilation building. As summarized in **Section 4.5.5** and **Section 4.5.8**, no adverse road traffic noise impact is expected to arise during the operational phase. The resulting noise disturbance impact is considered **minor**.

Ground-borne Vibration Disturbance

9.5.6.2 The ground-borne vibration posed by traffic may also potentially cause disturbance to the identified roosting grounds, i.e. TLC Catchwater Tunnel Nos. 1, 5, 6, 7 and 8. The road sections nearest to them are all tunnel sections, i.e. LTT, SKWLR and TLCT. However, it is expected that the ground-borne vibration caused by the inflated wheels of vehicles in tunnels would be far less than that due to blasting during the construction phase. The resultant ground-borne vibration disturbance impact is considered **minor**.

9.5.6.3 Maintenance works may be required inside LTT, SKWLR and TLCT during the operational phase. However, compared to the drill-and-blast for tunnelling works, the induced ground-borne vibration would be much insignificant than that generated by drill-and-blast method the impact of ground-borne vibration posed by maintenance works during the operational phase is considered **insignificant**.

Therefore, adverse ground-borne vibration impact due to the aforesaid maintenance works during operational phase is not anticipated.

Light Glare

9.5.6.4 During the operational phase, there will be more artificial lighting than before construction (e.g. lighting along open highway sections, interchanges and tunnel portals, as well as headlights on vehicles) and potentially impose light glare disturbances to nearby habitats, including the mixed woodland, plantation and shrubland/grassland within TLCP, which are adjacent to these open highway sections, and affect the distribution and behaviour of nocturnal terrestrial mammals, birds and herpetofauna. Given the artificial lightings will be installed outside and away from TLCP, potential light glare impact on the habitats and terrestrial fauna within TLCP is considered **insignificant** during the operational phase. The lighting design will be further reviewed during the detailed design phase to avoid potential glare impacts on TLCP.

9.5.6.5 For tunnel sections (i.e. LTT, SKWLR and TLCT), other than the associated portals, light will be fully contained by the tunnels and there will be no light glare issue. TLB will be constructed over marine waters and thus the lighting along TLB has little influence on terrestrial nocturnal fauna.

9.5.6.6 For open highway sections and interchanges outside TLCP, those LT area (LTQI and associated slip roads, the northern portal of LTT), part of SKW area (western portal of the tunnel section of SKWLR), and TLT area (TLTI and associated slip roads, northern landing of TLB) are located near existing development areas and infrastructures (e.g. LT Quarry and Tuen Mun Road) and would be of lower concern, as the nearby habitats currently have already been subject to influence of existing lighting and light sensitive fauna might have already avoided these areas. The potential impact of artificial lightings in habitats near these areas is ranked as **insignificant**.

9.5.6.7 Concerns would be on NL (NLI and southern landing of TLB), and part of SKW area and SL area (i.e. the Central Section between SKW and TLC, including the southern portal of LTT, the eastern portal of tunnel section of SKWLR, SKWI and associated slip roads, and the open highway of mainline of the Project from SKW via SL to TLC). These two areas have few existing large-scaled infrastructures and have more existing natural habitats. The habitat use by nocturnal fauna is expected to be more frequent.

9.5.6.8 Increase in artificial lightings will potentially affect the behaviour and distribution of nocturnal animals in habitats near the aboveground structures, including FSW, mixed woodland, plantation and shrubland/grassland. Nocturnal fauna species of conservation importance which are more frequently recorded within the assessment area during the ecological surveys include Black-crowned Night Heron and Collared Scops Owl. Outside TLCP, Collared Scops Owls were recorded in mixed woodland and shrubland/grassland habitats both within and outside the aboveground works areas. Black-crowned Night Heron can be found in urban areas, whereas Collared Scops Owl is known to occur in gardens and city parks (Carey *et al*. 2001), and hence could tolerate some artificial lightings. Both species did not appear to rely heavily on the habitats to be directly impacted and may still forage in the remaining shrubland/grassland and mixed woodland nearby during the operational phase. The potential impact on these species due to artificial

lightings is ranked as **minor**. Specific mitigation measure is not required. Light glare will also be partly screened by landscape areas in SKW and NL. The potential impact of lightings could be further minimized by orienting lightings towards target areas with lower fauna usage only.

Habitat Fragmentation during Operation

9.5.6.9 In the present study, while there is no major animal movement recorded near the aboveground works areas which are all outside TLCP, there are potential fragmentation impacts due to loss of wooded areas, comprising plantation and mixed woodlands, at these locations that currently provide potential ecological corridor function for mobile fauna, in particular mammals, but will be occupied by Project elements (portals, interchanges, at-grade roads, etc.) during the operational phase. Besides, the flight path of ardeids might also be potentially affected by the proposed TLB.

Fragmentation Impact on Terrestrial Habitats

9.5.6.10 The potential habitat fragmentation impact during the operational phase will be similar to that during the construction phase, but of lower magnitude as the aboveground works areas other than those occupied by the structures will be reinstated as far as practicable. The aboveground Project elements, including tunnel portals, ventilation and administration buildings, viaducts, at-grade roads, interchanges and slip roads, etc., in LT, SKW, SL, TL, TLT and NKL areas are all located outside TLCP and at the edge of developed area, mixed woodland, plantation and shrubland/grassland, and would not cause significant fragmentation impact. For the tunnel sections, they will not affect any linkage or connectivity of the habitats. While for the viaduct sections, the aboveground works areas beneath the viaducts will be reinstated as far as practicable after construction. The areas between the piers and underneath the viaducts will generally not be occupied where boundary fence is not required, hence allowing the movement of wildlife underneath the viaducts. Any fencing for individual facilities (e.g. plant rooms and viaduct piers) would be small in scale and separately located, and would not cause adverse effects on any wildlife passing the areas. Fauna, including those of conservation importance, are still able to access their habitats. Habitat fragmentation impact during operation phase is therefore considered **minor**.

9.5.6.11 Upon to direct encroachment onto a ditch and sections of watercourses within the aboveground works areas in SKW (i.e. W4, W23 and W24) and SL (i.e. W22), watercourse diversion will be required and the upstream and downstream sections of W4, W23 and W24 will be connected by the future diversion section with green channel design elements to be incorporated. The upstream section of W22 will be diverted to maintain the flow of surface runoff downstream and green channel design will also be adopted in the section to be diverted as far as practicable. Upon to completion of watercourse diversion and reconnection of water flow, fragmentation impact on the watercourses is not anticipated.

Barrier Effect and Flight-lines and Foraging Habitats of Ardeids

9.5.6.12 No egretry was identified within the assessment area and MW Egretry, Day Roost and Night Roost is situated at around 1.5km to the northeast of the mainline of the Project (i.e. TLB). Making reference to the ardeid flight-line survey results, only a small percentage of the ardeids at MW Egretry, Day Roost and Night Roost, might potentially cross it (around 4.5%) (**Figure 9.6**). The operation of the

suspension bridge may obscure a long-distance flight path of ardeids, potentially altering the ardeids to adopt alternative flight paths to and from foraging and breeding/roosting grounds.

9.5.6.13 However, ardeids may still adopt flight-lines which would not be obscured by TLB (**Figure 9.6**). They comprise short-, mid- and long-distance flight paths to suitable foraging grounds (e.g. channels, intertidal shores and watercourses) within and/or beyond the assessment area. Thus, any surge in energy exhaustion of the ardeids is not anticipated. The impact on obstructing ardeid flight-lines due to the presence of TLB is expected to be **minor**. Potential ardeid foraging ground(s) to be directly impacted by the Project includes the small sections of intertidal habitats at the reclamation site in TLT, which was not noted as a major ardeid foraging ground. In addition, new man-made intertidal habitats will be created by the new seawall and provide similar habitats. The loss of potential ardeid foraging ground is anticipated to be small and limited in scale and the resulting impact is anticipated to be **insignificant**.

Roadkill

9.5.6.14 Roadkill is not likely to occur along tunnel and viaduct sections but is of potential risk along at-grade roads. Outside TLCP, the terrestrial fauna species of conservation importance recorded within or in the vicinity of the at-grade road/viaduct section include Greater Coucal, Pallas's Squirrel, Four-clawed Gecko, Hong Kong Cascade Frog, Black-throated Laughingthrush, Emerald Cascader, Collared Scops Owl, Dancing Shadow-emerald, Lesser Spiny Frog, White-throated Kingfisher, Black-crowned Night Heron, Black Kite, Leopard Cat and Red Muntjac. They are all mobile and utilize habitats of the same kind nearby. Also, boundary fences will be installed along the boundaries of all at-grade roads for traffic safety (**Section 9.8.2.9** refers), which could also prevent the entry of mammal and herpetofauna species and thus roadkill risk. Thus, it is anticipated that the potential impact of roadkill will be **insignificant**.

Bird Collision

9.5.6.15 Buildings or structures made of transparent or reflective materials, cables, wires and noise barriers may pose bird collision risk. The proposed placement of aboveground structures in the main portal area is situated within plantation habitat, adjacent to developed area and shrubland/grassland habitats where "low" bird abundance were observed. No bird species of conservation importance was recorded within the proposed footprint of the aboveground structure. Black Kite, Black-crowned Night Heron and White-throated Kingfisher, being bird species of conservation importance, were recorded in the vicinity of the at-grade road, viaduct and/or TLB in TLT, likely foraging in nearby habitats. The bird species recorded within TLCP and immediately adjacent to the aboveground works areas are only expected to be indirectly impacted. Besides, no notable ecological corridor or flight path was noted in between the aboveground works areas and TLCP during the ecological surveys. Considering the lack of major flight corridor observed near the tunnel portal areas, the small size of the main portal area and the limited number of birds observed in the area, it is expected that any potential impact resulting from bird collision would be **minor**.

9.5.6.16 While noise barriers will be installed along part of the main alignment (**Section 4.5**), birds may collide with them when they appear reflective. With careful design

of their colour, pattern and opaqueness, potential resulting bird collision impact is considered **minor**. However, given the diversity and abundance of bird species recorded in habitats near the aboveground works areas, noise barriers are recommended to be given opaque design, as detailed in **Section 9.8.2**, to minimize bird collision risk and the potential impact as much as possible.

Water Quality Impact on Terrestrial Habitats

9.5.6.17 As mentioned in **Section 5.7**, potential sources of water quality impact identified during the operational phase include road runoff to be discharged from paved roads and developments proposed under the Project, tunnel runoff and drainage, sewage generated by ventilation buildings and administration buildings and wastewater generated from washing and maintenance operations. The potential impact of runoff to nearby waterbodies may exacerbate in heavy rainstorms. The tunnel section would be in the granite stratum and with sufficient depth below ground, together with the good practices and mitigation measures to be adopted during construction stage, adverse impacts from the change in groundwater level and suspended solids would be insignificant.

9.5.6.18 Adverse water quality impact is not anticipated during the operational phase through adopting the mitigation measures recommended in **Sections 5.11**, such as avoidance of direct discharge of tunnel run-off into nearby waterbodies, collecting surface runoff containing pollutants from paved areas of the Project and tunnel using silt traps and oil interceptors, and discharging wastewater generated from washing and maintenance operations to the sewerage system. Besides, no sewage will be generated at the ventilation buildings, as no toiletry facilities are proposed therein.

Shading Effect on Part of the Eastern Patch of Ching Uk Tsuen Fung Shui Woodland

9.5.6.19 Along the north-south axis, part of the eastern patch of CUTFSW will be shaded by a 70-metre-long viaduct section during daytime. Most trees at its canopy level have reached their mature size as the reported height of the canopy in the approved EIA report for ex-Route 10 is largely similar to that observed during the ecological surveys of the present study. Its understorey was dominated by shade-tolerant plant species (e.g. *Psychotria asiatica*) and is considered tolerant of low ambient light level. As such, the shading impact on part of the eastern patch of CUTFSW is anticipated to be **minor**.

9.5.7 Potential Operational Phase Impacts on Recognized Sites of Conservation Importance, Important Habitats, Roosting Ground and Species of Conservation Importance on Terrestrial Ecology

Recognized Sites of Conservation Importance

9.5.7.1 Recognized sites of conservation importance identified within or in the vicinity of the assessment area include "CA", TLCP and SLS SSSI. "CA" is situated at around 350m from LTI, whereas LTT, SKWLR and TLCT (South Section) will operate beneath TLCP. The disturbance effect would be remote given the distance and the nature of the Project elements. During the operational phase, based on the distance between the "CA" and the at-grade roads, viaducts and tunnels, it is anticipated that the indirect disturbance posed to "CA" would be **insignificant**. The operational disturbance impact on TLCP, meanwhile, is expected to be of smaller magnitude than the construction disturbance during the construction phase. In addition, the

proposed at-grade roads, viaducts, administration buildings and ventilation buildings are mostly located away from TLCP and those located immediately adjacent to TLCP have already been subject to some level of traffic disturbance (e.g. LTQ, Tuen Mun Road and Castle Peak Road – TLT). Thus, the impact of operational disturbance to TLCP is considered **insignificant**. Meanwhile, ecological impact will not be exerted on SLS SSSI during the operational phase, as the explosive magazine site at Pillar Point will be decommissioned before the operational phase commences.

Important Habitats

9.5.7.2 Important habitats identified within or in the vicinity of the assessment area include SLS Butterfly Habitat, FSWs in SKW and MW Egretry, Day Roost and Night Roost. Indirect impacts to them may arise from the air quality impact due to vehicular emission, increase in disturbance, such as noise and light glare. FSWs in SKW were not found supporting substantial faunal species and abundance, whereas MW Egretry, Day Roost and Night Roost is situated at 1.5km away from the mainline of the Project (i.e. TLB)) and SLS Butterfly Habitat is located at 700m away from the Pillar Point magazine site. The disturbance impact on FSWs in SKW is considered **minor**, while that to SLS Butterfly Habitat and MW Egretry, Day Roost and Night Roost is considered **insignificant**.

Roosting Grounds

9.5.7.3 Aside from the abovementioned types of operational disturbance, air-borne noise and ground-borne noise/vibration to be produced by moving vehicles inside LTT, SKWLR and TLCT respectively would be far less than that due to blasting during the construction phase. The resulting disturbance impact on roosting bats inside catchwater tunnels is considered **insignificant**.

Species of Conservation Importance

9.5.7.4 The fauna species of conservation importance recorded within TLCP may be indirectly impacted through disturbance by the operation of at-grade roads or viaducts, administration and ventilation buildings and associated facilities in LT, SKW and TLT. Outside TLCP, the terrestrial fauna species of conservation importance recorded within or in the vicinity of the aboveground works areas include Greater Coucal, Pallas's Squirrel, Four-clawed Gecko, Hong Kong Cascade Frog, Black-throated Laughingthrush, Emerald Cascader, Collared Scops Owl, Dancing Shadow-emerald, Lesser Spiny Frog, White-throated Kingfisher, Black-crowned Night Heron, Black Kite, Leopard Cat and Red Muntjac. They are all mobile and utilize habitats of the same kind nearby. Romer's Tree Frog appears to be a species which can even be found in disturbed areas, such as channels adjacent to construction sites in NKL. Assumingly accustomed to the disturbed surroundings, it is not anticipated that the increase in operational disturbance would severely impair their survival and habitat usage. The effect of operational disturbance to them will be temporary and **insignificant**.

9.5.8 Summary

9.5.8.1 Potential ecological impacts to agricultural land, backshore, channel, developed area, fung shui woodland, mixed woodland, plantation, reservoir, shrubland/grassland and watercourse within the assessment area during the construction and operational phases are summarized in **Table 9.25** to **Table 9.32**.

Table 9.25 Potential Ecological Impacts to Agricultural Land within the Assessment Area

Criterion	Description
Habitat quality	Low
Species	Low floral to faunal diversity 2 fauna species of conservation importance during the ecological surveys
Size/Abundance	Neither permanent nor temporary loss of agricultural land is expected
Duration	Construction phase Indirect impact (noise and vibration, air/dust, glare) during the construction phase would be temporary. Operational phase Indirect impact (noise and increase in human disturbance) during operation phase would be permanent.
Reversibility	Construction phase Construction phase indirect impacts (air/dust, noise and glare) would be reversible. Operational phase Operation phase indirect impacts (air/dust, noise and increase in human activities would be irreversible.
Magnitude	Negligible
Overall impact evaluation	**Negligible**

Table 9.26 Potential Ecological Impacts to Backshore within the Assessment Area

Criterion	Description
Habitat quality	Low
Species	Low floral to faunal diversity 1 fauna species of conservation importance was recorded during the ecological surveys
Size/Abundance	Permanent loss: About 0.16ha Temporary loss: About 0.09ha
Duration	Construction phase • Direct impact o Permanent loss of backshore within the aboveground works areas (about 0.16ha) would be permanent. o Temporary habitat loss of about 0.09 ha within the aboveground works areas would be transient. • Indirect impact o Noise and vibration, air/dust, glare, etc. during the construction phase would be temporary Operational phase Indirect impact (noise and increase in human disturbance) during operation phase would be permanent.

Criterion	Description
Reversibility	Construction phase • Permanent habitat loss would be irreversible • Temporary habitat loss and construction phase indirect impacts (disturbance, increase in human activities) would be reversible. Operational phase Indirect impacts (air/dust, disturbance and increase in human activities) would be irreversible.
Magnitude	Low
Overall impact evaluation	**Minor**

Table 9.27 Potential Ecological Impacts to Channel within the Assessment Area

Criterion	Description	
	Channels other than WSD catchwater tunnels	**WSD's Catchwater tunnels**
Habitat quality	Low	Low for TLC Catchwater Tunnel No. 5 Low to medium for TLC Catchwater Tunnel No. 6 Medium to high for TLC Catchwater Tunnel No. 8
Species	Low floral low faunal diversity 3 flora and 18 fauna species of conservation importance were recorded during the ecological surveys	**TLC Catchwater Tunnel No. 5**: Low faunal diversity, including cave-dwelling bat species **TLC Catchwater Tunnel No. 6**: Medium to high diversity of cave-dwelling bat species, but low diversity of remaining fauna **TLC Catchwater Tunnel No. 8**: Medium to high diversity of cave-dwelling bat species, but low diversity of remaining fauna 7 faunal species of conservation importance were recorded during the ecological surveys
Size/Abundance	Permanent loss: about 257m Temporary loss: about 90m	No permanent or temporary loss of WSD Catchwater Tunnels
Duration	Construction phase • Direct impact o Permanent loss: about 257m o Temporary loss: about 90m • Indirect impact (construction site runoff, groundwater infiltration) would be temporary. Operational phase Indirect impact (road runoff) would be permanent.	Construction phase Indirect impact (ground-borne vibration) would be temporary. Operational phase Indirect impact (ground-borne vibration) would be permanent.

Criterion	Description	
	Channels other than WSD catchwater tunnels	**WSD's Catchwater tunnels**
Reversibility	Construction phase • Permanent loss would be irreversible • Indirect impacts (disturbance and increase in human activities) would be reversible. Operational phase Indirect impact (road runoff) would be reversible.	Construction phase Indirect impacts (i.e. Disturbance through ground-borne vibration) would be reversible. Operational phase Indirect impact (i.e. ground-borne vibration) would be irreversible.
Magnitude	Minor	Minor for TLC Catchwater Tunnel No. 5 Minor to moderate for TLC Catchwater Tunnel Nos. 6 and 8
Overall impact evaluation	**Minor**	**Minor for TLC Catchwater Tunnel No. 5** **Minor to moderate for TLC Catchwater Tunnel Nos. 6 and 8**

Table 9.28 Potential Ecological Impacts to Developed Area within the Assessment Area

Criterion	Description
Habitat quality	Very low
Species	Medium floral diversity comprising a high proportion of exotic flora species and low fauna diversity 5 floral species of conservation importance and 18 faunal species of conservation importance were recorded during the ecological surveys
Size/Abundance	Permanent loss: 24.60ha Temporary loss: 16.85ha

Duration	Construction phase
	• Direct impact
	  o Permanent loss of developed area within the aboveground works areas would be permanent.
	  o Temporary loss of developed area within the aboveground works areas would be transient.
	• Indirect impact (air/dust, noise, vibration, glare and increase in human activities) would be temporary.
	
	Operational phase
	• Indirect impact (air/dust, noise, vibration, glare and increase in human disturbance) would be permanent.

Criterion	Description
Reversibility	Construction phase • Permanent habitat loss would be irreversible. • Temporary habitat loss would be reversible. • Indirect impacts (air/dust, noise, vibration, glare and increase in human activities) would be reversible. Operational phase Indirect impacts (air/dust, noise, vibration, glare and increase in human activities) would be irreversible.
Magnitude	Low
Overall impact evaluation	**Minor**

Table 9.29 Potential Ecological Impacts to Fung Shui Woodland within the Assessment Area

Criterion	Description
Habitat quality	Low to medium for the western edge of LUFSW Medium to high for THTFSW and both patches of CUTFSW
Species	Low to medium floral diversity and low faunal diversity 4 flora and 5 fauna species of conservation importance were recorded during the ecological surveys
Size/Abundance	Neither permanent nor temporary loss of FSW within the assessment area is anticipated
Duration	Construction phase Indirect impact (air/dust, noise, vibration, glare and increase in human activities) would be temporary. Operational phase Indirect impact (air/dust, noise, increase in human disturbance and shading effect) would be permanent.
Reversibility	Construction phase Indirect impacts (air/dust, noise, vibration, glare and increase in human activities) would be reversible. Operational phase Indirect impacts (air/dust, disturbance, increase in human activities and shading effect) would be irreversible.
Magnitude	Minor for the western edge of LUFSW Minor for THTFSW Minor to moderate for CUTFSW
Overall impact evaluation	**Negligible for the LUFSW.** **Minor for THTFSW and the western patch of CUTFSW** **Minor to moderate for the eastern patch of CUTFSW; minor with the adoption of mitigation measures**

Table 9.30 Potential Ecological Impacts to Mixed Woodland within the Assessment Area

Criterion	Description
Habitat quality	Low to medium on the overall, fragmentation observed for some patches especially those outside TLCP. Potentially be higher for the mixed woodland within TLCP, which has been protected under the Country Parks Ordinance (Cap. 208) since 1979 and under management
Species	Medium floral diversity and low to medium faunal diversity 12 flora and 24 fauna species of conservation importance were recorded during the ecological surveys
Size/Abundance	Permanent loss: 17.54ha Temporary loss: 6.54ha
Duration	Construction phase • Direct impact (habitat loss) within the aboveground works area of the Project would be permanent. • Temporary habitat loss would be reversible. • Indirect impact (air/dust, noise, vibration, increase in human activities and glare) would be temporary. Operational phase Indirect impact (air/dust, noise, vibration, increase in human disturbance and glare) would be permanent.
Reversibility	Construction phase • Permanent loss of mixed woodland within the aboveground works area of the Project would be irreversible. • Temporary loss of mixed woodland within the aboveground works area of the Project and indirect impacts (air/dust, noise, vibration, increase in human disturbance and glare) would be reversible. Operational phase Indirect impacts (air/dust, noise, vibration, increase in human disturbance and glare) would be irreversible.
Magnitude	Low to moderate
Overall impact evaluation	**Minor for the mixed woodland within TLCP** **Minor to moderate for the mixed woodland outside TLCP**

Table 9.31 Potential Ecological Impacts to Plantation within the Assessment Area

Criterion	Description
Habitat quality	Low for those outside TLCP. Low to medium for those within TLCP, which has been protected and managed under the Country Parks Ordinance (Cap. 208) since 1979.
Species	Medium floral diversity and low faunal diversity 3 floral and 16 faunal species of conservation importance were recorded during the ecological surveys
Size/Abundance	Permanent loss: 13.93ha Temporary loss: 5.88ha

Criterion	Description
Duration	Construction phase • Direct impact in terms of loss of plantation within the aboveground works area of the Project would be permanent. • Temporary loss of plantation within the aboveground works area of the Project would be reversible. • Indirect impact (air/dust, noise, vibration, increase in human activities and glare) would be temporary. Operational phase Indirect impact (air/dust, noise, vibration, increase in human activities and glare) would be permanent.
Reversibility	Construction phase • Permanent loss of plantation would be irreversible. • Temporary loss of plantation and indirect impacts (air/dust, noise, vibration, increase in human activities and glare) would be reversible. Operational phase Indirect impacts (air/dust, noise, vibration, increase in human activities and glare) would be irreversible.
Magnitude	Low to moderate
Overall impact evaluation	**Minor**

Table 9.32 Potential Ecological Impacts to Reservoir within the Assessment Area

Criterion	Description
Habitat quality	Low to medium
Species	Low floral and faunal diversity 1 flora and 11 fauna species of conservation importance were recorded during the ecological surveys
Size/Abundance	No permanent or temporary loss of reservoir is expected
Duration	Construction phase Indirect impact (air/dust, noise, vibration, increase in human activities and glare) would be temporary. Operational phase Indirect impact (air/dust, noise, vibration, increase in human activities and glare) would be permanent.
Reversibility	Construction phase Indirect impacts (air/dust, noise, vibration, increase in human activities and glare) would be reversible. Operational phase Indirect impacts (air/dust, noise, vibration, increase in human activities and glare) would be irreversible.
Magnitude	Negligible
Overall impact evaluation	**Negligible**

Table 9.33 Potential Ecological Impacts to Shrubland/Grassland within the Assessment Area

Criterion	Description
Habitat quality	Low in general. Low to medium for the contiguous shrubland/grassland within TLCP, which has been protected under the Country Parks Ordinance (Cap. 208) since 1979, and also those in NL.
Species	Low to medium diversity of flora and butterflies Low diversity of the remaining terrestrial fauna groups 6 floral and 31 fauna species of conservation importance were recorded during the ecological surveys
Size/Abundance	Permanent loss: 16.47ha Temporary loss: 5.72ha
Duration	Construction phase • Direct impact o Permanent loss of shrubland/grassland within the aboveground works areas would be permanent. o Temporary loss of shrubland/grassland would be temporary. • Indirect impact (air/dust, noise, vibration, increase in human activities and glare) would be temporary. Operational phase Indirect impact (air/dust, noise, vibration, increase in human activities and glare) would be permanent.
Reversibility	Construction phase • Permanent habitat loss would be irreversible. • Temporary habitat loss and indirect impacts (air/dust, noise, vibration, increase in human activities and glare) would be reversible. Operational phase Indirect impacts (air/dust, noise, vibration, increase in human activities and glare) would be irreversible.
Magnitude	Low
Overall impact evaluation	**Minor**

Table 9.34 Potential Ecological Impacts to Watercourse within the Assessment Area

Criterion	Description	
	Within TLCP	**Outside TLCP**
Habitat quality	Medium	Low to medium
Species	Medium floral diversity and low faunal diversity 2 floral and 6 faunal species of conservation importance recorded in the watercourses within the assessment area were recorded during the ecological surveys	Medium floral diversity and low faunal diversity 2 floral and 4 faunal species of conservation importance recorded in the watercourses outside TLCP during the ecological surveys
Size/Abundance	Neither permanent nor temporary loss of watercourse is anticipated	Permanent loss: Part of a ditch and about 164m from four watercourses within the aboveground works areas in SKW (i.e. W4, W22, W23 and W24)

Criterion	Description	
	Within TLCP	**Outside TLCP**
Duration	Construction phase Indirect impact (potential groundwater drawdown) would be temporary. Operational phase Indirect impact (potential groundwater drawdown) would be permanent.	Construction phase Direct loss of part of the ditch and four watercourses (including W4, W22, W23 and W24) in SKW and SL would be permanent. Indirect impact (construction site runoff) would be temporary. Operational phase Indirect impact (road runoff and potential groundwater drawdown) would be permanent.
Reversibility	Construction phase Indirect impact (potential groundwater drawdown) would be reversible Operational phase Indirect impact (potential groundwater drawdown) would be irreversible	Construction phase • Permanent loss of part of the ditch and W4, W22, W23 and W24 would be irreversible. • Indirect impacts (construction site runoff and potential groundwater drawdown) would be reversible. Operational phase Indirect impacts (road runoff and potential groundwater drawdown) would be irreversible.
Magnitude	Low for the watercourses within TLCP, including the upstream section of W4 within TLCP	Low for the section of the ditch falling within the aboveground works area in SKW Low to medium for the sections of W4, W22, W23 and W24 outside TLCP to be directly impacted Low for the remaining watercourses outside TLCP
Overall impact evaluation	**Minor for the watercourses within TLCP, including the upstream section of W4 within TLCP**	**Minor for the section of the ditch outside TLCP falling within the aboveground works area in SKW** **Minor to moderate for the sections of W4, W22, W23 and W24 outside TLCP** **Minor for the remaining watercourses outside TLCP**

9.6 Impact Evaluation for Marine Ecology

9.6.1 Descriptions of Project Elements in Marine

9.6.1.1 Marine elements of the Project only occur in the Southern Section, all related to the marine section linking between Tsing Lung Tau and Ng Kwu Leng at North Lantau across the Ha Pang Fairway, i.e. Tsing Lung Bridge (TLB).

9.6.1.2 Tsing Lung Bridge would be a cable suspension bridge. The key construction elements of Tsing Lung Bridge comprise the foundation and towers, anchorages, suspension cables, and the bridge deck. For protection to the tower of TLB from ship impact, a reclamation of approximately 2.2ha at Tsing Lung Tau from the shore is required.

9.6.2 Construction Phase – Marine Direct Impacts

9.6.2.1 Direct and indirect impacts on marine ecology arising from the construction phase of the Project and associated works are described in section below.

Overall Marine Habitat Loss

9.6.2.2 A permanent loss of 4.1ha of seabed at TLT is expected due to the 2.2ha reclamation at TLT for the TLB, which involves marine construction works including seawall construction works and filling behind seawall for reclamation. Also, a permanent loss of 122m of man-made seawall and 91m of semi-natural coastline is also expected due to the reclamation at TLT for the TLB, where the natural coastline is considered a semi-natural condition due to modification by man-made structures. The temporary marine works areas for the reclamation at TLT for the TLB is established approximately 150m offset from the edge of the reclaimed area, resulting in a temporary loss of approximately 13ha of seabed and 347m of intertidal habitat (49m of man-made seawall and 298m of natural coastline).

9.6.2.3 The estimated marine habitat loss is summarized in **Table 9.35**.

Table 9.35 Marine Habitat Loss Arising from the Project

Criterion	Approximate size/length of marine habitats loss arising from marine works of the Project (ha)/(m)	
	Reclamation Site (Permanent Loss)	Marine Works Area (Temporary Loss)
Intertidal Habitat (seawall)	122m	49m
Intertidal Habitat (natural coastline)	91m	298m
Sea	4.1ha	13ha

9.6.2.4 The reclamation quantities at TLT have been estimated to involve a total of 480,000m^3 rock fill and 310,000m^3 sand fill. Pelican barges and dump trucks are the major ways for reclamation filling within the marine works area. Subject to the detailed design, temporary berms in front of the seawall will be adopted in order to enhance the seawall stability to facilitate the construction works.

9.6.2.5 The reclamation and seawall construction works will cause a direct loss of approximately 122 m existing seawall and 91 m semi-natural coastline as well as

the 4.1ha of subtidal seabed within the reclamation site at TLT. The ecological value of the seawall within the assessment area including this section along TLT coast is ranked as Very Low as shown in **Table 9.16**. The man-made riprap seawall has a low diversity and abundance of intertidal fauna common and widespread in other intertidal shores in Hong Kong. The ecological value of the natural coastline within the assessment area including the section along the TLT coastline is ranked as Low as shown in **Table 9.16**. The natural coastline has a low diversity and abundance of intertidal fauna common and widespread in other natural coastline in Hong Kong. However, the natural coastline within the reclamation site is considered semi-natural coastline, due to the encroachment on the high shore portion by the presence of the man-made building structure. The ecological value of the sea within the assessment area is ranked as Low as shown in **Table 9.20**. Most of the species recorded throughout the benthic and subtidal surveys are considered common and widespread in Hong Kong. There is also a very low habitat use by CWD as indicated by the results from AFCD annual marine mammal monitoring. When compared with the 1,651km^2 of Hong Kong total marine waters (EPD 2005), the permanent loss of 4.1ha of seabed caused by the current Project is considered **minor**.

9.6.2.6 Besides, during the bridge erection works, there will be a barge positioning at the TLB alignment for lifting bridge segments. The required bridge deck erection area involves a self-propelled barge capable of being dynamically positioned and not require anchoring in the marine waters. The marine seabed will not be encroached and the marine water column will not be retained. The position of the barge is not fixed but will be moved with the works front for bridge segment lifting. The impact due to this barge is thus transient along the progress of bridge deck erection works, and is considered **insignificant**.

9.6.2.7 A total of three barging points will be located at North Lantau (To Kau Wan and NKL) and TLT. While the former two were located at existing vertical seawalls, only the one at TLT would involve construction. The latest design of the barging point at TLT would be in the form of a temporary jetty within the proposed reclamation site and will be demolished after the construction phase. Piling method may be required for the construction of the temporary jetty in TLT. When considering the relatively small scale of the jetty and the east-west flow of Urmston Road's current, the impact induced on water quality and change in hydrodynamics would both be considered **insignificant**.

9.6.3 Construction Phase – Marine Indirect Impacts

Marine Water Quality

9.6.3.1 According to the proposed construction sequence, filling works required for the reclamation at TLT would be constructed within the seawall, therefore there would likely be no significant suspended solid released to the marine environment. Therefore, adverse impact on marine water quality is not anticipated during the filling works. However, as dredging works at the seawall footprint would be required before the construction of the seawall, suspended solids are inevitably generated when the seabed sediments are disturbed. The estimated total volume of dredged sediment is a limited amount of about 30,000 m^3 and it was expected the dredging will be conducted for over 10 working days throughout the reclamation works.

9.6.3.2 Activities conducted at the three barging points within the assessment area may have potential impacts on the water quality. Adverse impacts on water quality can be brought by uncontrolled surface run-off generated at the barging points with high concentration of suspended solid, oil and grease, or chemicals, and materials may be splashed into the surrounding water during the transportation of spoil using the barging points, that may leak and pollute the marine environment. These barging points may also increase the turbidity and suspended solid content of nearby waters as marine deposits on the seabed may be disturbed through vessel movements and propeller wash. With the implementation of the good practices and mitigation measure mentioned in **Section 5.10**, adverse impacts on water quality would be considered **insignificant**.

9.6.3.3 Based on the results modelling scenarios conducted in **Section 5**, the predicted suspended solid level elevated due to the construction works would not exceed their respective limits and criteria, all observation points were well within their respective criteria without the implementation of silt curtain. After the implementation of a silt curtain to the reclamation site, the suspended solid criteria at all observation points showed further improvement in water quality and the suspended solid criteria are compiled. Therefore, it is concluded that with the implementation of proper mitigation measures (i.e. deployment of silt curtain), the indirect impact on marine waters is expected to be **insignificant**.

9.6.3.4 According to the modelling results from **Section 5**, the dissolved oxygen depletion evaluated from the presence of the reclamation works at all observation points are expected to be less than the detection limit of 0.1 mg/L, even without the presence of silt curtains. The modelling results reveal that the water quality impact will be further reduced with the deployment of silt curtains at the reclamation site, therefore the indirect impact on marine waters is expected to be **insignificant**. Even though the modelling results showed no adverse water quality impact without silt curtains, silt curtains are still advised to be deployed at the reclamation site to further reduce any water quality impact induced. With good site practice, such as regular inspections, the indirect impact on marine water is expected to be **minor**.

Disturbance due to Marine Traffic of Works Vessels

9.6.3.5 During the construction of reclamation at TLT, an increase in marine traffic is expected to increase for the transportation of construction materials and manpower for the reclamation works. Marine water quality may be impacted by the induced number of marine work vessels throughout the construction phase, including sewage generated by the construction workforce and accidental spillage of chemicals / chemical waste entering the marine environment. Also, overflow of filling materials in the barges or hoppers may cause pollution to the marine environment during loading and/or transportation. The provision of adequate sanitary facilities on marine vessels can control the potential impact associated with sewage generated. The storage and disposal of chemical waste should follow the guidelines stipulated in the Waste Disposal (Chemical Waste) (General) Regulations to prevent accidental spillage of chemicals /chemical waste polluting the marine environment. Good management practice such as limiting the capacity of barges to avoid overflow of filling material can minimise the potential marine water quality impact. Therefore, the impact on marine waters induced by disturbance of marine traffic is expected to be **insignificant**.

9.6.3.6 Cetaceans are acoustically sensitive to underwater noise as they rely on echo-location to explore, communicate, navigate and capture prey etc. Underwater noise pollution may have adverse impacts to marine mammals in Hong Kong such as CWD. Adverse noise disturbance can be contributed by work activities such as underwater blasting, while underwater blasting is not involved in the current Project. The source of underwear noise is expected to be the engines of the work vessels when travelling and marine works such as dredging and filling at the reclamation site at TLT. The daily marine work vessels are estimated to be around 4 trips per day from the TKW barging point, 6 trips per day from the TLT barging point within the reclamation site, and 1 trip per day from the NKL barging point. The reclamation site at TLT is over 5 km distance away from the Brother Marine Park, where the closest CWD sightings were recorded in the past 5 years with a scarce frequency. Considering the limited marine traffic and the distance away from the reclamation site, the impact of underwater noise is considered **insignificant**.

9.6.3.7 Besides underwater noise, the increased marine traffic induced may cause a potential escalation in collision risk, resulting in adverse impact on cetaceans. The marine vessels involved for mainly for transportation of fill materials, materials for the construction and manpower, which are not high-speed vessels but relatively large-sized ad slower vessels. Considering the waters nearby MW, TLT, NKL and the assessment area are not considered the hotspot of cetaceans and with scarce CWD sightings reported, the potential escalation of collision risk between cetaceans and induced marine works vessels is expected to be low. Therefore, the impact on the risk of collision associated with the induced marine traffic is expected to be **insignificant**.

Habitat Fragmentation

9.6.3.8 A section of seawall is expected to be encroached by the reclamation site at TLT for TLB. Within the temporary marine works area, sections of man-made seawall and natural coastline is expected to be included. The man-made seawall has been highly modified and the sections of natural coastline are exposed to human disturbance such as frequent fishing activities. Considering the size, scale and natural condition of seawall and natural coastline, habitat fragmentation impact due to the reclamation and seawall construction in TLT for TLB is considered to be **minor**.

9.6.4 Operational Phase – Marine Direct Impacts

9.6.4.1 Direct and indirect impacts on marine ecology arising from the construction phase of the Project and associated works are described in section below.

Permanent Loss of Seabed and Marine Waters

9.6.4.2 The Project will cause a total of 4.1ha permanent marine habitat loss of seabed and 122m of man-made seawall and 91m of semi-natural coastline, both with low ecological value during the operation phase due to the presence of reclamation. The impact of direct impacts during the operational phase is considered **minor**.

9.6.5 Operational Phase – Marine Indirect Impacts

9.6.5.1 Marine indirect impacts which may occur during the operational phase are described in **Section 9.6.5.2**, **Section 9.6.5.3** and **Section 9.6.5.4**.

Hydrological Regime

9.6.5.2 As a result of the reclamation at TLT, the Ha Pang Fairway between TLT and To Kau Wan is expected to be narrowed. A hydrodynamic modelling, using five major channels nearby the reclamation area as references, was conducted to simulate the change in hydrodynamic regime. The results of the hydrodynamic modelling as shown in **Section 5** indicated that the changes in instantaneous discharge, cumulative discharge, and depth averaged velocity for all channels were expected to be **insignificant**.

Spillage of Chemicals/Pollutants

9.6.5.3 During the operational phase, potential spillage or leakage of gasoline oil from vehicles that contains toxic chemical is a potential indirect impact on the marine ecological resources, where the gasoline oil can enter the marine habitats through surface runoff or drainage. Subject to the detailed design and safety management of the highway, spillage or leakage of gasoline oil entering the marine environment should be prevented. With a comprehensive design that considered preventing the spillage of toxic chemicals from entering, the potential marine indirect impact is considered **insignificant**.

Habitat Fragmentation

9.6.5.4 During the operational phase, seawall, but not natural coastline, will be encroached. Due to the size and high level of modification on the seawall, the potential fragmentation impacts due to the loss of seawall within the reclamation site in TLT for TLB is considered **insignificant.**

9.6.6 Potential Impacts on Recognised Sites of Conservation Importance, Important Habitats and Species of Conservation Importance on Marine Ecology

Recognised Sites of Conservation Importance

9.6.6.1 No marine recognized site of conservation importance is present within the assessment area. All marine elements and marine works areas have avoided recognised site of conservation importance.

Important Habitats

9.6.6.2 Important habitats include coral areas. In addition, TLB falls within the NL waters which are also part of the habitat range of CWD.

Species of Conservation Importance

9.6.6.3 Two hard coral species, namely *Oulastrea crispata* and ahermatypic cup coral *Balanophyllia* sp., and one gorgonian *Guaiagorgia* sp. were recorded scattered along the subtidal coastal area within the reclamation site at TLT. The ecological value of the seawall and sea within the assessment area were both ranked as Low, and the coral coverage of the coral species were recorded less than 1%. While two hard coral species and the gorgonian species are considered species of conservation importance, these species are common in the western Hong Kong waters, and they are generally adaptive and tolerance to extreme environment such as relatively high suspended solid level. Also, the seawall and reclaimed island will provide new and additional hard substrate for the colonisation of these coral species in the future. Although the two mentioned hard coral species and gorgonian are expected to be

directly affected by the seawall construction and reclamation along the TLT shoreline, the impact caused by the Project is considered **minor**.

9.6.6.4 These three coral species mentioned in the above section (**Section 9.6.6.3**) have also been recorded along the coastal area of NKL, with the coral coverage recorded less than 1%. Since no reclamation works will be conducted in Ng Kwu Leng, no direct impact is expected on the recorded coral species. As distanced by the Ha Pang Fairway, silt curtains together with good site practice is needed to avoid runoff from the reclamation site at TLT, in order to prevent adverse impacts to the coral species located at NKL. Therefore, the impact caused by the Project to the coral species along NKL coastal area is considered **insignificant**.

9.6.6.5 One individual of amphioxus *Branchiostoma belcheri* was recorded within the reclamation site at TLT and one individual amphioxus *B. belcheri* was recorded outside the reclamation site during the benthic survey conducted in the dry season, while no amphioxus was recorded during the wet season among all sampling locations. A relatively low density was recorded (1 individual/m^2) within and outside the assessment area comparing to Tai Long Wan (460 individuals/m^2) and Pak Lap Wan (290 individuals/m^2). During the benthic survey, it was observed that the seabed substrate within and outside the reclamation site along TLT were mainly composed of boulders and gravel embedded in sediments, where amphioxus is not likely to occur. Due to the low density, absence throughout the wet season and the unfavourable habitat, the seabed along TLT and NKL coastlines are not considered any breeding site / living habitats of amphioxus. Therefore, the impact on amphioxus caused by the Project is considered **insignificant**.

9.6.6.6 The permanent loss of 4.1ha seabed and temporary loss of 13.02ha water column caused by the reclamation work at TLT may lead to habitat loss of CWD, but the impact induced is not expected to be significant as the MW, TLT and NKL waters are not considered as hotpot or high CWD usage according to the longitudinal monitoring studies on marine mammals in Hong Kong waters. The loss of seabed and water column would not cause adverse effects on reduction of important habitat and food source for CWD.

9.6.6.7 As discussed in the above sections, the indirect impacts brought by the increase in marine traffic induced by the Project is not expected to pose any significant adverse impacts including underwater noise and collision risk to CWDs and other cetaceans. Silt curtains will be involved in the reclamation site at TLT during the construction phase, which may cause potential entanglement and entrapment to CWD. Due to the low usage of CWD in the vicinity of TLT waters, the chances of any event of entanglement or entrapment is considered unlikely. Although the chances are very low, silt curtains will be regularly checked as part of the site practices. As the reclamation site is distanced over 5 km from the nearest CWD sighting recorded, and the Ha Pang Fairway is known with existing heavy marine traffic, the chances of habitat fragmentation of CWD induced by the reclamation works at TLT are low. Therefore, the impact on CWD caused by the Project is considered to be **insignificant**.

9.6.7 Summary

9.6.7.1 Potential ecological impacts to intertidal habitat and sea within the assessment area during the construction and operational phases are summarized in **Table 9.36** and **Table 9.37**.

Table 9.36 Potential Ecological Impacts to Intertidal Habitat within the Assessment Area

Criterion	Description	
	Natural Coastline	**Seawall**
Habitat quality	Low	Very low
Species	Low intertidal faunal diversity No faunal species of conservation importance was recorded during the ecological surveys	Low floral to faunal diversity No fauna species of conservation importance was recorded during the ecological surveys
Size/Abundance	Permanent loss: 91m Temporary loss: 298m	Permanent loss: 122m Temporary loss: 49m
Duration	<u>Construction phase</u> • Direct impact (habitat loss) within the aboveground works areas of the Project would be permanent. • Direct impact (habitat loss) within the temporary marine works area of the Project would be temporary. • Indirect impact (marine water quality, marine traffic and habitat fragmentation) would be temporary. <u>Operational phase</u> • Direct impact (habitat loss) would be permanent. • Indirect impact (hydrological regime, spillage of chemicals/pollutants and habitat fragmentation) would be permanent	<u>Construction phase</u> • Direct impact (i.e. loss of seawall) within the aboveground works areas of the Project would be permanent. • Direct impact (habitat loss) within the temporary marine works area of the Project would be temporary. • Indirect impact (marine water quality, marine traffic and habitat fragmentation) would be temporary. <u>Operational phase</u> • Direct impact (habitat loss) would be permanent. • Indirect impact (hydrological regime, spillage of chemicals/pollutants and habitat fragmentation) would be permanent.
Reversibility	<u>Construction phase</u> • Permanent habitat loss would be irreversible. • Temporary habitat loss and indirect impacts (marine water quality, marine traffic and habitat fragmentation) would be reversible. <u>Operational phase</u> • Direct impact (habitat loss) would be irreversible • Indirect impacts (hydrological regime, spillage of chemicals/pollutants and habitat fragmentation) would be irreversible.	<u>Construction phase</u> • Permanent habitat loss would be irreversible. • Temporary habitat loss and indirect impacts (marine water quality, marine traffic and habitat fragmentation) would be reversible. <u>Operational phase</u> • Direct impact (habitat loss) would be irreversible • Indirect impacts (hydrological regime, spillage of chemicals/pollutants and habitat fragmentation) would be irreversible.
Magnitude	Low	Low

Criterion	Description	
	Natural Coastline	Seawall
Overall impact evaluation	**Minor**	**Minor**

Table 9.37 Potential Ecological Impacts to Sea within the Assessment Area

Criterion	Description
Habitat quality	Low
Species	Low faunal diversity 10 faunal species of conservation importance were recorded during the ecological surveys
Size/Abundance	Permanent loss: 6.46ha

Duration	Construction phase
	• Direct impact
	  ○ Loss of seabed within the aboveground works area of the Project would be permanent.
	  ○ Temporary loss of seabed within the aboveground works area of the Project would be temporary.
	• Indirect impact (marine water quality, marine traffic and habitat fragmentation) would be temporary.
	
	Operational phase
	• Direct impact (habitat loss) would be permanent.
	• Indirect impact (hydrological regime, spillage of chemicals/pollutants and habitat fragmentation) would be permanent.

Reversibility	Construction phase • Permanent loss of seabed would be irreversible. • Temporary loss of seabed and indirect impacts (marine water quality, marine traffic and habitat fragmentation) would be reversible. Operation phase • Permanent loss of seabed would be irreversible. • Indirect impacts (hydrological regime, spillage of chemicals/pollutants and habitat fragmentation) would be irreversible.
Magnitude	Low
Overall impact evaluation	**Minor**

9.7 Cumulative Impacts

9.7.1 Concurrent Projects

9.7.1.1 As mentioned in **Section 2.11**, advance works comprising reclamation works, site formation for TLB anchorages and construction of underground explosive magazine at LT Quarry will commence in the first quarter of 2026, while the construction phase of the Project will tentatively commence in the first quarter of 2028 and be completed by the third quarter of 2033. **Section 2** lists the following concurrent projects which may take place concurrently with the Project. In order to assess the cumulative impacts, a review of best available information at the time

of preparing this EIA report to identify a number of other projects that are undergoing planning, design, construction and/or operation within the construction and/or operational period for this Project has been conducted and a list of the concurrent projects identified at this stage is provided in **Section 2** of this EIA report. A total of 18 concurrent projects are included below, and their relevancy to ecology is examined individually.

- Ground Investigation Works within Tai Lam Country Park for Route 11 (Section between Yuen Long and North Lantau);
- Tuen Mun Bypass (TMB);
- Tsing Yi-Lantau Link (TYLL);
- Hong Kong Island West- Northeast Lantau Link (HKIW-NEL Link);
- Road P1 (Tai Ho – Sunny Bay Section);
- Widening of Yuen Long Highway (Section between Lam Tei Quarry and Tong Yan San Tsuen Interchange);
- Widening of Castle Peak Road – Castle Peak Bay;
- Widening of Fuk Hang Tsuen Road (Between Castle Peak Road – Lam Tei and Fuk Hang Tsuen Lane);
- Underground Quarrying at Lam Tei, Tuen Mun;
- Hung Shui Kiu (HSK) / Ha Tsuen New Development Area (NDA);
- Development at Lam Tei North East;
- Cycle Track between Tsuen Wan and Tuen Mun (Tuen Mun to So Kwun Wat Section);
- Cycle Track between Tsuen Wan Bayview Garden and So Kwun Wat;
- Proposed Public Housing Developments at Ping Shan South, Yuen Long, Lam Tei North and Nai Wai, Tuen Mun;
- Public Housing Development near Tan Kwai Tsuen, Yuen Long;
- Developments of Tuen Mun East and Adjacent Green Belt Cluster;
- Relocation of Tuen Mun Water Treatment Works to Caverns; and
- Sunny Bay Development.

9.7.1.2 All the above concurrent projects involve EcoIA conducted or to be conducted. For terrestrial ecology, the potential of occurrence of cumulative impacts would be mostly determined by the nature and scale of the projects, and the distances between the projects. The listed projects, except Ground Investigation Works within Tai Lam Country Park for Route 11 (Section between Yuen Long and North Lantau), had avoided TLCP and hence will not generate any habitat loss in TLCP.

<u>Projects under Study or Planning</u>

9.7.1.3 The proposed works of TMB, TYLL, HKIW-NEL Link, Road P1 (Tai Ho – Sunny Bay Section), Widening of Yuen Long Highway (Section between Lam Tei Quarry and Tong Yan San Tsuen Interchange), Development at LT North East, Proposed Public Housing Developments at Ping Shan South, Yuen Long, Lam Tei North and

Nai Wai, Tuen Mun, Public Housing Development near Tan Kwai Tsuen, Yuen Long, Developments of Tuen Mun East, Relocation of Tuen Mun Water Treatment Works to Caverns and Adjacent Green Belt Cluster, Sunny Bay Development and Cycle Track between Tsuen Wan Bayview Garden and So Kwun Wat are still under study or planning and fall within LT, SKW or NL areas of the current assessment area. According to the best information available at this stage, no confirmed design information of these projects is available. However, with the adoption of ecological mitigation measures to be specified in respective separate studies, adverse cumulative ecological impact from these projects is not anticipated.

Projects with Defined Tentative Programme

9.7.1.4 **Ground Investigation Works within Tai Lam Country Park for Route 11 (Section between Yuen Long and North Lantau)** – To ensure safe engineering of tunnels of Route 11 beneath TLCP, ground investigation works are required to understand the geological conditions of TLCP. 5 vertical boreholes and 6 horizontal directional corings within TLCP had been proposed. The proposed HDC will be set up at a launching site outside TLCP and there will be no aboveground works within TLCP. This Project has already commenced for completion in 2024. Cumulative ecological impact is thus not anticipated to arise, as the advance works for the present Project will not start until the first quarter of 2026.

9.7.1.5 **Underground Quarrying at Lam Tei, Tuen Mun** – The development of an underground quarry at LT, Tuen Mun, which partly overlaps with the LT portion of the current assessment area, will commence in 2024/25 and will be completed by 2025/27. Construction of the underground explosive magazine site at LT Quarry of the current Project will overlap with the construction programme of the development of an underground quarry at LT. However, as the works are mainly situated in developed area and involve underground works, any adverse cumulative ecological impact (e.g. disturbance) is unlikely to arise.

9.7.1.6 **Cycle Track between Tsuen Wan and Tuen Mun (Tuen Mun to So Kwun Wat Section)** – The EIA report for Cycle Track between Tsuen Wan and Tuen Mun (Tuen Mun to So Kwun Wat) (AEIAR-239/2022), comprising the development of a new cycling track, was approved with conditions in 2022. The construction programme was expected to start in 2023 and reach completion in 2026. Despite that part of the cycle track alignment in SKW area falls within the current assessment area and the construction programmes of both projects overlap in 2026, cumulative ecological impact is not expected as the advance works for the Project will start in the first quarter of 2026 and commence in LT, TLT and NL areas first.

9.7.1.7 For the contributions/influences related to water quality, as the water quality impact assessment has already considered the relevant projects during both construction phase (mainly the sediment release), and operation phase (mainly the influences on hydrodynamics and pollution loading), the assessment on marine ecology in above sections which have made reference to water quality results have already addressed the potential cumulative impacts related to water quality, and thus those impacts would be briefly recapped based on the assessment results from above sections.

9.7.1.8 For marine ecology, the construction of the current Project may potentially overlap with the construction phase of the project “Road P1 (Tai Ho – Sunny Bay Section). According to **Section 5**, the proposed dredging at Sham Shui Kok is included in

the construction phase water quality modelling, where no cumulative water quality impact is anticipated given the implementation of the proper mitigation measures (such as deployment of silt curtains). The construction of the current Project may also potentially overlap with the construction period of other nearby concurrent projects such as TYLL and HKIW– NEL Link, while no cumulative water quality impact on marine ecology have been anticipated as shown in **Section 5**.

Commenced Projects

9.7.1.9 **Widening of Castle Peak Road – Castle Peak Bay** – Existing Castle Peak Road – Castle Peak Bay section (from Kwun Tsing Road to Hoi Wing Road) is the main road connecting SKW, Hong Kong Gold Coast, Cafeteria Bay, Castle Peak Bay and Sam Shing Hui. The objective of this project is to improve the traffic condition, provision of additional lanes to cater for Tuen Mun East development and future traffic growth of the road section. In addition, road safety will be strengthened via this project. Commenced in 2020, the works is scheduled to be completed in the second quarter of 2024. As there is no overlap in construction period with the current Project, cumulative impact during construction phase is thus not anticipated.

9.7.1.10 **Public Housing Development near Tan Kwai Tsuen, Yuen Long** – Site formation works, construction of access road, construction of water supply facilities (including service reservoirs and pumping station) and the ancillary works including drainage, sewerage and landscape works will be undertaken at a public housing site near Tan Kwai Tsuen in Yuen Long. Construction commenced in 2022. This project has already commenced and while the construction period and tentative completion year are not yet known, adverse cumulative ecological impact during construction phase is not anticipated since this project barely overlaps with the current Project in extent and area terms.

9.7.1.11 **Widening of Fuk Hang Tsuen Road (Between Castle Peak Road – Lam Tei and Fuk Hang Tsuen Lane)** – This project is to improve and widen the section of Fuk Hang Tsuen Road between Castle Peak Road – LT and Fuk Hang Tsuen Lane. The scope of this project comprises widening of a section of the existing single two-lane carriageway of approximately 600m long from 6.5m to 10.3m; widening of footpaths; provision of one layby and one roundabout. Commenced in 2022, the works is scheduled to be completed in the first quarter of 2025. As there is no overlap in construction period with the current Project, cumulative ecological impact during construction phase is thus not anticipated.

9.7.1.12 **Hung Shui Kiu (HSK) / Ha Tsuen New Development Area (NDA)** – The EIA report for HSK and Ha Tsuen NDA (AEIAR-203/2016), which aims at providing a new town development area to meet housing and land supply needs, was approved with conditions in 2016. The construction phase has commenced and is expected to be completed by the end of 2034. Part of HSK and Ha Tsuen NDA falls in the northwestern fringe of the current assessment area (i.e. LT area). Cumulative ecological impacts, mainly in the form of cumulative habitat loss and disturbance during construction phase, will arise when the construction programme when the construction phase of this Project overlaps with that of the current Project. However, as the directly impacted habitats/habitats to be directly impacted were of comparatively low ecological value, significant cumulative ecological impact is not expected to arise.

9.8 Mitigation Measures

9.8.1 Avoidance

Avoidance of Direct Impact on Recognized Sites of Conservation Importance, Important Habitats and Roosting Grounds

Recognized Sites of Conservation Importance

9.8.1.1 All aboveground works will not encroach on recognized sites of conservation importance, including "CA", SLS SSSI, and TLCP, where only underground tunneling works for LTT, SKWLR and TLCT (South Section) will be conducted beneath TLCP. As such, encroachment onto habitats within the recognized sites of conservation importance, such as mixed woodland and watercourse within TLCP, has been avoided and fragmentation will not be exerted on these recognized sites of conservation importance. There will be no habitat loss within TLCP.

Important Habitats and Roosting Grounds

9.8.1.2 **Important Habitats and Roosting Grounds other than CUTFSW** – Direct impact on important habitats except CUTFSW and roosting grounds, including SLS Butterfly Habitat, TLC Catchwater Tunnel Nos. 1, 5, 6, 7 and 8 serving as bat roosting grounds, and MW Egretry, Day Roost and Night Roost will be avoided by the alignment and all aboveground works. Due consideration has been paid in the alignment design of LTT, SKWLR and TLCT, given the significance of TLC Catchwater Tunnel Nos. 6 and 8 serving as roosting ground of bats. The significance of former and latter as an overwintering ground for bats, as described in **Table 9.13**, were evaluated with low to medium and medium to high ecological value respectively. Recognizing the consistent presence of a population of Leschenault's Rousette inside TLC Catchwater Tunnel No. 8 throughout years, the alignment of LTT has been designed to avoid passing underneath it and will instead pass to its west at a horizontal distance of around 115m. As described in **Section 2**, TLCT would unavoidably pass underneath TLC Catchwater Tunnel No. 6 due to technical infeasibility and other site constraints. Design has optimized the separation distance of TLC Catchwater Tunnel No. 6 and TLCT (South Section) to a vertical distance of 20m.

9.8.1.3 **CUTFSW** – Compared to the alignment proposed in the Feasibility Study stage of Route 11, the total area of FSW to be affected has been minimized by adopting alternative alignment to minimize the extent of FSW habitat overlapping with alignment. The current alignment of SKWLR avoids both direct and indirect impact on LUFSW, and the alignment of the Central Section has also been shifted. The total overlapping area has been largely reduced from 0.95ha under the previous feasibility study alignment to 0.25ha under the current proposed alignment), the habitat sizes to be affected by cut slope works, and the amount of excavation materials), the mainline of the Project will overpass the eastern patch of CUTFSW. Even though, direct impacts on this patch of FSW has still been avoided. This section of the Project has adopted viaduct form instead of at-grade road, and thus the viaduct will overpass but not directly impact this FSW. The alignment is raised to increase headroom clearance as much as possible over the area that overlaps with the FSW. The columns of this section of viaduct will also avoid the FSW. Therefore, no direct impact will be exerted on the eastern patch of CUTFSW. The northbound and southbound viaduct structures above the FSW are also split to allow for a local separation of about 7m. As the local section above the FSW is in

a north-south orientation, the provision of a 7m separation would maximize the time for sunlight to penetrate through the separation and reach into the FSW underneath.

Avoidance of Reclamation in North Lantau

9.8.1.4 During the feasibility study stage of Route 11, possible reclamation locations at both TLT and TKW were included. Further studies to optimize the Project alignment and engineering design have been conducted, and the reclamation at TKW could be totally avoided by adjustment of the alignment and setback of the tower of the suspension bridge.

9.8.2 Minimization

Minimization of Habitat Loss

Tunnelling Design

9.8.2.1 The Project has maximized the proportion and extent of the tunnel sections where appropriate and practicable. In addition to adopting tunnelling design for all sections within TLCP, tunnelling design will also be adopted in the TLCT (North Section) and TLCT (South Section), which partly fall outside TLCP. The overall loss of natural habitats, especially mixed woodland and watercourse habitats ranked with relatively higher ecological value, will therefore be minimized.

Refinement/Shifting the Alignment to Minimize Mixed Woodland Slope Cutting

9.8.2.2 As detailed in **Section 2.10**, upon to refining and/or shifting the alignment, the area of mixed woodland, which is of low to medium ecological value, lost due to slope cutting will be minimized. The volume of hillslope cutting in SKW/TLC area will also be minimized by re-routing the alignment round the hill instead of across the hill area and raising the road levels, bringing about a significant reduction in the size and extent of mixed woodland and shrubland/grassland outside TLCP to be permanently lost.

Maximization of Haul Road Extent Overlapping with the Main Alignment

9.8.2.3 The alignment of haul road has been designed to overlap with the main alignment as far as possible, such that habitat loss solely incurring from the construction of haul road has been minimized as far as possible. A particular exception is at the eastern patch of CUTFSW, where direct impact on this important habitat and the population of *Ixonanthes reticulata* is intended to be avoided by having the viaduct to span over the FSW and haul road will also thereby avoid this FSW.

Minimization of Reclamation Footprint in Tsing Lung Tau

9.8.2.4 Reclamation in TLT will still be inevitable due to local constraints prohibiting further setback of the bridge tower. The engineering design has taken a proactive approach to minimize the scale of reclamation as far as practicable. The latest design has reduced the reclamation extent by approximately 0.5ha (i.e. from 2.7ha to 2.2ha).

Minimization of Habitat Fragmentation

The Majority of Tunnel and Viaduct Form

9.8.2.5 Potential habitat fragmentation impact has been minimized by maximizing the proportion and extent of tunnel and viaduct sections. Tunnel sections will not

affect the linkage or connectivity of the habitats above, while the piers of the viaducts will still allow movement of fauna species.

9.8.2.6 During the construction phase, vegetation clearance will be performed at the locations of the piers to facilitate the construction works. For the areas in between the piers, vegetation will be cleared on as-needed basis if space is required for manoeuvring or haul roads (Maximizing the overlapping of haul roads with the main alignment is a means of minimizing direct habitat loss, and the works areas beneath the viaducts would be reinstated after construction as far as practicable.). While haul roads would not pose obstruction to fauna movement after working hours, the remaining vegetation beneath the viaducts would still provide passage for fauna during construction.

9.8.2.7 During the operational phase, while the piers would sit on their locations, the remaining areas between the piers will generally not be occupied where boundary fence is not required, hence allowing the movement of wildlife underneath the viaducts. Any fencing for individual facilities (e.g. plant rooms and viaduct piers) would be small in scale and separately located, and would not cause adverse effects on any wildlife passing the areas. Passage for fauna across the viaducts between habitats will still be available.

Locations of Aboveground Works Areas

9.8.2.8 The major aboveground works areas are located in LT, SKW, TL, SL, TLT and NKL, where habitats will be directly impacted, but these habitats mostly fall on their respective edges. Ecological connectivity, in terms of connection of habitats of the same kind and animal passage, would still be largely maintained. Though these major aboveground works areas have comparatively higher potential to cause fragmentation impact, they are only of small proportion of the Project footprint and are separately located in different areas. Alternative passages for fauna, such as habitats above tunnel alignments or beneath viaducts are also available nearby. The fauna therein, including those of conservation importance, would still be able to access their habitats.

Minimization of Risk of Direct Injury/Mortality to Species of Conservation Importance

9.8.2.9 As a viaduct will overpass but not directly impact the eastern patch of CUTFSW, the population of *Ixonanthes reticulata* therein would be largely preserved, except that felling of the 8 individual trees of *I. reticulata* will be unavoidable due to conflict with the viaduct above and low "Suitability for Transplanting" based on preliminary assessment at this stage (**Appendix 11.1** under **Section 11**). Tree compensation will be provided under **Section 11**. The gradient of the viaduct has been elevated to increase the headroom clearance beneath and minimize the number of *I. reticulata* in conflict with the viaduct.

9.8.2.10 TLCT (South Section) will pass underneath TLC Catchwater Tunnel No. 6 with vertical separation of 20m, while LTT and SKWLR will pass close to TLC Catchwater Tunnel No. 8 at 115m away from tunnel portal. The separation distance between them has been optimized to the best practicable extent. The tunnelling methodology will also be adjusted. For the known bat roost inside TLC Catchwater Tunnel No. 6, due consideration has been given to the alignment design and selection process. It has been demonstrated that complete avoidance of TLCT (South Section) running beneath TLC Catchwater Tunnel No. 6 is not feasible

(details see **Section 2**). Efforts have been put to minimize the ground-borne vibration impact as much as possible. The vertical distance of TLCT (South Section) from TLC Catchwater Tunnel No. 6 has been maximized through the adjustment of the gradient of TLCT (South Section) to its acceptable limit.

Minimization of Risk of Potential Bird Collision with Noise Barriers

9.8.2.11 Although no major flight path of avifauna was recorded near the Project footprint, considering the proximity of the main alignment to natural habitats nearby, mitigation measure on noise barrier is proposed to minimize the risk of potential bird collision. Tinted materials and superimposing dark patterns or strips on noise barriers, as per Guidelines on Design of Noise Barriers (EPD and HyD 2003) and Practice Notes No. BSTR/PN/003 (Revision E) Noise Barriers with Transparent Panels (HyD 2020), would be deployed to minimize the risk of bird mortality due to collision.

Minimization of Shading Impact on the Eastern Patch of CUTFSW

9.8.2.12 While the viaduct above part of the eastern patch of CUTFSW will align along the north-south axis, the gradient of the viaduct has been maximized as far as possible. Besides, as a 7-metre gap is left between the dual 2-lane carriageway, sunlight will be able to pass through the gap and reach the canopy of the eastern patch of CUTFSW during the operational phase.

Minimization of Light Glare Impact

9.8.2.13 While the installation of artificial lightings is unavoidable during the construction and operational phases, the light glare impact on the surrounding habitats and terrestrial fauna both within and outside TLCP can be minimized by adopting the following measures.

9.8.2.14 The incidence angle of artificial lighting should be directed towards areas with necessity of lighting only and away from natural habitats both within and outside TLCP. In this sense, the light glare impact on nocturnal terrestrial fauna will be minimized by reduction in the extent of possible habitats for foraging purpose. Besides, the intensity of artificial lighting should be optimized with an aim to minimize unnecessary light glare impact in turn deters terrestrial fauna from utilizing natural habitats.

Minimization of Water Quality Impacts

9.8.2.15 Mitigation measures recommended to be undertaken to mitigate water quality impacts are detailed in **Section 5.5**. All effluent discharged from the construction site should comply with the standards stipulated in the DSS-TM. Filling works for reclamation will only commence upon the full completion of the perimeter seawall and will only be conducted within the seawall to prevent any fill materials and fine suspended solids from being discharged into the open sea.

Minimization of Indirect Disturbance

9.8.2.16 To minimize indirect disturbance to the nearby habitats and associated wildlife, the following key mitigation measures should also be implemented:

- Confining the works within the site boundary;
- Controlling access of site staff to avoid damage to the vegetation in surrounding areas; and

- Placement of equipment or stockpile in the existing disturbed/urbanized land within the site boundary of the Project to minimize disturbance to vegetated areas.

9.8.2.17 Good site practice should be implemented to further minimize impacts from disturbance, such as noise, air quality and water quality issues. The key measures include the following items.

- The use of quiet plant and EPD's Quality Powered Mechanical Equipment (QPME);
- The use of movable noise barrier;
- The use of temporary noise screening structures or purpose-built temporary noise barriers;
- Installation of site hoarding as temporary noise barrier where construction works will be undertaken; and
- Compliance of mitigation measures stipulated in the ProPECC PN 1/94 "Construction Site Drainage" to minimize water quality impact.

9.8.2.18 Site audit and inspection will be undertaken during the construction phase to ensure that the mitigation measures have been properly implemented, all the aboveground works areas do not encroach on TLCP and all aboveground construction activities are confined within their boundaries.

9.8.2.19 To mitigate the ecological impacts to arise from the temporary loss of developed area, mixed woodland, plantation and shrubland/grassland during the construction phase, replanting will in general be implemented upon the completion of the construction works to reinstate the areas to be temporarily affected to condition similar to pre-disturbed status. With the implementation of mitigation measures, no adverse ecological impact is anticipated from the temporary habitat loss.

Minimization of Groundwater Infiltration

9.8.2.20 Appropriate measures during the tunnelling works should be implemented to minimize groundwater infiltration. The water control strategies listed in **Section 5.11.2** should be duly followed.

Minimization of Site Runoff

9.8.2.21 During the construction phase, site runoff would need to pass through sedimentation tanks to reduce the concentration of suspended solid. In accordance with the Practice Note for Professional Persons on Construction Site Drainage, EPD, 1994 (ProPECC PN 1/94), best management practices should be implemented onsite as far as practicable to control site runoff and drainage at all construction sites during construction phase, so that the runoff to be treated will be discharged to public drainage system in compliance with the Water Pollution Control Ordinance. Construction effluent, site runoff and sewage will be properly collected and/or treated. Wastewater from construction sites will be managed. Proper locations for discharge outlets of wastewater treatment facilities well away from the natural streams/rivers will be identified. Effluent monitoring will be incorporated to make sure that the effluent from construction sites to be discharged will meet the effluent discharge guidelines. The best practices are detailed in **Section 5**.

Minimization of Disturbance to Bat Roosts

9.8.2.22 A thorough tunnel construction methodology selection process has been undertaken to determine the tunnel construction methodology incurring as minimal ground-borne vibration as possible. Drill and blast, tunnel boring machine (TBM) and other mechanical methods, like drill and break, have been considered. TBM is considered unfeasible for the construction of LTT, SKWLR and TLCT, as TBMs of the size required for dual 3-lane or dual 4-lane tunnels for hard rock ground condition are not currently available on the market (**Section 2.9.2.6** refers). Besides, owing to slow excavation rate, mechanical excavation method is also considered not feasible.

9.8.2.23 Ground-borne vibration due to blasting represents the major source of disturbance to the identified bat roosts inside TLC Catchwater Tunnels Nos. 6 and 8. Mitigation of the potential ground-borne vibration impact will be through an integrated approach to combine the review of charge weight which in turn determines the action level of ground-borne vibration, and continuous monitoring package, covering monitoring on ground-borne vibration at these catchwater tunnels and bat roost monitoring. In addition, continuous adaptive review on the alert, action and limit levels of ground-borne vibration in accordance with the monitoring results and the latest studies to be collected and reviewed respectively will be conducted, given there are limited precedent examples in Hong Kong.

9.8.2.24 While a ground-borne vibration limit of 13mm/s is imposed on blasting works near catchwater tunnels by WSD, minimization of ground-borne vibration disturbance to be produced by blasting works and critical determination of a justified and acceptable level of ground-borne vibration for the Project is needed. As detailed in **Section 9.5.1.1**, while there were studies reporting that roosting bats inside caves or hibernacula were not impacted by ground-borne vibration level beyond 10mm/s, ground-borne vibration level at about 6mm/s were frequently reported as the level without significant impact on bat roosts/hibernacula, and that at about 2.5mm/s was the lowest ground-borne vibration level imposed to cap ground-borne vibration impact noted from the reviewed literature. To take a precautionary approach for the roosting bats inside TLC Catchwater Tunnel Nos. 6 and 8, it is recommended to take 6mm/s as the ground-borne vibration level postulated to be safe for the roosting bats inside the catchwater tunnels, and consider **2.5mm/s**, **≥6mm/s** and **≥10mm/s** in PPV terms as **"Alert Level"**, **"Action Level"** and **"Limit Level"** respectively. It was noted from one of the reviewed literature that 10mm/s was imposed as a Limit Level of ground-borne vibration. Regular adaptive review on the Alert, Action and Limit Levels based on the monitoring data, including ground-borne vibration and bat monitoring data to be collected for TLC Catchwater Tunnel Nos. 6 and 8 during pre-blasting and blasting phases (**Section 9.10** refers), and the latest studies available to be reviewed will commence and will be conducted throughout the construction period. The level of ground-borne vibration at TLC Catchwater Tunnel Nos. 6 and 8 will be controlled, through review of charge weight, to not exceed **6mm/s** ("Action Level"), which would be subject to adaptive review. Should TLC Catchwater Tunnel No. 5 be found to be occupied by roosting bats during the pre-blasting and blasting phases, the monitoring results related to TLC Catchwater Tunnel No. 5 should also be taken into account when reviewing the Alert, Action and Limit Levels.

9.8.2.25 In accordance with the Action Level of 6mm/s, which would be subject to adaptive review, the blasting programme for TLC Catchwater Tunnel Nos. 6 and 8 under the Project should be properly planned. When the blasting front approaches the nearest point of the two concerned catchwater tunnels, the charge weight will be adjusted and the appropriateness of the Alert, Action and Limit Levels will be reviewed based on the monitoring results (i.e. ground-borne vibration and bat monitoring data) and any new literature to be collected and reviewed respectively during the course of the tunnelling works (**Section 9.10** refers) with a view to minimize ground-borne vibration impact on roosting bats. The adaptive review of the Alert, Action and Limit Levels will also take the ground-borne vibration and bat roost monitoring data of TLC Catchwater Tunnel No. 5 into account, should roosting bats be found therein.

Blasting Phase: Action Plan when Ground-borne Vibration Level Reaches or Exceeds Action Level

9.8.2.26 When ground-borne vibration reaches or exceeds the Action Level, the Environmental Team (ET) and Resident Site Supervisor (RSS) will investigate whether the exceedance is significantly caused by the blasting works and if affirmative, ET and the qualified ecologist will investigate any adverse impact on bats roosting inside TLC Catchwater Tunnel Nos. 6 and/or 8, acoustics survey and emergence survey to be conducted at catchwater tunnel portals at dusk will be increased to daily until the level of ground-borne vibration drops below the Action Level and the interval of bat roost survey will be agreed with AFCD. Should any adverse impacts be identified, ET/RSS will propose practicable remedial measures, including but not limited to adjustment/optimization of construction methodology, to minimize ground-borne vibration impact for agreement with relevant authorities (e.g. AFCD and EPD). The construction team will implement the measures to be agreed.

Blasting Phase: Action Plan when Ground-borne Vibration Level Reaches or Exceeds Limit Level

9.8.2.27 When ground-borne vibration level reaches or exceeds the Limit Level, blasting will be suspended, while alternative tunnelling method will be proposed and adopted upon agreement with relevant authorities (e.g. AFCD and EPD). Acoustics survey and emergence survey will be conducted at catchwater tunnel portals at dusk and at the time of implementing the alternative tunnelling method daily, until it is accepted by relevant authorities that the alternative tunnelling method is satisfactory and the level of ground-borne vibration falls below the Action Level.

Blasting Phase: Action Plan for Significant Abnormality

9.8.2.28 In case of any significant abnormality (e.g. Unaccountable fatality of bats, emergence of a significant number of bats from the concerned catchwater tunnels during daytime, etc.) observed during the construction phase, even there is no exceedance on Action Level or Limit Level, blasting will be suspended, and ET and the qualified ecologists will investigate the cause of the abnormality and on any direct relationship with the construction works. The ET and the Contractor should recommend and implement remedial measures (e.g. review and strengthen ground-borne vibration minimization measures), in consultation and agreement with relevant authorities (e.g. AFCD and EPD).

9.8.3 Compensation

Diversion of Watercourse

9.8.3.1 **Minor to moderate** ecological impact will arise from the permanent loss of sections of watercourses (i.e. W4, W22, W23 and W24) within the aboveground works areas in SKW and SL. These watercourse sections will be diverted before the commencement of construction works but the flow of water downstream will be maintained upon diversion, so the aquatic ecology in the downstream sections will not be indirectly affected. The diversion should be carried out in dry season as far as practicable. The design of the sections of the watercourses to be diverted should maximize the ecological opportunities for aquatic and riparian flora and fauna. Green channel should be adopted in the sections to be diverted. Natural substrates should be used as far as practicable to facilitate natural colonization of flora and utilization by fauna. Reuse of rock materials to be excavated is also recommended, as it would help reduce the need for offsite disposal. The proposed stream diversion works should follow the guidelines of protecting natural streams/rivers specified in Environment, Transport and Works Bureau Technical Circulars (Works) No. 5/2005 "Protection of natural streams/rivers form adverse impacts arising from construction works".

Compensatory Woodland Planting

9.8.3.2 With the adoption of tunnel design, there will be no loss of mixed woodland within TLCP and compensatory planting within TLCP is not required. The Project would result in permanent loss of approximately 17.54ha of mixed woodland outside TLCP, which is evaluated with low to medium ecological value. Also, there would be about 6.54ha of temporary loss of mixed woodland outside TLCP. As mentioned in **Section 9.5.5.2**, reinstatement will be conducted upon completion of works at the areas to be temporarily affected where feasible. The proposed extent of off-site compensatory woodland planting has also taken potential unsuccessful reinstatement with justification into consideration, such that mixed woodland to be temporarily lost and not readily reinstated will be compensated.

Site Constraint for Considering On-Site Compensatory Woodland Planting

9.8.3.3 The option of on-site woodland compensation is not considered feasible due to limited space within the Project footprint and on-site impracticability. Off-site compensatory woodland planting is considered the only feasible option.

Off-site Compensatory Woodland Planting

9.8.3.4 **Compensation Principle** – Following the "like for like" basis for provision of offsite mitigation measures to the extent that is practicable according to Annex 16 of EIAO-TM, a compensatory woodland planting ratio of 1:1 in terms of compensatory planting area will be considered and thorough justification for any scenario deviating from the aforesaid ratio to be eventually adopted will be provided.

9.8.3.5 **Compensation Site Consideration** – During the site selection process, developed area, plantation and shrubland/grassland habitats with a slope angle smaller than 35° on government land, outside CPs, firing range, SSSIs and "CA" will be considered as potential compensatory woodland planting sites. Compensatory woodlands can be established on vacant developed areas deprived of vegetation, while native tree species can be planted in shrubland/grassland to facilitate

succession to woodland. At this stage, areas in Tuen Mun West (around ~24.4ha) fulfilling the criteria above, are identified as potential compensatory woodland planting sites (**Figure 9.7**).

9.8.3.6 **Planting Composition** – Native tree species are preferred for the purpose of compensatory planting. The native tree species to be selected should be referenced to the native trees recorded in the existing similar habitat within the assessment area. Early and timely arrangement with plant nurseries for propagation of native tree seedlings should be made to ensure the availability of both the species and the quantity required. At maturity, the compensatory planting sites would create a habitat with layer stratification (i.e. canopy, middle layer and understorey), which promotes habitat complexity and enhances the ecological value. A woodland compensation plan and tree compensation plan will be submitted in the detailed design stage in consultation and agreement with relevant authorities.

9.8.3.7 As detailed in **Section 11**, felling of 8 trees of *Ixonanthes reticulata* will be unavoidable and compensatory planting of *I. reticulata* will be required. Should seedlings of *I. reticulata* be unavailable in plant nurseries, collection of seeds of naturally occurring *I. reticulata* will be performed. The seeds to be collected will be cultured in plant nurseries and allowed to germinate and become seedlings strong enough to be cultivated. Compensatory planting of *I. reticulata* is proposed to be undertaken within and/or in the vicinity of CUTFSW as far as practicable. The exact location where *I. reticulata* will be compensated will be subject to further confirmation during the detailed design stage.

9.8.3.8 **Maintenance** – The management and maintenance of the compensatory woodland should follow the Development Bureau Technical Circular (Works) No. 6/2015 Maintenance of Vegetation and Hard Landscape Features. Details of the management and maintenance program will be included in the Woodland Compensation Plan to be submitted in the detailed design stage and agreed with relevant authorities.

9.8.3.9 With the implementation of the proposed compensatory planting, ecological impact arising from the permanent loss of mixed woodland would be compensated.

Preservation, Transplantation and/or Compensatory Planting of Plant Species of Conservation Importance

9.8.3.10 Preservation and/or transplantation of plant species of conservation importance, including *Aquilaria sinensis*, *Diospyros vaccinioides*, *Gnetum luofuense*, *Ixonanthes reticulata* and *Nepenthes mirabilis*, will be conducted before site formation works. Priority should be given to on-site preservation, especially for large-sized individuals, and followed by transplantation, which is more feasible for small-sized individuals/seedlings. Prior to construction, plant species of conservation importance will be identified and those intended to be preserved will be fenced off onsite. The proposed recipient site for individuals of plant species of conservation importance to be transplanted is the compensatory woodland planting site as recommended in **Section 11**. An updated vegetation survey will be conducted and a detailed transplantation plan will be submitted during the detailed design stage. For climber species (i.e. *G. luofuense* and *N. mirabilis*), in the case that onsite preservation and transplantation are considered not feasible during the detailed design stage, seedling planting of both species would be considered and implemented.

Translocation of Aquatic and Water-dependent Fauna Species of Conservation Importance

9.8.3.11 Pre-construction detailed survey of aquatic and water-dependent fauna species of conservation importance, including but not limited to Hong Kong Cascade Frog, will be conducted before the commencement of watercourse diversion and site formation works to identify if any aquatic and water-dependent fauna species of conservation importance is present within and in the vicinity of the sections of the watercourses within the aboveground works to be directly impacted. Translocation to a proper recipient site will be proposed and carried out prior to the commencement of watercourse diversion to avoid potential direct impact on the aquatic and water-dependent fauna species of conservation importance. Monitoring of the aquatic and water-dependent fauna species of conservation importance to be translocated, if any, will be carried out.

9.8.4 Precautionary Measure

Detailed Reconnaissance Dive Survey

9.8.4.1 Before the start of marine construction works, including both seabed construction and reclamation works, a detailed reconnaissance dive survey was recommended to be conducted along the man-made seawall and semi-natural coastline within the reclamation site of TLT. The detailed reconnaissance dive survey should include items such as coral species composition to inspect if there are any additional colonies of hard / soft coral species. Should significant colonies be identified, the effectiveness and feasibility of coral translocation will be assessed. Depending on the detailed reconnaissance dive survey result, a detailed translocation proposal will be prepared if coral translocation is confirmed necessary.

9.8.5 Enhancement

Seawall Enhancement

9.8.5.1 When considering the seawall construction works within the reclamation site at TLT and the seawall surface of the reclaimed island, enhancement work should be considered during the design stage to include as many ecological features as possible to enhance the recruitment and colonization of the intertidal and subtidal fauna onto the hard substrate surface. Ecological features can be considered on artificial vertical seawalls and riprap seawall in the future, where capable of supporting various ecological enhancement features. For vertical seawalls, ecological features such as eco-tiles with complex designs and rough surfaces can be deployed to achieve better ecological performance comparing to conventional vertical seawalls. For artificial riprap seawall, ecological enhancement features such as tidal pools and hard substrate with enhanced surface should be considered, in order to provide microhabitats for marine organisms, increase the recruitment and colonization of intertidal fauna and increase the overall ecological value, integrity and complexity. The seawall enhancement can benefit not only the intertidal shore but also increase the associated ecosystems in the close vicinity.

9.9 Residual Impacts

9.9.1.1 Residual ecological impacts refer to the ecological impacts which will still arise despite the adoption and implementation of ecological mitigation measures.

9.9.1.2 Among the terrestrial habitats to be permanent lost (i.e. backshore, channel, developed area, mixed woodland, plantation, shrubland/grassland and watercourse), the permanent loss of around 17.54ha of mixed woodland and 164m of watercourses would be mitigated by the compensatory woodland planting, and stream diversion and the adoption of green channels at the sections to be diverted respectively. The permanent loss of around 24.60ha of developed area will be re-provided with at least the same extent of developed area during the operational phase. Residual impacts arising from permanent habitat loss would include net loss of around 0.16ha of backshore, 257m of channel, 13.93ha of plantation and 16.47ha of shrubland/grassland. However, these habitats are common within the assessment area and in the context of the entire Hong Kong. The residual impact of permanent terrestrial habitat loss is considered acceptable. Meanwhile, preservation, transplantation and/or compensatory planting of flora species of conservation importance (*Aquilaria sinensis*, *Diospyros vaccinoides*, *Gnetum luofuense*, *Ixonanthes reticulata* and *Nepenthes mirabilis*), as well as translocation of aquatic and water-dependent fauna species of conservation importance, including but not limited to Hong Kong Cascade Frog, should the presence of aquatic and water-dependent fauna species of conservation importance be confirmed in the pre-construction detailed survey on aquatic and water-dependent fauna species of conservation importance to be carried out, will ensure that there is no loss of flora or fauna species of conservation importance and thus no resulting residual impact will occur.

9.9.1.3 The residual impact on marine habitats occurring as a result of the construction and operational phases is the permanent loss of about 122m man-made seawall, 91m of semi-natural coastline and 4.1ha of seabed. The loss of intertidal fauna, hard and soft coral, and subtidal seabed area will be compensated by the recolonization on the new and additional hard substrate to be provided by the future seawall and reclamation site. The residual impact on marine habitats is considered acceptable.

9.9.1.4 The identified indirect impacts (i.e. habitat fragmentation, ground-borne vibration, light glare, noise, dust, human activities, water quality impact, groundwater drawdown and shading impact) to the habitats, recognized sites of conservation importance (e.g. TLCP), important habitats (e.g. the eastern patch of CUTFSW), flora and fauna species, and roosting ground (i.e. TLC Catchwater Tunnel Nos. 1, 5, 6, 7 and 8) would be **minor to moderate**, **minor**, **insignificant** or **negligible** during both construction and operational phases. With the recommended mitigation measures, the residual indirect impacts will be mitigated to an acceptable level. As a result, no unacceptable residual impact is anticipated during both construction and operational phases.

9.9.1.5 With the full implementation of the proposed ecological mitigation measures, no significant residual ecological impact would arise.

9.10 Environmental Monitoring and Audit (EM&A)

9.10.1.1 The assessment presented above indicates that unacceptable construction phase impacts and operation phase impacts are not expected to occur to terrestrial ecological resources. The implementation of the ecological mitigation measures described in **Section 9.8** will be inspected and monitored regularly as part of the ecological monitoring programme during the construction period. These procedures are presented in the separate EM&A manual.

9.10.2 Preservation, Transplantation and/or Compensatory Planting of Flora Species of Conservation Importance

9.10.2.1 A pre-construction detailed vegetation survey should be conducted by qualified plant ecologist, whose curriculum vitae should be submitted to the AFCD for comments and approval beforehand, for the aboveground works areas, focusing on plant species of conservation importance, including but not limited to *Aquilaria sinensis*, *Diospyros vaccinioides*, *Gnetum luofuense*, *Ixonanthes reticulata*, *Nepenthes mirabilis* and those recorded in the literature review of this EIA study, to update and verify their presence and/or abundance. The flora species of conservation importance to be directly impacted will be preferably preserved in-situ where feasible. Transplantation and/or compensatory planting of seedlings would be recommended should on-site preservation be confirmed unfeasible with justification during the detailed design stage. Prior to transplantation, a transplantation proposal for the individuals of flora species of conservation importance to be directly impacted and feasible to be transplanted will be prepared and submitted to AFCD for comments and approval. A monitoring programme for the individuals of plant species of conservation importance to be preserved, transplanted and/or compensated, if any, will also be detailed in the transplantation proposal. In the case that onsite preservation and transplantation are both considered unfeasible during the detailed design stage, compensatory seedling planting of the flora species of conservation importance to be directly impacted would be considered and implemented, and a planting proposal to recommend their quantity and location will be prepared for agreement with AFCD. A post-planting monitoring programme for these flora species of conservation importance to be planted for compensatory purpose will also be provided.

9.10.3 Translocation of Aquatic and/or Water-Dependent Fauna Species of Conservation Importance

9.10.3.1 A pre-construction survey plan for aquatic and water-dependent fauna species of conservation importance in the sections of the ditch and watercourses W4, W22, W23 and W24 to be directly impacted should be prepared by a qualified ecologist to be engaged, whose curriculum vitae should be submitted to AFCD for review and comments prior to the commencement of any survey to be conducted. A pre-construction survey on aquatic and/or water-dependent fauna species of conservation importance, with a focus on but not limited to those of conservation importance recorded within the ditch and sections of the watercourses falling within the aboveground works areas (e.g. Hong Kong Cascade Frog), is proposed to be conducted along with the identification of suitable recipient site(s) by a qualified ecologist, who should also prepare a translocation plan, encompassing (1) translocation methodology, (2) identification of suitable recipient site(s) (e.g.

Watercourse W7) and (3) post-translocation monitoring methodology, to be submitted to AFCD for comments and approval prior to conducting translocation.

9.10.4 Monitoring of Compensatory Woodland

9.10.4.1 Monitoring of the compensatory woodland should be performed on a regular basis after the first planting, to monitor the survival and establishment of trees and wildlife use. Survey in each compensatory woodland location will commence after the first planting. Individuals of each planted species to be randomly selected will be tagged and their survival rate will be computed. Supplementary planting will be recommended if deemed necessary. Wildlife use of the planted vegetation will also be monitored. Details of the monitoring will be included in the Woodland Compensation Plan to be submitted in the detailed design stage and agreed with relevant authorities.

9.10.5 Bat-relevant Monitoring

9.10.5.1 In view of the significance of the roosting bats inside TLC Catchwater Tunnels, an array of monitoring approaches is hereby formulated and a Detailed Bat Monitoring and Remedial Plan, encompassing monitoring on ground-borne vibration level, and bat roost monitoring, comprising bat emergence survey, bat acoustics survey at catchwater tunnel portals and bat roost surveys, before, during and after the tunnelling works. Initial consent on the planned mitigation or monitoring near and within the catchwater tunnels by WSD has already been sought. The bat roost monitoring will be performed by ecologist(s) with relevant experience, while the bat monitoring and remedial plan should be prepared and submitted to relevant authorities, including AFCD, for agreement in advance.

9.10.5.2 Bat monitoring aims to 1) infer up to date information about roosting bats, confirm bat usage and record the variation in the diversity and number of roosting bats inside TLC Catchwater Tunnel Nos. 1, 5, 6, 7 and 8 during the pre-blasting, blasting, post-blasting and operational phases; 2) The information collected in 1) will be used to evaluate the impacts on the roosting bats inside TLC Catchwater Tunnel Nos. 1, 5, 6, 7 and 8, and provide grounded basis for adaptive review of the Alert, Action and Limit Levels of ground-borne vibration based on the monitoring data, including ground-borne vibration and bat monitoring data to be collected for TLC Catchwater Tunnel Nos. 6 and 8 during pre-blasting and blasting phases, which will take up to date information about bat roosts into account (Should TLC Catchwater Tunnel No. 5 be found to be occupied by roosting bats during the pre-blasting and blasting phases, the monitoring results related to TLC Catchwater Tunnel No. 5 should also be taken into account when reviewing the Alert, Action and Limit Levels.); 3) ensure effectiveness of the proposed mitigation measures and to avoid impacts on the bats roosting catchwater tunnels during the construction and operational phases of the Project and 4) help formulate remedial actions in case of need.

Ground-borne Vibration Monitoring

9.10.5.3 Ground-borne vibration will be monitored and measured at suitable locations inside and/or near the portals of TLC Catchwater Tunnel Nos. 6 and 8 using a vibration sensor and a data logger during the pre-blasting, blasting, post-blasting and operational phases. The exact installation locations will be agreed with WSD. Monitoring data should be reported to relevant authorities (e.g. AFCD and EPD). The relationship between ground-borne vibration level, timing of blasting works

and distance between the blasting source and TLC Catchwater Tunnel Nos. 1, 5, 6, 7 and 8 (if there is blasting works) should be suitably presented in the bat monitoring report. If the level of ground-borne vibration to be measured exceeds the Action and/or Limit Levels, (i.e. ≥6mm/s and ≥10mm/s respectively), mitigation measures to reduce the magnitude of ground-borne vibration as detailed in the EM&A Manual, such as reviewing the charge weight and tunnelling method, will be reviewed and adopted. Regular adaptive review on the Alert, Action and Limit Levels of ground-borne vibration will be conducted over the course of tunnelling works.

Bat Roost Monitoring

9.10.5.4 **Bat Baseline Surveys** - Before the commencement of any tunnel blasting works of LTT, SKWLR and TLCT (South Section), pre-blasting bat baseline survey, including acoustics survey and emergence survey at the portals of TLC Catchwater Tunnel Nos. 1, 5, 6, 7 and 8, and bat roost surveys inside TLC Catchwater Tunnel Nos. 1, 5, 6, 7 and 8 by ecologists to update and determine the abundance and diversity of bat species therein for a period of at least 9 months, covering the overwintering season (usually mid-December to mid-March of the following year), breeding season (usually May to September) and the time gaps between the overwintering season breeding season (i.e. late March to April and October to early December). Monthly bat acoustics and emergence survey, meanwhile, should be carried out, while the interval of bat roost survey is quarterly tentatively, subject to agreement with AFCD in prior. The methodology of bat roost, acoustics and emergence surveys should follow that stated in **Section 9.3.3.3** to **Section 9.3.3.5**, while the survey results should remain valid for three years only. Other types and means of monitoring, such as bat activity monitoring, by suitable devices will be subject to agreement with AFCD and WSD. A pre-blasting bat monitoring report will be submitted to relevant authorities (e.g. AFCD and EPD) for comments.

Blasting Phase: Monitoring on Roosting Bats and Ground-borne Vibration

9.10.5.5 Ground-borne vibration monitoring will be conducted continuously throughout the entire tunnelling works for LTT, SKWLR and TLCT (South Section), including all blasting works, for both ecological monitoring and engineering purposes.

9.10.5.6 Monitoring on roosting bats will commence when the first blasting works is conducted at either end of the tunnel alignment (i.e. when the blasting works is farthest to TLC Catchwater Tunnel Nos. 6 and 8 and the roosting bats therein), and the frequencies of monitoring on roosting bats will be adjusted with the ground-borne vibration data to be recorded, which also indicates the shortest distance of blasting works from TLC Catchwater Tunnel Nos. 6 and 8. During the first stage of bat roost monitoring to be conducted, monthly bat acoustics survey and emergence survey should be carried out, while the interval of bat roost survey is quarterly tentatively, subject to agreement with AFCD in prior. Other types and means of monitoring, such as bat activity monitoring by suitable devices, will be subject to agreement with AFCD and WSD. A bat monitoring report for blasting phase will be submitted to relevant authorities (e.g. AFCD and EPD) for comments.

9.10.5.7 For TLC Catchwater Tunnel Nos. 6 and 8, when the level of ground-borne vibration reaches the Alert Level (2.5mm/s), weekly acoustics survey and emergence survey will be conducted at catchwater tunnel portals and during blasting by qualified ecologists. The interval of bat roost survey at this stage is monthly tentatively,

subject to agreement with AFCD in prior, and will also be conducted on an as-needed basis. For TLC Catchwater Tunnel No. 6, the monitoring frequency of bat acoustics survey and emergence survey, including those to be conducted and during blasting, will be further increased to daily when the works front of TLCT (South Section) underpasses, and the monitoring data will be submitted to AFCD, EPD and HyD within 24 hours after each blasting event. The frequency and interval of bat roost survey during the underpass duration will be agreed with AFCD in prior. The frequency of acoustics survey and emergence survey could be relaxed to weekly when works front advances and leaves the underpass location and the level of ground-borne vibration is reduced to the Alert Level.

9.10.5.8 For both TLC Catchwater Tunnels Nos. 6 and 8, the monitoring frequency will revert to monthly when the ground-borne vibration level drops to below 2.5mm/s.

9.10.5.9 From the kick-off of the blasting phase monitoring, an adaptive review on the Alert, Action and Limit Levels on ground-borne vibration level, which will be based on the results of both ground-borne vibration and roosting bat monitoring, will be conducted every 3 months throughout the course of the tunnelling works, or on an as-needed basis. Through adopting a conservative approach to be supported by data and prudent observations, the adaptive review will recommend if any adjustments are needed upon retrieval of monitoring results, and shall be submitted to relevant authorities (e.g. AFCD and EPD) for agreement.

Blasting Phase: Action Plan when Ground-borne Vibration Level Reaches or Exceeds Action Level

9.10.5.10 If the level of ground-borne vibration to be measured reaches or exceeds the Action Level, whether the exceedance is significantly caused by the blasting works will be investigated. If affirmative, the qualified ecologist will investigate on any adverse impact on bats roosting inside TLC Catchwater Tunnel Nos. 6 and/or 8. The frequency of bat acoustics and emergence surveys, which will also include surveys to be conducted during blasting, to be conducted at catchwater tunnel portals will be increased to daily until the level of ground-borne vibration drops below the Action Level, while the frequency and interval of bat roost survey will be agreed with AFCD. Should any adverse impacts be identified, practicable remedial measures, including but not limited to adjustment/optimization of construction methodology, to minimize ground-borne vibration impact will be proposed for agreement with relevant authorities (e.g. AFCD and EPD). The Contractor will implement the measures to be agreed.

Blasting Phase: Action Plan when Ground-borne Vibration Level Reaches or Exceeds Limit Level

9.10.5.11 If the level of ground-borne vibration to be measured reaches or exceeds the Limit Level, blasting will be suspended, and alternative tunnelling method will be proposed and adopted upon agreement with relevant authorities (e.g. AFCD and EPD). Daily bat acoustics survey and emergence survey will be conducted at the portals of TLC Catchwater Tunnel Nos. 6 and 8, covering the duration and at the time of implementing the alternative tunnelling method, until it is accepted by relevant authorities that the alternative tunnelling method is satisfactory and the level of ground-borne vibration to be measured falls below the Action Level.

9.10.5.12 In case any significant abnormality (e.g. Unaccountable fatality of bats, emergence of a significant number of bats from TLC Catchwater Tunnels Nos. 6 and/or 8

during daytime, etc.) is observed in the absence of exceedance on Action Level or Limit Level during the blasting phase, blasting will be suspended and the abnormality will be reported to relevant authorities (e.g. AFCD, EPD and WSD). Potential cause(s) of the abnormality will be investigated and if proven correlated to the construction works of the Project, including blasting works for the construction of tunnels and other construction activities in the vicinity), remedial measures (e.g. further review charge weight and adopt alternative construction method other than blasting) will be recommended and suitably implemented by the Contractor, in consultation and agreement with relevant authorities.

Post-Blasting Phase Monitoring on Ground-borne Vibration and Roosting Bats

9.10.5.13 After all blasting works has been completed, post-blasting ground-borne vibration monitoring, acoustics survey, emergence survey and bat roost survey will be conducted at TLC Catchwater Tunnel Nos. 6 and 8 for at least 9 months, following the same method and frequency as the baseline monitoring, covering the overwintering season (usually mid-December to mid-March), breeding season (usually May to September) and the time gaps between the overwintering and breeding seasons (i.e. late March to April and October to early December). Acoustics survey and emergence survey should be carried out at least monthly, while the interval of bat roost survey is quarterly tentatively, subject to agreement with AFCD in prior. A bat monitoring report for post-blasting phase monitoring will be submitted to relevant authorities (e.g. AFCD and EPD) for comments.

Operational Phase Monitoring on Ground-borne Vibration and Roosting Bats

9.10.5.14 In addition, within the first year of the operational phase, monitoring on ground-borne vibration and roosting bats will be conducted for TLC Catchwater Tunnel Nos. 1, 5, 6, 7 and 8 for at least 9 months, covering the overwintering season and breeding season. Monthly bat acoustics survey and emergence survey should be carried out, while the frequency of bat roost survey and/or other types and means of monitoring, such as bat activity monitoring by suitable devices, will follow that to be adopted during the construction phase. A bat monitoring report for operational phase will be submitted to relevant authorities (e.g. AFCD and EPD) for comments.

9.10.6 Pre-construction Detailed Reconnaissance Dive Survey

9.10.6.1 Prior to the construction phase, especially the start of marine works, a detailed reconnaissance dive survey should be conducted by qualified SCUBA divers, who should be experienced in SCUBA diving and possessed knowledge related to marine organisms and the ability to identify both hard and soft coral species. The presence and location of hard coral *Oulastrea crispata*, ahermatypic cup coral *Balanophyllia* sp., and gorgonian *Guaiagorgia* sp. should be clearly indicated within the reclamation site at TLT. Also, the presence of other hard or soft coral species should also be inspected if any. To minimize the loss of these species and assess the feasibility of coral translocation if there is a need to undertake coral translocation. If coral translocation is confirmed necessary, a detailed translocation proposal will be prepared and submitted to the AFCD for comments.

9.10.7 Monitoring on the Effectiveness of Mitigation Measures on Groundwater Infiltration

9.10.7.1 As stated in **Section 5**, it is anticipated that the underground tunnelling works would not generate adverse groundwater infiltration impacts with proper

implementation of groundwater infiltration minimization measures. Nonetheless, as a precautionary measure, surface water level monitoring at natural watercourses within TLCP and in the vicinity of the tunnelling works will be conducted during the construction phase. Monthly monitoring will be conducted at watercourses underneath the tunnels to be constructed, to monitor water depth, water velocity and other relevant parameters to record and evaluate if any abnormal significant decrease of the water level, which is unlikely to be associated with changes in weather patterns, arises from the construction works and operation of the Project. In case any abnormal significant decrease in water level arises during the construction and operational phases, the Contractor should recommend and implement remedial measures (e.g. review and strengthen groundwater water control strategies), where necessary, in consultation with relevant authorities.

9.11 Conclusions

9.11.1.1 The ecological baseline has been established based on literature review, focal ecological surveys lasting for nine months and completed in January 2023, and supplementary surveys finished in May 2023, covering both wet and dry seasons. A total of 12 habitat types, including agricultural land, backshore, channel, developed area, fung shui woodland, intertidal habitat (natural coastline and seawall), mixed woodland, plantation, reservoir, sea, shrubland/grassland and watercourse were identified within the assessment area. The number of species of conservation importance recorded within the aboveground works areas were also limited.

9.11.1.2 Key ecological issues of the Project include potential impacts to TLCP, roosting bats inside WSD's Catchwater Tunnels, FSWs, and mixed woodland. Due consideration on impact avoidance and impact minimization have been undertaken. Tunnel form, including LTT, SKWLR and TLCT, will be adopted for most of the land section of the alignment and thus will extensively reduce the extent of aboveground works areas and the sequential habitat loss. The aboveground works areas will also completely avoid all recognized sites of conservation importance, including TLCP, by careful site selection for aboveground works. A few Project elements will be located on existing developed areas such as LT Quarry and TLT with limited ecological value. By refining the alignment, the extent of cut slope and thus the associated habitat loss is further reduced. Overlapping of the alignment with FSW is also reduced from 0.9ha to 0.25ha, and the design at this overlapping section has been modified to adopt a viaduct with elevated gradient and leave a 7-metre gap between the northbound and southbound lanes. Direct encroachment and shading impact on FSW will be avoided and minimized respectively. Reclamation at NL has been avoided and the reclamation extent at TLT has also been reduced to 2.2ha.

9.11.1.3 Potential direct ecological impacts arising during the construction phase include permanent and temporary habitat loss and impact on flora species of conservation importance (including *Aquilaria sinensis*, *Diospyros vaccinioides*, *Gnetum luofuense*, *Ixonanthes reticulata* and *Nepenthes mirabilis*) and fauna species of conservation importance of relatively low mobility (Hong Kong Cascade Frog) identified within the aboveground works areas.

9.11.1.4 The Project will cause potential permanent habitat loss to around 0.16ha of backshore, 257m of channel, 24.60ha of developed area, 17.54ha of mixed

woodland, 91m of natural coastline, 13.93ha of plantation, 4.1ha of seabed, 122m of seawall, 16.47ha of shrubland/grassland and 164m of watercourse. In addition, there will be temporary habitat loss of about 0.09ha of backshore, 90m of channel, 16.85ha of developed area, 6.54ha of mixed woodland, 298m of natural coastline, 5.88ha of plantation, 49m of seawall, 5.72ha of shrubland/grassland and 13ha of sea.

9.11.1.5 In the absence of mitigation, the identified ecological impacts during construction phase are mostly minor in magnitude. Most habitats to be lost (e.g. backshore, channel, developed area, plantation, shrubland/grassland and sea) are of low ecological value. No specific ecological mitigation measure will be required for the permanent or temporary loss of habitats of relatively lower ecological value.

9.11.1.6 The potential impact of the permanent loss of mixed woodland of low to medium value is considered as **moderate**. Permanent loss of about 17.54ha of mixed woodland would be mitigated by offsite compensatory woodland planting. For the about 6.54ha of temporary loss of mixed woodland, should onsite reinstatement at temporary works areas be found not feasible with justification, the loss may also be compensated together as part of the compensation woodland.

9.11.1.7 Impact on around 164m of watercourse habitat in SKW and SL (i.e. W4, W22, W23 and W24) of low to medium ecological value will be mitigated by diversion of the watercourse sections to be directly impacted and provision of green channel design where applicable, together with translocation of aquatic and water-dependent fauna species of conservation importance, if to be found during the pre-construction detailed survey on aquatic and water-dependent fauna species of conservation importance.

9.11.1.8 Fauna species of conservation importance of relatively higher mobility and recorded within and in the vicinity of the aboveground works areas will only be indirectly impacted.

9.11.1.9 To mitigate the remaining potential direct ecological impacts on flora and fauna species of conservation importance within the aboveground works area, pre-construction detailed vegetation survey followed by onsite preservation, transplantation and/or compensatory planting of flora species of conservation importance, and translocation of aquatic and water-dependent fauna species of conservation importance will be carried out.

9.11.1.10 The anticipated direct ecological impact will be mitigated to **minor** level. Monitoring of the establishment of the compensatory woodland, implementation of transplantation and/or translocation and monitoring of the individuals of plant, aquatic and/or water-dependent species of conservation importance to be preserved, transplanted, translocated and/or compensated, will be implemented where applicable.

9.11.1.11 Potential indirect impacts during the construction phase include habitat fragmentation, construction disturbance, ground-borne vibration impact on the roosting bats inside TLC Catchwater Tunnel Nos. 1, 5, 6, 7 and 8, water quality impact and potential groundwater drawdown, potential indirect impact on recognized sites of conservation importance, important habitats, roosting grounds and species of conservation importance. These impacts are either **minor** or **insignificant** in nature or level and do not require specific ecological mitigation

measure to be implemented to mitigate their effect, except ground-borne vibration impact on the roosting bats inside TLC Catchwater Tunnel Nos. 6 and 8.

9.11.1.12 Through reviewing relevant and publicly available literature, it is postulated that 6mm/s (in PPV terms) is considered a safe ground-borne vibration threshold to these roosting bats and to be adopted for planning tunnelling works. The impact of ground-borne vibration on the roosting bats inside TLC Catchwater Tunnel Nos. 6 and 8 arising from tunnelling works of LTT, SKWLR and TLCT (South Section) is anticipated to be **minor to moderate**. To mitigate the impact of ground-borne vibration to these roosting bats, "Alert Level" at 2.5mm/s, "Action Level" at >6mm/s and "Limit Level" at >10mm/s of ground-borne vibration will be established. Monitoring on ground-borne vibration and bat monitoring surveys comprising acoustics survey, emergence survey and bat roost survey covering overwintering season, breeding season and time gaps between overwintering and breeding season, will be conducted for TLC Catchwater Tunnel Nos. 1, 5, 6, 7 and 8 for at least 9 months prior to any blasting as baseline, upon to the completion of blasting, and within the first year during the operational phase. Both ground-borne vibration monitoring and bat roost monitoring will be exercised throughout the blasting phase. With the use of suitable blasting/charge rate, the implementation of bat monitoring programme, as well as the adaptive review on tunnelling methods during the construction phase, it is anticipated that the ground-borne vibration impact on roosting bats and TLC Catchwater Tunnel Nos. 6 and 8 as roosting ground will be mitigated to an acceptable level.

9.11.1.13 Appropriate groundwater control measures and associated monitoring/site inspections discussed in **Section 5.10** will be implemented to minimize the groundwater infiltration during tunnel construction and no adverse residual impacts on water quality impact are anticipated. As a precautionary measure, surface water level monitoring of natural watercourse(s) in the vicinity of the underground tunnel works area should be conducted during the construction stage. Post-construction monitoring of surface water level of natural watercourse in the vicinity of the underground tunnel works area, including those within TLCP, for one year should also be carried out. Monthly monitoring should be conducted at watercourses where tunnels pass underneath to monitor water depth and water velocity and remedial measures should be recommended, where necessary, if any abnormal significant decrease of the water level not likely relevant to natural stochastic factors (e.g. spate after heavy rainstorms) is arising from the Project.

9.11.1.14 Potential direct marine ecological impacts arising from the proposed 2.2ha reclamation site at TLT for TLB during the construction phase include permanent (4.1ha) and temporary (about 13ha) loss of seabed and the marine waters above, and associated direct impact on species of conservation importance (including amphioxus, hard and soft coral) identified within the reclamation site.

9.11.1.15 No specific marine ecological measure will be required for the permanent or temporary loss of seabed, man-made seawall or natural coastline with relatively low ecological value.

9.11.1.16 Though two hard coral species and one gorgonian species (namely *Oulastrea crispata* and ahermatypic cup coral *Balanophyllia* sp., and one gorgonian *Guaiagorgia* sp.) recorded scattered (less than 1% coverage) along the subtidal coastal area within the reclamation site at TLT, these species are common in the western Hong Kong waters, and they are generally adaptive and tolerance to

extreme environment such as relatively high suspended solid level. The impact is considered **minor**, and no mitigation is required. As a precautionary measure, a detailed reconnaissance dive survey will be conducted. Prior to the start of marine construction works, a detailed reconnaissance of dive survey should be conducted to inspect the presence of significant colonise of hard and/or soft coral along the artificial rocky shore within the reclamation site. Should significant colonises are identified, feasibility of coral translocation will be assessed, and a detailed translocation proposal will be prepared if coral translocation is confirmed necessary.

9.11.1.17 As an enhancement measure, seawall enhancement design will be considered during the design stage of the reclamation site at TLT for TLB. Possible ecological features should be considered to enhance the recruitment and colonization of the intertidal and subtidal fauna.

9.11.1.18 Potential indirect marine ecological impacts during the construction phase include impacts on marine water quality and disturbance due to increased marine traffic of works vessels. These impacts are either **minor** to **insignificant** in nature or level and do not require specific ecological mitigation measure to be implemented to mitigate their effect.

9.11.1.19 Ecological impacts due to noise disturbance, ground-borne vibration disturbance, light glare, habitat fragmentation, impact on flight-lines and foraging habitats of ardeids, potential roadkill and bird collision, water quality impact and shading effect on the eastern patch of CUTFSW during the operational phase are all considered **minor** or **insignificant** in nature. The impact on recognized sites of conservation importance, important habitats, roosting grounds and species of conservation importance during the operational phase will either be **minor** or **insignificant** in nature. No specific ecological mitigation measure is considered necessary.

9.11.1.20 With the implementation of proposed mitigation measures, unacceptable residual impacts on the ecological resources within and in the vicinity of the Project footprint during construction and operation phases are not anticipated.

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