



Agreement No. CE 15/2023 (CE)

First Phase Development of the
**New Territories North –
San Tin / Lok Ma Chau
Development Node**

Package 1 – Design and Construction

Implementation Plan for Wetland Enhancement Measures at Mai Po (Final) (Ref. Z8-06)
July 2025



土木工程拓展署
Civil Engineering and Development Department
North Development Office

Agreement No. CE 15/2023 (CE)

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Reviewed:

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31 July 2025

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31 July 2025

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1 INTRODUCTION

1.1 Background

- 1.1.1.1 The 2013 Policy Address first stated the need to take forward further development of the New Territories North (NTN) with a view to developing a modern new town there on a similar scale of the Fanling or Sheung Shui New Towns. In 2014, the Government commissioned the Preliminary Feasibility Study on Developing NTN (referred hereafter as “the Preliminary Study”) and an area in San Tin / Lok Ma Chau (STLMC) was identified as having potential for further development. In October 2016, a Broad Land Use Concept Plan (BLCP) of the area was promulgated in the public engagement of “Hong Kong 2030+: Towards a Planning Vision and Strategy Transcending 2030” (Hong Kong 2030+).
- 1.1.1.2 Following the announcement of advancing the studies on developing brownfield sites in the NTN in the 2018 Policy Address and the acceptance of the eight land supply options recommended by the Task Force on Land Supply in February 2019, the Feasibility Study on STLMC Development Node (STLMC DN) as the first phase development of NTN was jointly commissioned by the Civil Engineering and Development Department (CEDD) and the Planning Department (PlanD) in September 2019 to further develop the BLCP into a Preliminary Outline Development Plan (PODP) and confirm its feasibility. The PODP was presented to the Legislative Council in mid-2021 in the form of an Initial Land Use Plan.
- 1.1.1.3 In October 2021, the 2021 Policy Address announced to expand STLMC DN into San Tin Technopole together with the Hong Kong-Shenzhen Innovation and Technology Park (HSITP) at the Loop. By making use of the land to be released by the Lok Ma Chau Boundary Control Point (LMC BCP) upon commissioning of the new Huanggang Port with co-location arrangement, and replanning the rural areas and fishponds around LMC BCP, it was proposed to increase the land supply for innovation and technology (I&T) development so as to achieve industry clustering effect with economy of scale. It was also proposed to increase the housing supply in San Tin Technopole to help address the housing shortage in the territory, in which some of the units can be used as talent apartments for I&T enterprises and research institutes. The Northern Metropolis has been incorporated in the Conceptual Spatial Framework promulgated in the Final Report of Hong Kong 2030+.
- 1.1.1.4 In the same month, CEDD and PlanD jointly commenced an Investigation Study on STLMC DN (hereinafter referred to as “the Investigation Study”) to take forward the San Tin Technopole initiative and formulate the Recommended Outline Development Plan (RODP) for STLMC area, carry out engineering and technical assessments including the statutory Environmental Impact Assessment (EIA), and conduct public engagement (PE) to facilitate public discussions and foster consensus building. A 2-month PE was conducted between June and August 2023 to solicit public views on the RODP. Taking into account the public views collected in the PE, planning and engineering considerations, technical assessments as well as departmental comments and advice, a Revised RODP was formulated.
- 1.1.1.5 According to the Revised RODP, STLMC area will be developed into an I&T hub and a new community providing about 50,000 to 54,000 flats for a new population of about 147,000 to 159,000. It will generate about 165,000 jobs including 120,000 jobs on I&T sites. It will be an integral part of San Tin Technopole, providing ample amount of I&T land in various sizes for different I&T uses, as well as an integrated community with wide range of commercial, retail, community, recreational and cultural facilities.
- 1.1.1.6 The EIA Report for STLMC DN was approved by the Director of Environmental Protection (EIAO register no.: AEIAR-261/2024) with conditions in accordance with the EIAO on 17 May 2024.

1.2 The Project

- 1.2.1.1 AECOM-HALCROW JV (hereafter refers as the Consultants) has been commissioned by CEDD to undertake Agreement No. CE 15/2023 (CE) – First Phase Development of the New Territories North – San Tin/Lok Ma Chau Development Node – Package 1 – Design and Construction. The consultancy commenced on 27 September 2023 for a contract period of 138 months.

1.2.1.2 The proposed scope of the Project comprises the following principal works elements:

- (a) site formation of land at the STLMC DN, of which covers about 250ha of land for innovation and technology development, housing, community, commercial and other developments;
- (b) engineering infrastructure works including but not limited to roadworks, drainage, sewerage, waterworks, pumping stations, fresh water and flushing water service reservoirs, Common Utility Enclosure (CUE) and other associated buildings/structures/E&M/systems for the STLMC DN;
- (c) landscaping works; and
- (d) implementation of environmental monitoring and mitigation measures works mentioned in (a) to (c) above.

Construction Phasing of Development of STLMC DN

1.2.1.3 The STLMC DN is being developed in phases. Under the Agreement No. CE15/2023 (CE), it comprises as part of the Phase 1 Stage 1 and Stage 2 of the STLMC DN. Details can be referred to the Development Scheme in the webpage <https://nm-santintech.hk/en/implementation-arrangement/development-schedule/>. The construction contracts for the Phase 1 Stage 1 and Stage 2 of the STLMC DN would commence starting from December 2024 and tentatively in 2027 respectively.

1.3 Wetland Enhancement Measures at Mai Po

1.3.1.1 With reference to Sections 10.11.3.39 to 10.11.3.46 of the Approved EIA Report for STLMC DN, wetland enhancement measures concerning the following key management issues at Mai Po Inner Deep Bay Ramsar Site would also be implemented to enhance the ecological value of wetland habitats in the Deep Bay area and environmental capacity across the broader northwest new territories wetland system. The indicative location of the wetland enhancement measures recommended in the Approved EIA Report is enclosed in **Appendix A**.

- 1) Improvement of tidal channels: tidal channels that link *gei wai* in the Mai Po Nature Reserve (MPNR) to the Inner Deep Bay have become silted up over time, limiting tidal exchange and degrading the function of habitats within the *gei wai*. Improvement of these channels via desilting can promote tidal exchange and enhance habitat condition within the *gei wai*;
- 2) *Sonneratia* clearance: the invasive exotic mangrove *Sonneratia* sp. has spread rapidly across mudflat habitats and drainage channels across the northwest New Territories (NWNT). Selective clearance of larger *Sonneratia* stands can help restore wetland habitats in affected areas.

1.3.1.2 According to the Mai Po Inner Deep Bay Ramsar Site Management Plan (RSMP), the Agriculture, Fisheries and Conservation Department (AFCD) has taken precautionary measures to regularly remove the exotic *Sonneratia* in the Inner Deep Bay to maintain native mangroves and open mudflat as feeding ground for waterbirds. Maintenance de-silting operations of *gei wais* channels have also been carried out for management of MPNR since 2006. These habitat management measures allow for restoration/enhancement of degraded habitats such as *gei wai* and mudflats and would be beneficial to the whole inner Deep Bay ecosystem. Since the Inner Deep Bay is a more important bird feeding ground than the wetlands impacted under this Project, it would be more cost-effective if restoration works are conducted in inner Deep Bay as more birds would be benefited from the enhancement.

1.4 Environmental Impact Assessment Ordinance (EIAO) Implications

1.4.1.1 The proposed enhancement works at Mai Po involving earthworks (i.e. excavation) falls within Mai Po Marshes Site of Special Scientific Interest (SSSI) and Inner Deep Bay SSSI (**Figure 1** refers).

- 1.4.1.2 As detailed in **Section 2.1.1**, the *gei wai* at Mai Po are primarily managed as an ecological habitat, providing an important foraging and wintering site for migratory waterbirds including species of conservation interest such as Black-faced Spoonbill. They also provide sustainable fisheries production, being used to raise shrimp. Both the ecological habitat and fisheries function of the *gei wai* rely on tidal exchange. This maintains the wetland habitats that support migratory waterbirds, as well as allows the natural recruitment of shrimp larvae from the surrounding Deep Bay Area. The earthworks are an essential part of maintaining tidal exchange by desilting the channels that link the *gei wai* to Deep Bay. Likewise, selective physical removal of exotic mangrove tree *Sonneratia* at intertidal mangal and mudflat in the Inner Deep Bay has also been an vegetation management practices adopted by the AFCD to maintain native mangroves and open mudflat as feeding ground for waterbirds as detailed in **Section 3.1.1**.
- 1.4.1.3 The nature of proposed enhancement works are similar to the existing management practices of the MPNR and mudflats at Inner Deep Bay area that the proposed desilting works for improvement of tidal exchange and removal of the exotic *Sonneratia* are considered as “works relating to the management of vegetation or habitat”. Hence, they are not considered as a “designated project” (DP) by virtue of Item Q1, Part I, Schedule 2 of the EIAO in consultation with the EPD:
- Item Q.1: All projects involving earthworks, dredging works and other building works partly or wholly in an existing or gazetted proposed country park or special area, a conservation area, an existing or gazetted proposed marine park or marine reserve, a site of cultural heritage, and a site of special scientific interest, except for the following—
 - (d) all earthworks relating to forestry, agriculture, fisheries or the management of vegetation or habitat.

1.5 Scope of Implementation Plan for Wetland Enhancement Measures at Mai Po (IPM)

- 1.5.1.1 This Report is prepared in line with Section 10.11.3.41 of the Approved EIA Report of the San Tin / Lok Ma Chau Development Node (STLMC DN) (Register No.: AEIAR-261/2024) and Item (3) of the conditions of approval under Section 8(3) of the EIAO for the Approved STLMC DN EIA Report (therein referred to as “EIA Approval Conditions”), with an aim to setting out the details of the recommended wetland enhancement measures at Mai Po, namely Improvement of Tidal Channel and *Sonneratia* Clearance.
- 1.5.1.2 As required under Item (5) of the EIA Approval Conditions, an Environmental Committee (EC) of STLMC DN (also referred to as “San Tin Technopole”) has been established to advise on the preparation of the ecological mitigation and enhancement plans required under the EIA Approval Conditions and to monitor the effectiveness of the implementation of the proposed ecological mitigation / enhancement measures, including the IPM. Details of the recommended wetland enhancement measures at Mai Po have been consulted with the AFCD and EC. Key advices and recommendations have been incorporated in this Report accordingly, including pre-construction site check for egretry and avoidance of works within 100m from Mai Po Mangrove Egret, pre-construction site check for species of conservation importance (e.g. otter) to avoid injuries, prioritisation of *Sonneratia* removal areas that serve to maintaining native mangroves and open mudflat when reviewing the works extent upon pilot works, testing and handling of any contaminated marine sediments, monitor and address potential water quality impacts resulting from the mitigation/enhancement works, remove exotic *Sonneratia* at and adjacent to the tidal channels while limiting impacts on native mangroves, close coordination with AFCD and management agent of MPNR (WWFHK) on the implementation of the enhancement works to minimise environmental impacts and create synergy, minimise disposal of yard waste by recycling and reusing the removed *Sonneratia* at the STLMC DN and review of methodology of desilting and clearance work to ensure suitability and sustainability.
- 1.5.1.3 Apart from this introductory section, other sections of this Report are as follows:
- **Section 2** describes the work plan for the improvement of tidal channels;
 - **Section 3** describes the work plan for the *Sonneratia* clearance;

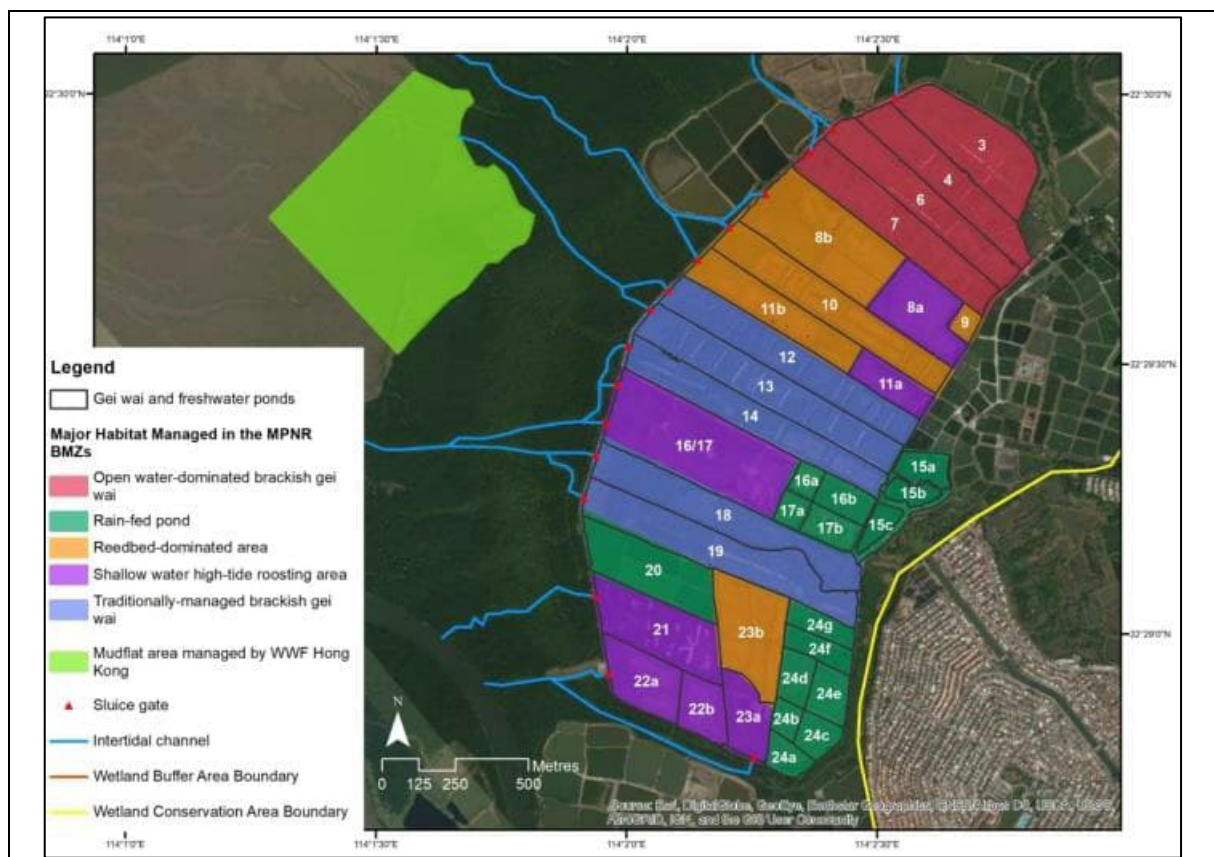
- **Section 4** describes the environmental protection measures for the implementation of the wetland enhancement measures at Mai Po; and
- **Section 5** outlines the overall implementation programme of the wetland enhancement measures at Mai Po.

2 IMPROVEMENT OF TIDAL CHANNELS

2.1 Existing Baseline Conditions

2.1.1 Existing Site Conditions

- 2.1.1.1 *Gei wai* located within the Mai Po Nature Reserve (MPNR) are managed for conservation, especially as feeding and roosting grounds for over-wintering birds (WWF, 2018). *Gei wai* in Deep Bay, together with mudflat and fishponds, provide feeding ground for over 40,000 over-wintering birds (HKBWS, 2022).
- 2.1.1.2 Between 1898 and 1949, the average sedimentation rate in Deep Bay was estimated to be 8 mm per year (Wong & Li, 1990). In the 1990s, the accretion rate speeded up and between 1990 and 2000, was around 30 mm per year (WWF-HK, 2006). This increase was probably due to soil runoff from deforested hillsides and runoff from a large coastal reclamation project on the Shenzhen side of the catchment. Additionally, it might also be related to the Shenzhen River Regulation Stage 2 Project which significantly changed the morphology and hence the hydrology of Deep Bay/Shenzhen River system (Chan *et al.*, 2011).
- 2.1.1.3 Increased sedimentation rates in the Deep Bay Area have resulted in the expansion of mangroves outside the *gei wai* in the last few decades, the *gei wai* at Mai Po are now only linked to the Deep Bay waters through a number of water channels several hundred metres in length (**Drawing 2.1**), limiting tidal exchange between the *gei wai* and Deep Bay. Tidal exchange is further limited by direct sediment deposition within the channels.



Drawing 2.1 Gei Wai Management with the Mai Po Nature Reserve in 2024 (WWF, 2024)

- 2.1.1.4 Tidal exchange is essential to the effective management of the *gei wai*. It helps to maintain water quality, and perhaps more importantly, is critical to resupply fish and shrimp within the *gei wai* which serve as food for birds. Without adequate tidal exchange, the food resources inside the *gei wai* could become exhausted within three days during winter and their function as feeding ground for the birds would be degraded (WWF, 2001). Desilting of the channel beds to lower levels could improve the tidal exchange at the *gei wai* at Mai Po and restore /

enhance their hydrological function, thus increasing the food supply for birds and benefiting a much larger area inside the connected *gei wai*. This effect is expected to last for several years. The Shenzhen Western Corridor EIA Report (2002) also noted the long-term beneficial effect to the Deep Bay ecosystem and had carried out desilting works for the water channel leading to *gei wai* Nos. 16 & 17 in the MPNR (to one metre below the then-existing channel bottom) to restore the water exchange regime at the silted up channel. The improvement work had increased the availability of prey to birds using the *gei wai* habitat and led to a better water quality in the *gei wai*.

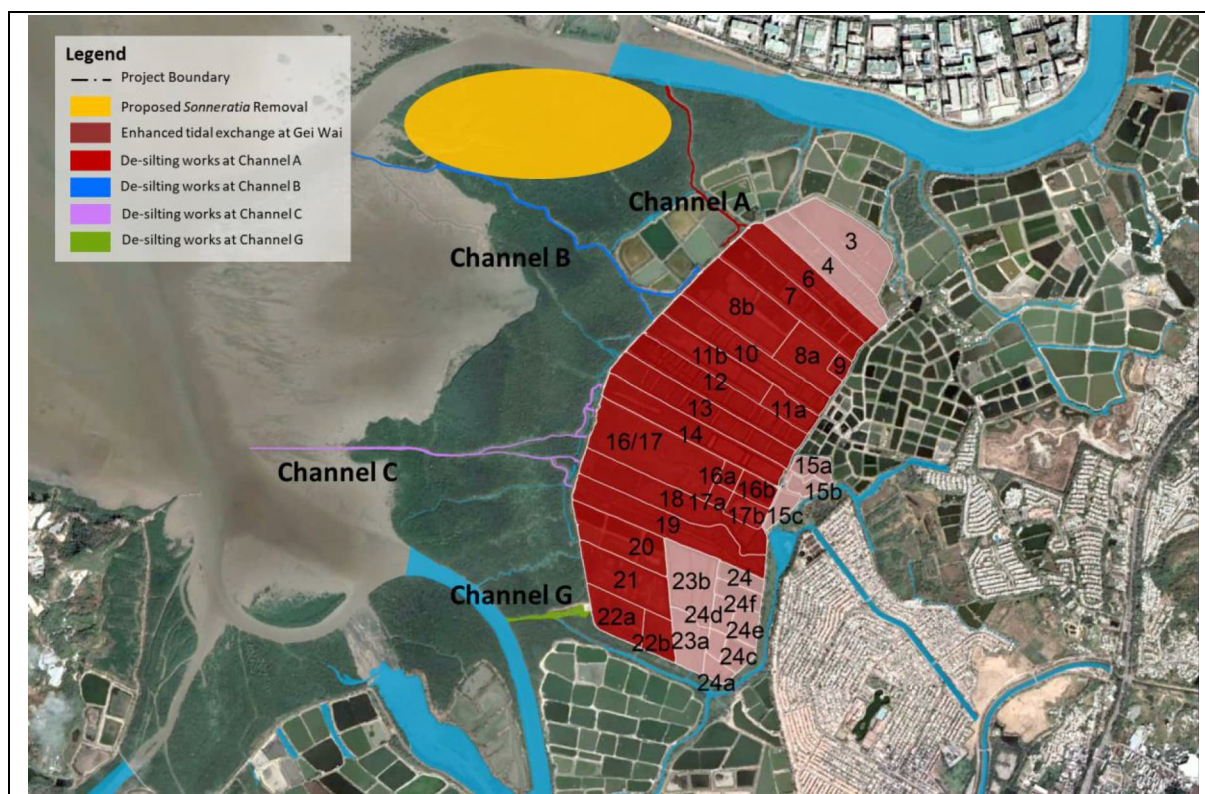
- 2.1.1.5 Furthermore, the control of water levels within the *gei wai* is crucial for the management of MPNR. Retaining a high-water level inside *gei wai* in summer will minimize the growth of wetland vegetation on soft substrates that are the preferred feeding habitat of many avifaunal species. De-silting of water channels to restore the suitable depth would help the control of water levels during tidal flushing as water exchange between the mudflat and *gei wai* could be achieved at a lesser high tide subsequently.

2.1.2 Existing Ecological Baseline

- 2.1.2.1 The proposed wetland enhancement works are located on the northwest of the MPNR, which is managed primarily for conservation. The proposed wetland enhancement works include tidal channel improvement (via desilting) at selected channels, and *Sonneratia* removal (**Figure 1** refers). These works take place at various sites of conservation importance, while its vicinity also supports various sensitive ecological resources and particular species of conservation importance.
- 2.1.2.2 The proposed enhancement works falls within Mai Po Nature Reserve, Mai Po Inner Deep Bay Ramsar Site, Ramsar Site Priority Site for Enhanced Conservation, Mai Po Marshes Site of Special Scientific Interest (SSSI), Inner Deep Bay SSSI, and Wetland Conservation Area (WCA). Other sites of conservation importance are also identified in close proximity to the proposed enhancement works area, including Deep Bay Wetland outside Ramsar Site Priority Site for Enhanced Conservation, Wetland Buffer Area (WBA), Conservation Areas ("CA" zone), as well as other sensitive ecological resources such as Mai Po Mangrove Egret, roosting areas for avifauna, and Inner Deep Bay and Shenzhen River Catchment Important Bird Area (IBA). The area generally comprises ecologically sensitive wetland habitats, including intertidal mangrove and mudflat, as well as fishponds, watercourses, and *gei wais*. These habitats serve as important foraging habitats, breeding and / or nursery grounds for various wildlife. In particular, some globally / regionally threatened species were previously recorded in the area, including mammals (such as Eurasian Otter and Leopard Cat), various avifauna species (including Black-faced Spoonbill), as well as Mai Po Bent-winged Firefly. The wetland habitats in the area are known to provide important habitats for these threatened species.
- 2.1.2.3 The proposed tidal channel improvement works via desilting take place mainly along existing watercourses and adjacent mangrove area (**Figure 1** refers). Dominant species of native mangroves include the true mangroves species of native mangroves are *Aegiceras corniculatum*, *Kandelia obovata* and *Acanthus ilicifolius*. Invasion of the exotic *Sonneratia* spp. were also widely observed. Potential direct impact might affect these habitats and associated ecological resources, such as foraging and roosting avifauna along the channel and the mangroves, breeding and / or nursery grounds for the threatened species (e.g., Mai Po Bent-winged Firefly, Leopard Cat, Eurasian Otter).
- 2.1.2.4 Some other ecological resources in the proximity might also be affected by indirect impacts from the proposed improvement works (e.g., visual and noise disturbance, and potential water quality impact from desilting), including breeding ground of Black-winged Stilt, roosting sites of waterbirds such as Black-faced Spoonbill, Great Cormorant, Anatidae (duck species) at the wetland habitats, movement corridors (e.g. avifauna flight line) from MPNR toward intertidal areas, and foraging ground in the broader area of Deep Bay. Any uncontrolled night-time glare / lighting might also affect breeding behaviour of Mai Po Bent-winged Firefly. Environmental protection measures as detailed in **Section 4** should be implemented to avoid and minimise potential adverse environmental impacts from the desilting works.

2.2 Proposed Tidal Channels for Improvement and Key Enhancement Objectives

2.2.1.1 With reference to the recommendations in the Approved EIA Report (**Appendix A** refers) and in consultation with AFCD and the habitat management team of MPNR, the tidal channels for enhancement works have been reviewed. In addition to the three tidal channels (Channels A, B and C) recommended under the EIA, an addition Channel G, would be adopted for enhancement works as shown in **Drawing 2.2** and **Figure 1**.



Drawing 2.2 Proposed Improvement of Tidal Channels at Mai Po

2.2.1.2 These recommended channels connect to the water-gates of several *gei wai*, as described in **Table 2.1**. The proposed de-silting works can potentially enhance the functioning of 14 *gei wai* with various habitat management objectives, with a total area of 132.6ha.

Table 2.1 Water Channels to be Improved within the Mai Po Nature Reserve, and Details of Gei Wai Enhanced by the Works

Channel	Approx. Length (km)	Gei Wai No.	Area of Gei Wai (ha)	Management Objectives
Channel A	1.0	6	8.77	Open water to benefit wintering population of black-faced spoonbills and ducks
		7	10.38	
Channel B	1.8	8b	12.64	Reedbed habitats with diversifying water depths for reedbed-dependent passerine, bitterns and herons
		10	10.65	
		11b	7.72	
		9	0.97	
		8a	6.42	Shallow water high-tide roosting area with islands for the benefit of passage and wintering shorebirds and other waterbirds, particularly roosting black-faced spoonbills, ducks and breeding black-winged stilts.
		11a	3.01	
Channel C	2.3	16a+b	10.42	Traditionally-operated brackish <i>gei wai</i> . Aquatic fauna, such as shrimp and fish feed
		17a+b	12.07	
		14	10.23	Traditionally-operated brackish <i>gei wai</i> . Aquatic fauna, such as shrimp and fish feed
		18	11.64	

Channel	Approx. Length (km)	Gei Wai No.	Area of Gei Wai (ha)	Management Objectives
		19	12.14	on the benthic organic matter and organisms, and the waterbirds feed on the aquatic fauna, especially when the water level is lowered with periodic draining of the ponds.
Channel G	0.4	21	8.44	Brackish <i>gei wai</i> to provide open water habitat for waterbirds during high-tide in Deep Bay.
		22a+b	8.07	
Total	5.5		133.6	

2.3 Design and Construction Method

- 2.3.1.1 The lengths of the four inlet water channels to be de-silted are approximately 1.0km, 1.8km, 2.3km and 0.4km. The intent of the works is to improve water flow and exchange to the MPNR *gei wai*. The desilting works would be undertaken by phases outside of the overwintering season for birds (i.e. April to mid-Oct) to minimise disturbance impacts. Given the unique site constraints and the lack of existing records or information on past works, Channel G would be adopted as the pilot channel for desilting works to determine the effectiveness of currently proposed works methods for the remaining channels as detailed in **Section 5**. The total estimated volume of excavated materials from desilting works to be removed at Channel G is approximately 3200 m³. The works area, estimated volume of excavated materials from desilting works, works method, logistic arrangement, estimated duration and implementation programme of the remaining channel desilting works would be reviewed upon completion of the pilot enhancement scheme as detailed in **Section 5**.
- 2.3.1.2 The proposed desilting in each channel would be approximately 6m in width, with the seabed level lowered by approximately 1m. Bathymetric and topographic surveys would be undertaken prior to the desilting works to confirm the channel profiles.
- 2.3.1.3 The desilting works would be conducted in phases, with only one works front per channel at any one time due to site constraints. As the proposed desilting section is only 6m in width throughout the channel, this effectively confines the channel to one-way traffic at any time.
- 2.3.1.4 Similar to the existing management practices of MPNR, local removal of mangroves / overgrown vegetation might be required subject to site conditions and access along the channels to be desilted. Opportunities would also be taken to remove the *Sonneratia* at the mouth of channels to be desilted, subject to the site constraints and availability of resources.
- 2.3.1.5 Due to restricted access to proposed water channels from the landward side of MPNR, which is currently bounded by boundary fence, the recommended access for desilting works is from the seaward side via Deep Bay for Channel B & C and via Shenzhen River for Channel A, moving landwards until the *gei wai* is reached.
- 2.3.1.6 Marine / amphibious plants would be adopted for any excavation, transportation and disposal of desilted materials as the works would be operating within the confines of the channel and subject to tidal variation throughout the day. Portable floating silt curtains with anchored would be used to confine the works area and to prevent the escape of silt.
- 2.3.1.7 The desilted materials would be transferred from the amphibious backhoe to an amphibious tractor, which would deposit the desilted materials to a waiting barge at the channel mouth. The barge shall be provided with excavation equipment for transfer of desilted materials or a temporary platform with a land-based excavator might be set up to facilitate transfer of desilted materials. Due to restricted access and limited draught for large machinery (even after desilting), any marine plant (i.e. the barge) must remain at handling point outside mudflat area in deeper waters. The recommended access and logistic arrangement would be further reviewed upon completion of the pilot enhancement scheme.

- 2.3.1.8 Environmental protection and standard pollution control measures as detailed in **Section 4** should be implemented to avoid and minimise potential adverse environmental impacts during the desilting works.

3 SONNERATIA CLEARANCE

3.1 Existing Baseline Conditions

3.1.1 Existing Site Conditions

3.1.1.1 The exotic mangrove genus *Sonneratia* was first recorded in the Deep Bay area in the early 2000's and has spread rapidly across NWNT and some other parts of Hong Kong. The *Sonneratia* that occur in Hong Kong are invasive alien species that can cause two main issues to existing intertidal communities:

- *Sonneratia* are fast-growing species that have the potential to out-compete native mangrove species; and
- *Sonneratia* grow on the seaward side of the mangrove, and can extend out onto and impact mudflat habitats that are important feeding grounds for avifauna.

3.1.1.2 Currently AFCD engage a contractor annually to conduct *Sonneratia* removal work in the Deep Bay Area. Works are generally conducted on the seaward side of the MPNR along the mudflats, with specific focus areas identified each year. The proposed focus area for *Sonneratia* removal works as detailed in **Section 3.2** has been consulted and coordinated with AFCD. Removal work is only conducted outside of the overwintering season for birds (i.e. April to mid-Oct) to minimise disturbance impacts under the existing AFCD practices.

3.1.2 Existing Ecological Baseline

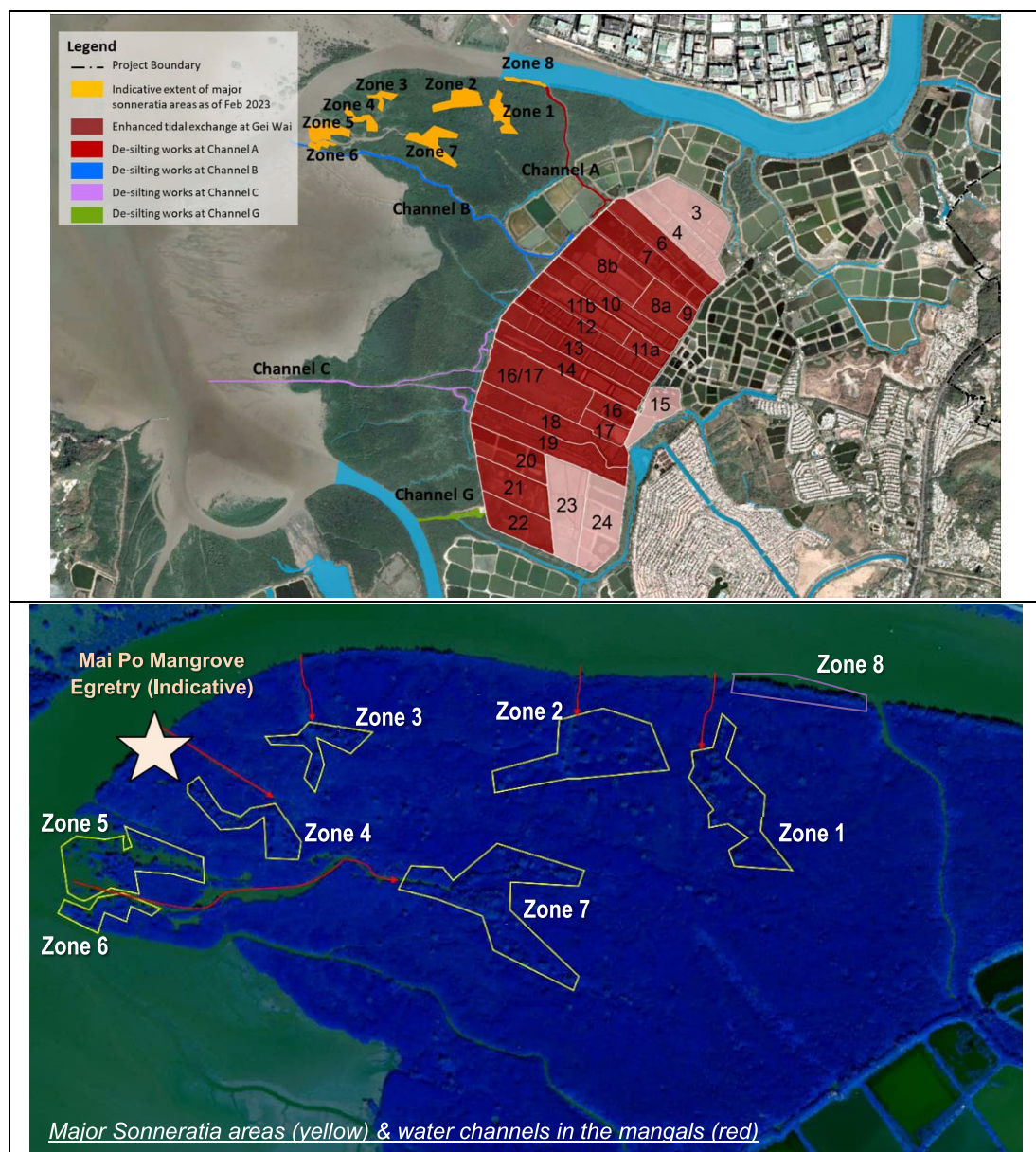
3.1.2.1 The proposed locations of *Sonneratia* clearance are in close proximity to the proposed tidal channel improvement, northwest to MPNR. The overall ecological baseline conditions in the broader area are similar to that of the proposed tidal improvement works area, as described at **Section 2.1.2.2**.

3.1.2.2 Similar to the proposed channel improvement works, some ecological resources might be subject to direct and indirect impacts from the proposed *Sonneratia* clearance works. While the proposed vegetation removal would be focused on the invasive *Sonneratia* sp., uncontrolled activities in the adjacent area might result in the direct loss of breeding and/or roosting substratum for avifauna (e.g., Mai Po Mangrove Egret, other roosting sites of wetland-dependent avifauna species). Indirect disturbance (e.g., visual and noise disturbance) might also affect adjacent habitats with high ecological value, such as the broader area of mangrove and mudflat which serve as foraging and wintering site for migratory waterbirds along the East Asian-Australasian Flyway. Any uncontrolled night-time glare / lighting might also affect breeding behaviour of Mai Po Bent-winged Firefly. Environmental protection measures as detailed in **Section 4** should be implemented to avoid and minimise potential adverse environmental impacts from the *Sonneratia* removal works.

3.2 Key Enhancement Objectives

3.2.1.1 Under the current project, additional enhancement of the Deep Bay Area can be provided by the removal of exotic mangrove species on mudflat (*Sonneratia* spp.). An initial area of *Sonneratia* to be removed was indicated in the EIA Report.

3.2.1.2 The focus area for *Sonneratia* removal works was refined following detailed review of satellite imagery and site visits conducted in May 2024. Works would focus on several large patches of *Sonneratia* identified within the focus area, as shown in **Drawing 3.1** and **Figure 1**, and summarised in **Table 3.1**. An additional area of *Sonneratia* along the Shenzhen River (Zone 8) was identified for inclusion as pilot scheme in the removal works.



Drawing 3.1 Indicative Extent of Major Areas of Sonneratia for Proposed Removal

Table 3.1 Indicative Extent of Major Area of Sonneratia for Proposed Removal Works

Sonneratia Zone	Area ⁽¹⁾
Zone 1	1.78
Zone 2	2.20
Zone 3	0.64
Zone 4	0.95
Zone 5	1.82
Zone 6	0.48
Zone 7	2.74
Zone 8	0.45
Total	11.1ha

Note:

(1) Estimated area based on indicative extent of major sonneratia areas as of February 2023

3.3 Design and Construction Method

- 3.3.1.1 Based on existing *Sonneratia* removal works in Deep Bay undertaken by the AFCD, removal works shall only be conducted during non-overwintering season for birds (i.e. April to mid-Oct). Pre-construction site check within 100m from the *Sonneratia* removal area would be undertaken to check for the presence of any active egretty prior to the commencement of any vegetation clearance works. For areas located within 100m from the Mai Po Mangrove Egretty, removal works should also avoid the ardeid breeding season, i.e. March to August. Subject to consultation with and prior approval by AFCD, if the breeding activities at the Mai Po Mangrove Egretty are reported to finish early, opportunities would be taken to carry out the enhancement works within 100m from the egretty before September.
- 3.3.1.2 Similar to the existing practices by AFCD, the removal area would be accessed from the seaward side and conducted by backhoe mounted on a floating pontoon and / or workers using hand-tools. The effectiveness of machinery would be highly dependent on operator's skill to operate in mudflat / tidal situation. Some of the areas can only be assessed via small boat with shallow draft or amphibious plant.
- 3.3.1.3 As the removal area is mostly on soft mud and inaccessible by marine vessel, the accessibility would be highly dependent on tidal condition. High tide can allow intermittent access for marine vehicles to deliver workers and equipment close to the works area, whereas low tide is required for workers to access and clear the *Sonneratia* area on foot. Due considerations would be given to potential safety and site constraints (e.g. soft mudflat, dense / large *Sonneratia* to be removed) when planning of deployment of manual labour or machinery for *Sonneratia* removal works.
- 3.3.1.4 With reference to the existing *Sonneratia* removal work in the Deep Bay Area undertaken by AFCD, the Contractor shall cut and remove the *Sonneratia* trees 5 cm above the ground and remove their pneumatophores (i.e. the erected aerial roots protruding above the ground) completely. To prevent re-growth and sprouting from the tree stumps, the cut stumps remaining on the ground are completely covered with mud.
- 3.3.1.5 All removed parts, including fruits, of the *Sonneratia* shall be cleared, raked up and placed in containers or bags and appropriately loaded and disposed outside the removal area.
- 3.3.1.6 As the focus area for *Sonneratia* removal works (i.e. Zones 1 to 7) is situated within mangal with no land access, local removal of mangroves / overgrown vegetation might be required subject to site conditions and access to the works area. For the major *Sonneratia* areas that are deep within the mangals and can only be accessed via narrow water channels (including Zones 1 to 4 and 7), desilting works and local removal of mangroves along the channels might also be required to enable access to the works areas.
- 3.3.1.7 The implementation details (including the extent, works period, anticipated *Sonneratia* population to be removed and regeneration of *Sonneratia*) and feasibility of the subsequent *Sonneratia* removal at the focus area and along Shenzhen River coast would be reviewed for further consideration upon completion of the pilot enhancement works at Zone 8 as detailed in **Section 5**. Priorities would be given to maintaining native mangroves and open mudflat, as well as areas with better access to ensure action in the short term, when confirming the works extent.
- 3.3.1.8 Environmental protection measures as detailed in **Section 4** should be implemented to avoid and minimise potential adverse environmental impacts from the *Sonneratia* removal works.

4 ENVIRONMENTAL PROTECTION MEASURES

- 4.1.1.1 The wetland habitats in Mai Po and in the general vicinity of the proposed wetland enhancement works support the Mai Po Mangrove Egret and a generally high diversity and abundance of waterbirds, in particular during overwintering season. Taking into consideration the recommendations of the Approved EIA Report for STLHC DN to focus the interim enhancement works during the wet season and the existing habitat practices by AFCD, the channel desilting and *Sonneratia* removal works should be undertaken during the non-overwintering season for birds (i.e. April to mid-Oct) to minimise disturbance impacts.
- 4.1.1.2 For areas located within 100m from the Mai Po Mangrove Egret, removal works should also avoid the ardeid breeding season, i.e. March to August, to avoid any potential injury or disturbances to the breeding ardeids. Pre-construction site check within 100m from the *Sonneratia* removal area should be undertaken to check for the presence of any active egret prior to the commencement of any vegetation clearance works.
- 4.1.1.3 Pre-construction site check for presence of any otter holts / signs of otter activities and other notable species of conservation importance (e.g. Mai Po Bent-winged Firefly) in the proposed works area should be undertaken to avoid injuries to wildlife. Given that no night-time construction works would be undertaken, as well as the transient and localised nature of works similar to the existing habitat management practices in the Inner Deep Bay area, it is expected that no unacceptable disturbance impacts on wildlife would arise from the proposed desilting and *Sonneratia* removal works.
- 4.1.1.4 Deep Bay has naturally high suspended solids level due to its shallowness, presence of extensive mudflats, and the strong riverine inputs from within and outside. Nonetheless, in order to minimise any potential water quality impacts, the desilting works must be excavated, transported with care to minimise any loss of contaminants either into solution or by resuspension. A portable, single-layered floating silt curtain with anchor should also be used to confine the works area and to prevent the escape of silt. The silt curtain shall be formed and installed in such a way that tidal variation is accommodated. The silt curtain would be equipped with floating system at the top of the geotextile (e.g. floatation tube) and with weight chain at the bottom for fixing in place to ensure the silt curtain would be portable and could be moved along with the works front, with all excavation taking place inside the curtain. The Contractor shall regularly inspect the silt curtains to check for any damages. Any damage to the silt curtain shall be repaired by the Contractor and the work shall be suspended until the repair is effected.
- 4.1.1.5 Precautionary water quality monitoring inside of connecting *gei wai* should be undertaken during the works. Precautionary water quality monitoring at the sluice gates of *gei wai* connecting to the desilted channel shall be carried out three times per week, with a minimum interval of 36 hours, when desilting works is being carried out at the respective desilted channels. The precautionary water quality monitoring is proposed at *gei wai* #7 for Channel A, *gei wai* #8b for Channel B, *gei wai* #14 for Channel C (**Table 2.1** and **Drawing 2.2** refer). For Channel G, as the connecting *gei wai* #22a would be drained for habitat management works undertaken by WWF during the proposed pilot desilting works in wet season of 2025 (**Section 5** refers), the precautionary water quality monitoring is therefore recommended to be undertaken at the confluence of Shan Pui River and Channel G. Detailed requirements on water quality parameters (for baseline and construction phase monitoring), sampling procedures and monitoring equipment, and laboratory measurement / analysis shall follow the Environmental Monitoring and Audit Manual of the Approved EIA Report for STLHC DN. For stations with a water depth of less than 1m, monitoring shall be carried out at the mid-depth. Water sampling shall not be taken if water depth is less than 0.25m. A water quality monitoring plan and the proposed water quality monitoring schedule should be submitted to EPD for agreement one week before commencement of monitoring works. The proposed water quality monitoring schedule shall be updated to the WWF-HK, i.e. the management agent of MPNR, before the first day of the monitoring month. EPD should also be notified immediately for any changes in monitoring schedule. The results and findings of the precautionary water quality monitoring shall be documented in a yearly progress report and be submitted to EPD for records.

- 4.1.1.6 Marine sediments might be generated from the desilting works. Marine disposal of any excavated sediment is subject to control under the Dumping at Sea Ordinance (DASO). Excavated sediment destined for marine disposal is classified based on its contaminant levels with reference to the Paragraph 4.2.1 of Chapter 4 of the Project Administration Handbook for Civil Engineering Works (PAH), 2022 Version – Management of Dredged/Excavated Sediment, which stipulated a set of sediment quality criteria or Chemical Exceedance Levels (CEL) for contaminants including metals, metalloid and organic pollutants. A Sediment Sampling and Testing Plan (SSTP) would be prepared with reference to *Paragraph 4.2.1 of Chapter 4 of the PAH* and submitted to EPD for review and agreement. The sediment sampling results and recommended disposal method of any excavated sediment will be reported in a standalone Sediment Quality Report (SQR). The rationale for sediment removal / disposal will be submitted to the Marine Fill Committee/CEDD for agreement in accordance with the PAH.
- 4.1.1.7 Fuel combustion from the use of powered mechanical equipment (PME) (e.g. amphibious backhoe / tractor) during construction works could be a potential source of air pollutants such as NO₂, SO₂ and CO. To improve air quality and protect public health, EPD has introduced the Air Pollution Control (Non-road Mobile Machinery) (Emission) Regulation on 1 June 2015 and since 1 December 2015, only approved or exempted non-road mobile machinery are allowed to be used in construction sites. In addition, all construction plants are required to use ultra-low sulphur diesel (ULSD) (defined as diesel fuel containing not more than 0.005% sulphur by weight) as stipulated in Environment, Transport and Works Bureau Technical Circular (ETWB-TC(W)) No. 19/2005 on Environmental Management on Construction Sites. Marine emissions from the use of barge for transportation of desilted materials could also be a potential sources of air pollutants including NO_x, SO₂ and particulates. All marine vessels are required to use compliant fuel, i.e. marine fuel with sulphur content not exceeding 0.5% by weight within Hong Kong waters, irrespective of whether they are sailing or berthing in accordance with *Air Pollution Control (Fuel for Vessels) Regulation*. On the other hand, for marine light diesel acquired from local supply, the local vessel should be using the marine light diesel with sulphur content not exceeding 0.05% by weight in accordance with *Air Pollution Control (Marine Light Diesel) Regulation*. Consider the limited works front and localised scale of the enhancement works, as well as the small number of PMEs involved, adverse air quality impacts due to emissions from the use of marine / amphibious plants would be unlikely.
- 4.1.1.8 No construction activity is expected during restricted hours, i.e. the time between 1900 and 0700 hours on all days, and any time on general holidays, including Sundays. A Construction Noise Permit (CNP) is required under the Noise Control Ordinance (NCO) (Cap. 400) in case the construction works are to be carried out during restricted hours. In general, noise control measures stipulated in EPD's "Recommended Pollution Control Clauses for Construction Contracts" should be implemented during construction phase to minimise any construction noise nuisance.
- 4.1.1.9 Yard waste generated from *Sonneratia* clearance shall be separated from other non-inert C&D materials and various types of yard waste / shred wood should be segregated to facilitate reuse and recycling. Considerations should be given to recycle and reuse of yard waste for a variety of purposes under the construction contracts for the STLMD DN (e.g. decomposition and composting, recreational / decorative uses for site office or community uses, and mulching in planting areas, etc.). Off-site recycling options (e.g. delivery to yard waste recycling facilities such as Yard Waste Recycling Centre Y·PARK) should be explored for yard waste that cannot be reused on-site to minimise the quantity of yard waste to be disposed of at landfill. Where appropriate, the Contractor should be responsible to cut and shred the yard waste in order to meet the collection requirement of the recycling outlet for processing. Disposal of yard waste directly at landfills should only be regarded as the last resort, when no alternative is available.

5 IMPLEMENTATION PROGRAMME

- 5.1.1.1 The latest proposed wetland enhancement works at Mai Po are summarised in **Figure 1** and summarised in **Table 5.1**.
- 5.1.1.2 Current maintenance desilting works in Hong Kong, excluding capital dredging works, generally take place in manmade canals or can otherwise be accessed from land. For instance, the maintenance desilting works undertaken by CEDD in the vicinity of Mai Po had been executed using land-based plant only as it had suitable land access. Nonetheless, temporary access path formed by rock fill might still be required to allow for the use of heavy land-based plant or removal of desilted materials over soft soils.
- 5.1.1.3 Furthermore, the proposed tidal channels for improvement and *Sonneratia* removal areas are across the MPNR and Frontier Closed Area that land access of machinery is largely restricted by the boundary fence and the mudflat of the Inner Deep Bay area.
- 5.1.1.4 Approval / permit from the relevant authorities should be obtained before works are conducted within the Mai Po Marshes Restricted Area under the Wild Animals Protection Ordinance (Cap. 170) or works area patrolled by border control authorities including the Hong Kong Police Force as well as those from Shenzhen border.
- 5.1.1.5 While marine access is recommended for the proposed enhancement works, the works area comprises mudflats and mangroves which will pose access difficulties in terms of available marine navigation depth and obstructions respectively. Tidal restrictions are also applicable. Some of the areas can only be accessed via small boat with shallow draft, or alternatively by amphibious plant. Approval / permit from the relevant authorities (e.g. Marine Department) should be obtained for marine access of the amphibious plants and navigation routes.
- 5.1.1.6 Given the unique challenges of accessing these channels due to shallow inlets, the dependence on marine and amphibious plant, and the lack of existing records or information on past works, a pilot scheme would be implemented to evaluate and optimise the proposed desilting and *Sonneratia* clearance methodology. Channel G and Zone 8 would be adopted as the pilot channel for desilting works and area for *Sonneratia* clearance works respectively to determine the effectiveness of currently proposed works methods, given that both works area could be easily accessed from Shan Pui River and Shenzhen River respectively.
- 5.1.1.7 Non-intrusive survey works, including bathymetric and topographic surveys for the four proposed channels to be de-silted (i.e. Channels A, B, C and G), sediment sampling for Channel G and site check on the proposed *Sonneratia* removal areas (focusing on vegetation coverage, soil / mud conditions and site access), would commence in Q1 2025 to supplement further information to facilitate the implementation of the remaining enhancement works. The survey method and programme should be submitted to AFCD for prior approval to avoid any potential disturbance impacts on over-wintering birds.
- 5.1.1.8 Subject to non-intrusive survey works results and obtaining of relevant necessary permits for the proposed enhancement works, the pilot enhancement works (i.e. desilting works at Channel G and *Sonneratia* clearance at Zone 8) is planned to be undertaken earliest in Q2 2025. For areas with potential safety concerns (e.g. soft mudflat, large / dense vegetation), deployment of appropriate amphibious plant / machinery instead of manual labour would be explored. The desilting works and *Sonneratia* clearance would only be conducted between April and mid-Oct, with a view to avoid the overwintering seasons for birds to minimise disturbance. Therefore, the physical works might be carried in the subsequent non-overwintering seasons in case of longer preparatory and permitting time required for the relevant machinery. Based on review of the site constraints and the proposed methodology for the pilot scheme, it is estimated that the pilot enhancement works could be completed in around 6 months (tentatively to be completed in 2025 or 2026). The progress of the pilot enhancement works would be checked periodically and during the middle of the pilot works in Q2 2025 to formulate any necessary amendments to the works method and update the works programme.
- 5.1.1.9 The works area, estimated volume of excavated materials from desilting works, works method, logistic arrangement, estimated duration and implementation programme of the remaining channel desilting works and *Sonneratia* removal would be reviewed for agreement

with relevant authorities (including EPD and AFCD) in consultation with the EC upon completion of the pilot enhancement scheme, tentatively in Q4 2025 depending on the actual works progress. If the works assumption remains valid, subject to obtaining of relevant necessary permits, it is envisaged that the desilting works for the remaining channels would take around up to 3 non-overwintering seasons (tentatively to be completed in 2028 or 2029) to complete, assuming the three channels would be desilted at the same time with only one works front per channel at any one time. The pilot *Sonneratia* clearance area along Shenzhen River coast (Zone 8) could ensure effective works method and facilitate confirmation of the extent of the subsequent *Sonneratia* removal area and anticipated population to be removed.

- 5.1.1.10 The progress of the implementation proposed wetland enhancement measures, e.g. works area, estimated volume of excavated materials from desilting works, works method, logistic arrangement, estimated remaining duration and implementation programme, would be reported at least once a year and upon completion of works to EPD and AFCD, with supporting drawings and photos to record and document the progress of the measures.

Table 5.1 Implementation Schedule of Proposed Additional Wetland Enhancement Measures at Mai Po

	Improvement of tidal channels	<i>Sonneratia</i> clearance
Recommended Enhancement Measures	Desilting at selected tidal channels	Removal of invasive exotic mangrove <i>Sonneratia</i> sp. on mudflat
Objectives and Environmental Performance of the Enhancement Measures	Tidal channels that link <i>gei wai</i> in the MPNR to the Inner Deep Bay have become silted up over time, limiting tidal exchange and degrading the function of habitats within the <i>gei wai</i> . Improvement of these channels via desilting can promote tidal exchange and enhance habitat condition within the <i>gei wai</i>	The invasive exotic mangrove <i>Sonneratia</i> sp. has spread rapidly across mudflat habitats and drainage channels across the NWNT. Selective clearance of larger <i>Sonneratia</i> stands can help restore wetland habitats in affected areas
Responsible Parties to Implement the Enhancement Measures	Contractor of CEDD	Contractor of CEDD
Locations	Channels A, B, C and G that link <i>gei wai</i> in the Mai Po Nature Reserve (MPNR) to the Inner Deep Bay (Drawing 2.2 and Figure 1)	Focus areas for <i>Sonneratia</i> northwest to MPNR and along the Shenzhen River (Drawing 3.1 and Figure 1). Exact location and extent to be determined upon completion of the pilot enhancement works at Zone 8.)
Time and Period to Implement the Measures	- The channel desilting should be undertaken during the non-overwintering season for birds (i.e. April to mid-Oct) to minimise disturbance impacts. No night-time construction works would be undertaken. - Pilot enhancement scheme (i.e. desilting works at Channel G) is planned to commence in April 2025, subject to obtaining of relevant necessary permits. It is estimated that the pilot enhancement scheme could be completed within one non-overwintering season (i.e. around 6 months). - Subject to review of the pilot scheme and agreement with relevant authorities (including EPD and AFCD) in consultation with the EC, if the works assumption remains valid, subject to obtaining of relevant	- The <i>Sonneratia</i> removal works should be undertaken during the non-overwintering season for birds (i.e. April to mid-Oct) to minimise disturbance impacts. No night-time construction works would be undertaken. - For areas located within 100m from the Mai Po Mangrove Egret, removal works should also avoid the ardeid breeding season, i.e. March to August. - Pilot enhancement scheme (i.e. <i>Sonneratia</i> clearance at Zone 8) is planned to be undertaken from April to mid-Oct 2025, subject to obtaining of relevant necessary permits. - The implantation details (including the extent, works period and anticipated <i>Sonneratia</i> population to be removed) and feasibility of subsequent <i>Sonneratia</i> removal at the focus area would be reviewed for further

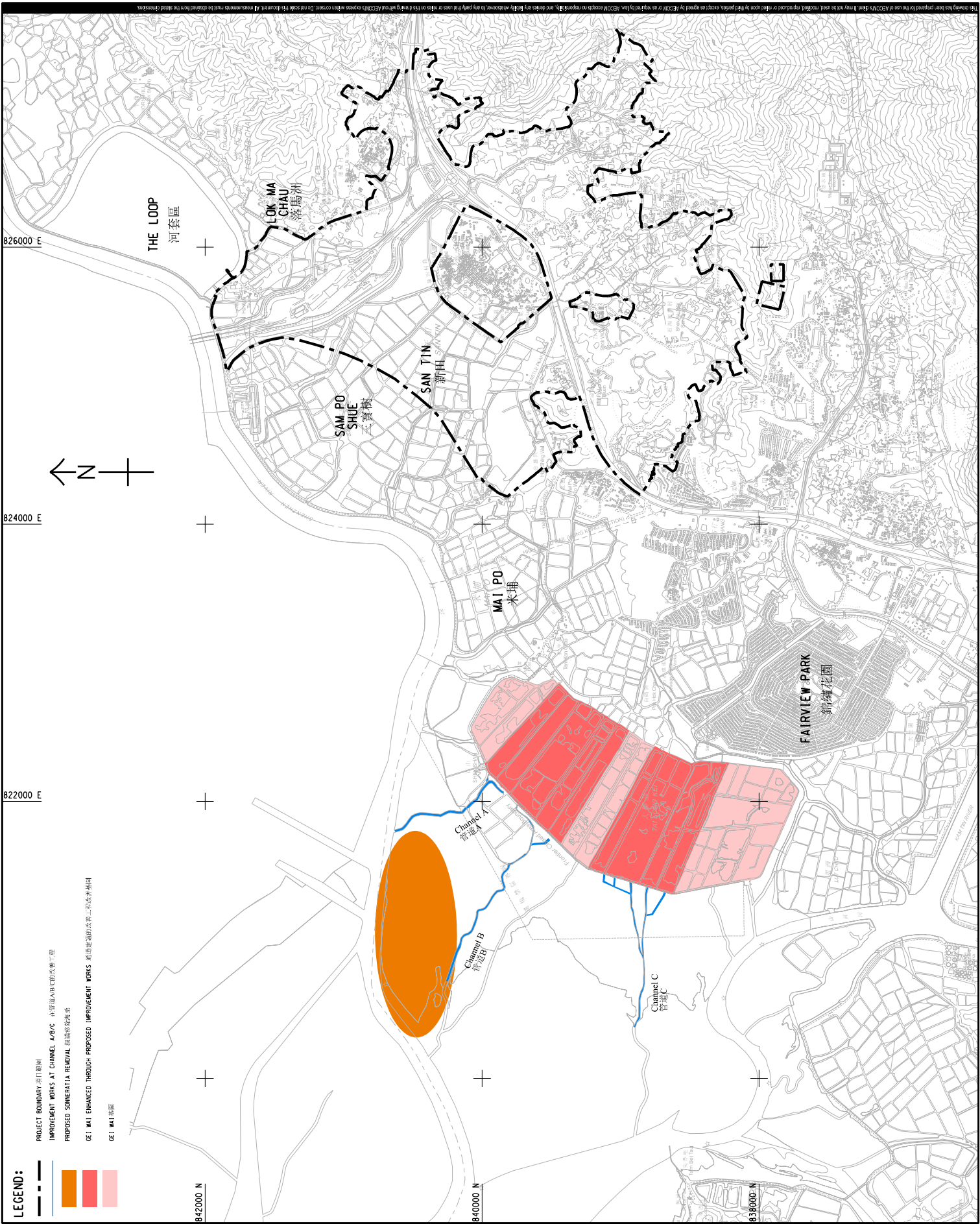
	Improvement of tidal channels	<i>Sonneratia</i> clearance
	necessary permits, it is envisaged that the desilting works for the remaining channel would around up to 3 non-overwintering seasons (tentatively to be completed in 2028 or 2029) to complete, assuming the three channels would be desilted at the same time with only one works front per channel at any one time.	consideration upon completion of the pilot enhancement works at Zone 8. Priorities would be given to maintaining native mangroves and open mudflat, as well as areas with better access to ensure action in the short term, when confirming the works extent. CEDD will also explore suitable alternative locations for subsequent <i>Sonneratia</i> clearance in consultation with AFCD and the EC before the commissioning of the first phase of Sam Po Shue Wetland Conservation Park tentatively in 2031.

Figure 1

Proposed Wetland Enhancement Works at Mai Po

Appendix A

**Indicative Location of the Wetland Enhancement
Measures recommended in the Approved EIA Report**



LEGEND:

- PROJECT BOUNDARY 項目範圍
- IMPROVEMENT WORKS AT CHANNEL A/B/C 在管理A/B/C的改善工程
- PROPOSED SONNERATIA REMOVAL 擬議移除蘇木
- GEI MAI ENHANCED THROUGH PROPOSED IMPROVEMENT WORKS 通過建議的改善工程改善蘇木
- GEI MAI 範圍



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STATUS
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SCALE
A3 1:25000
DIMENSION UNIT
METRES

KEY PLAN
REV

PROJECT NO.
60670882
AGREEMENT NO.
CE 20/2021

SHEET TITLE
INDICATIVE LOCATION FOR
WETLAND ENHANCEMENT
MEASURES

SHEET NUMBER
60670882/A34/FIGURE 10.12B

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