For Discussion on **NCSC Paper 2/10**
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Advisory Council on the Environment
Nature Conservation Subcommittee

Baseline Ecological Monitoring Programme of the Mai Po and Inner Deep Bay Ramsar Site

Purpose

This paper briefs Members on the main results of the Baseline Ecological Monitoring Programme (BEMP) of the Mai Po and Inner Deep Bay Ramsar Site which is being carried out by Agriculture, Fisheries and Conservation Department (AFCD).

Background

2. In September 1995, the Mai Po and Inner Deep Bay area in the North West New Territories of Hong Kong was listed as a Wetland of International Importance (Ramsar Site) under the Convention on Wetlands of International Importance Especially as Waterfowl Habitat (i.e. The Ramsar Convention). According to Article 3.2 of the Ramsar Convention, "each Contracting Party shall arrange to be informed at the earliest possible time if the ecological character of any wetland in its territory and included in the List has changed, is changing or is likely to be changed." Therefore, AFCD, as the local Ramsar administrative authority, is obliged to arrange ecological monitoring of the Ramsar Site so that the changes in ecological characters of the Ramsar Site could be detected and as appropriate to pass information on such changes to the Ramsar Bureau.

3. In order to monitor the long-term trend of ecological characters of the Ramsar Site, Hyder Consulting Ltd was commissioned in August 1998 and prepared a Technical Manual (TM) in 2000 to establish the framework for a baseline ecological monitoring programme (BEMP) for the Ramsar Site. The BEMP involves collection of data including water quality; sediment quality; mudflat sedimentation; benthic fauna; habitat

extent and condition, and external data including general avifauna records for the establishment of the long-term baseline ecological characters of the Ramsar Site.

4. The BEMP has been conducted annually since October 2001. Currently, the Hong Kong University of Science and Technology was commissioned to conduct the 9th BEMP (i.e. BEMP 2010-2011). A Study Management Group chaired by AFCD and consisted of a representative from Environmental Protection Department (EPD) and the Reserve Manager of Mai Po Marshes Nature Reserve has been formed to guide the project.

Main Results

Water Quality

5. There was a consistent trend that waters in Inner Deep Bay is contaminated with wastewater discharge containing high levels of nutrients as revealed by low dissolved oxygen, high biochemical oxygen demand, ammoniacal nitrogen, total Kjeldahl nitrogen, *ortho*-phosphate, total phosphorus, chlorophyll-*a* and suspended solids. The pollutants were likely derived from the sewage discharged from the Shenzhen River and Shan Pui River, which flow to the mudflat of the Inner Deep Bay. However, as exhibited by the water sample data collected in 2009, the total phosphorus and *ortho*-phosphate levels complied with the action levels which indicated an improving trend in the water quality of the area. In fact, EPD has implemented a number of measures including waste water discharges control through the Water Pollution Control Ordinance and establishment of the Pearl River Delta Regional Water Quality Management Cooperation with the Guangdong Environmental Protection Bureau with the aim of improving the environmental conditions of Inner Deep Bay area.

6. The high chlorophyll-*a* concentration in the water samples and elevated total organic carbon level in the sediment samples of *gei wais* 12 and 13 indicated an elevated phytoplankton biomass in these *gei wai*s which may be flourished by ample nutrient supply from water source and surrounding vegetation. Dredging water channels in *gei wai*s to facilitate water flow and more frequent water exchange should be considered to

alleviate the coherent eutrophication phenomenon.

Sediment Quality and Benthic Fauna

7. The low redox potential of sediment indicated an anaerobic environment due to heavy loading of organic materials, as revealed from total organic carbon, total Kjeldahl nitrogen, total nitrogen, total phosphorus and total sulfide, and high decomposition activity by the microorganisms. Pollution is considered as one of the driving forces to limit the establishment, biodiversity and community structure of benthic infauna. The major infauna groups are oligochaete and polychaete which are low in diversity but high in abundance and tolerant to pollution.

Sedimentation

8. AFCD has constructed topographic profiles of the mudflat by measuring the elevation of random points and monitoring the annual change of elevation at eight fixed stations on the mudflat using Global Positioning System (GPS) for geodetic surveying. The locations of monitoring stations are displayed in **Annex**.

9. Comparison of the profiles in 2005 and 2006 showed that both accretion and erosion took place in different parts of the mudflat. The monitoring results at the eight fixed stations revealed substantial changes in elevation, which amount up to 10cm, in different years but could not lead to definite conclusion on whether the mudflat is experiencing accretion or erosion at specific locations. However, these results do indicate that the sediment transport is a very dynamic process and is influenced by certain environmental processes such as flooding and typhoon in addition to tide and topography. BEMP would be continued to record and further study the annual change of elevation at these fixed stations.

Habitat Extent and Mapping

10. The extent and boundary of intertidal mangrove and mudflat in the Ramsar Site were determined by using satellite images and digital aerial photos. The data were further analyzed using geographic information system. Based on 2007 data, mangrove at the Ramsar Site occupied an area of 350 hectares and the mudflat has an area of 300

hectares. It was observed that recent mangrove extension mainly took place at Shenzhen River outlet and has experienced a diminishing increment rate. Mangrove colonization across the inter-tidal mudflat could also have a major influence on the usage of the site by benthic fauna and waterbirds as a result of reduction in open mudflat area where benthic fauna is abundant. While there is a need to conserve the mudflat area since it is the feeding site for waterbirds, monitoring of the growth of mangroves would be continued to determine if there is a need to carry out mangrove management works in the Ramsar Site.

Way Forward

11. The description of ecological character of the Ramsar Site is an important part of the management planning process. Over the years, results from the BEMP constitute a complementary element for detecting and notifying changes in ecological character. Therefore, the BEMP serves as an important management tool for the detection and monitoring of changes of the site over time. Based on the latest scientific findings and technical development reported in the literature as well as the experience gained in previous BEMP studies, BEMP could be subjected to improvement in its robustness and effectiveness from time to time.

Advice Sought

12. Members are invited to note and comment on the findings of BEMP.

Agriculture, Fisheries and Conservation Department
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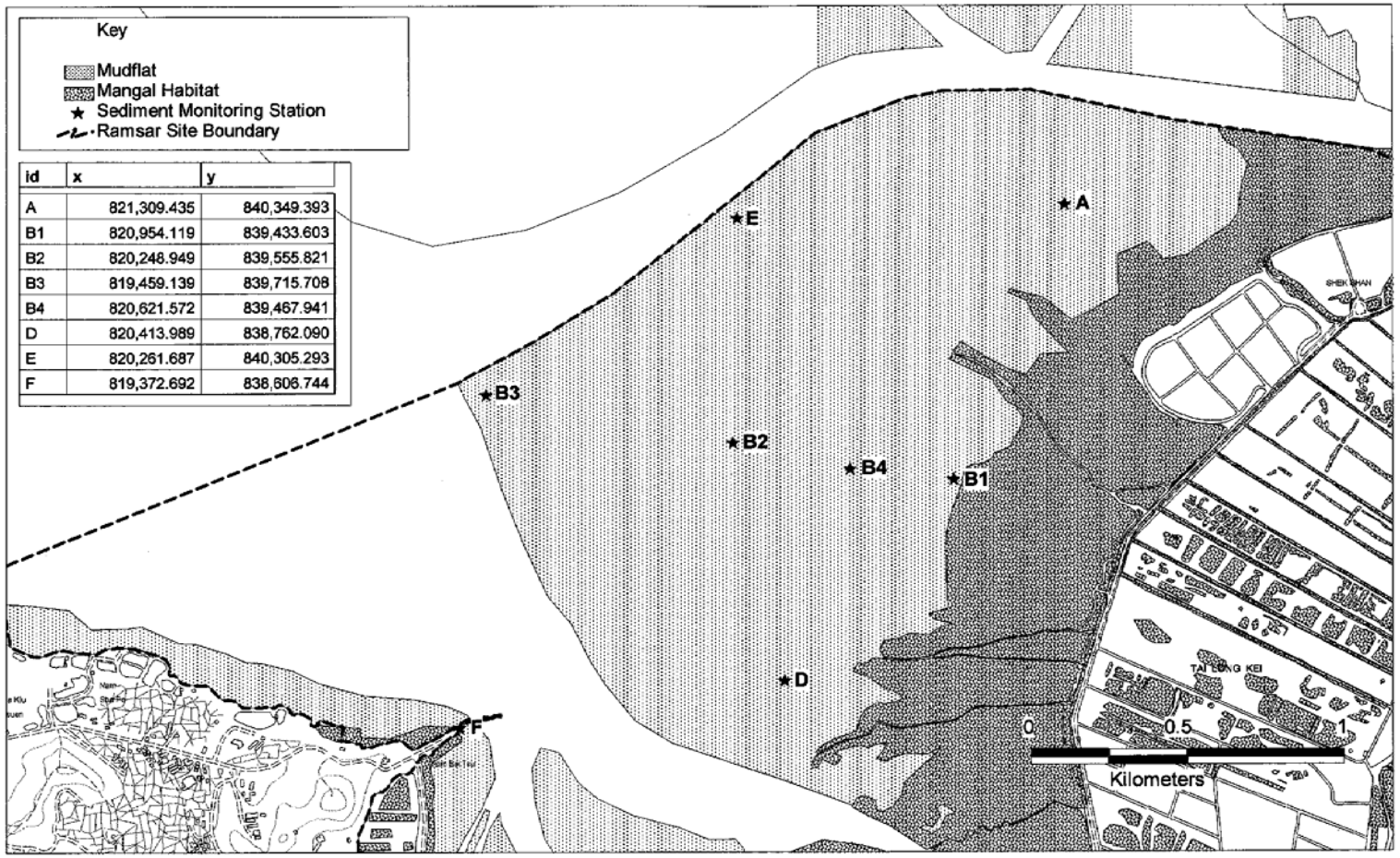

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D	820,413.989	838,762.090
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Sedimentation Monitoring Stations at Mai Po and Inner Deep Bay Ramsar Site