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For discussion on
9 June 2018

LanDAC Paper No. 07/2018

LANTAU DEVELOPMENT ADVISORY COMMITTEE

Smart and Low Carbon Designs in Tung Chung New Town Extension

PURPOSE

The paper aims to report to the Lantau Development Advisory Committee (LanDAC) on the proposed introduction of smart and low-carbon designs into Tung Chung New Town Extension (TCNTE) Project.

BACKGROUND

2. The Government released the "Smart City Blueprint for Hong Kong" in December 2017, with the vision to "embrace innovation and technology ("I&T") to build a world-famed smart Hong Kong characterised by a strong economy and high quality of living". The Blueprint lists out six major areas, namely "Smart Mobility", "Smart Living", "Smart Environment", "Smart People", "Smart Government" and "Smart Economy", with a view to developing Hong Kong into a smart city by leveraging I&T.

3. In addition, the Sustainable Lantau Blueprint aims to develop Lantau into a smart and low-carbon community. In this connection, we have adopted a new way of thinking in conducting planning studies for the TCNTE project[1] by integrating advanced and suitable smart and low-carbon technologies into the designs.

4. Upon preliminary studies, we propose to introduce a number of smart and green elements, including the construction of a comprehensive cycle track network, Sustainable Urban Drainage System, eco-shorelines and District Cooling System, and to explore with the relevant departments the feasibility of introducing e-vehicle charging facilities, Water Intelligent Network and smart lampposts etc. These proposals aim to develop the TCNTE Area into a smart, green and low-carbon community, and to create a more liveable environment for

[1] The progress of the TCNTE project is at LanDAC Paper No. 05/2018.

the public in support of the three areas under the "Smart City Blueprint for Hong Kong", namely "Smart Mobility", "Smart Environment" and "Smart Living".

SMART MOBILITY

5. Railway will serve as the backbone of the transport for the TCNTE Area. The proposed Tung Chung West Extension and Tung Chung East Station will be connected to the existing railway system so as to facilitate the use of public transport and to reduce the carbon footprint. In addition, we will provide a convenient walking environment and comprehensive cycle track network, with a view to enhancing connectivity among communities and improving the walking facilities.

(a) Convenient walking environment

We will provide accessible green spaces, pedestrian-friendly environment and promenade whenever possible, and link up the existing Tung Chung Station with the proposed railway stations at Tung Chung East and Tung Chung West.

The open space at the northern side of Tung Chung East Station will connect to the waterfront promenade, with the central area reserving as "Central Green". To enhance accessibility for at-grade pedestrian facilities, the section of the district distributor road and local district road across the "Central Green" will be constructed as an underpass and an elevated road respectively. In addition, the proposed "Central Green" and green walking trails can integrate the pedestrian facilities with the open spaces, and connect the Metro Core Area where the future Tung Chung East Station will be located, residential areas and waterfront areas together. Moreover, the road network will be designed to match with the planning concept of street shops and restaurants to create vibrancy for the community (**Appendix 1**).

As for Tung Chung West, we will construct a coastal pedestrian assess connecting Ma Wan Chung with Tung Chung Town Centre (**Appendix 2**) to provide a more direct and comfortable link to the Town Centre.

(b) Comprehensive cycle track network

The new 12-km long cycle track network will be constructed along

the waterfront promenade and pedestrian walkways, linking most areas of residential, commercial, schools and social facilities of the TCNTE Area, and the existing cycle track network in Tung Chung. The proposed network includes a 5-km continuous cycle track (**Appendix 1**) along the Tung Chung East waterfront promenade leading to the proposed Cycle Park at Tai Ho Interchange for daily commuting and leisure purposes.

On the other hand, we will extend the cycle track in Tung Chung West to connect Ma Wan Chung with the existing cycle track network, thereby facilitating the public access to the future Tung Chung West Station and the existing Tung Chung Station (**Appendix 2**). We will also consider introducing double-decked cycle parking racks in the TCNTE Area.

(c) Real-time information for the convenience of passengers and drivers

To allow passengers to grasp the bus services information (such as waiting time), we will reserve sufficient spaces at the Public Transport Interchanges in Tung Chung East for installation of information display panels by franchised bus companies.

We will also explore with the relevant departments to disseminate real-time information on parking space vacancies in the TCNTE Area, thereby facilitating drivers to locate the parking spaces.

SMART ENVIRONMENT

6. The TCNTE project will strive to reduce energy consumption and carbon footprints in the area by means of optimising infrastructure facilities, and promoting the sustainable development and green living concept to provide a more liveable environment.

(a) Sustainable Urban Drainage System (SUDS)

For more effective protection of the ecological environment of Tung Chung Stream[2], we will construct a series of SUDS in Tung Chung Valley, including stormwater attenuation and treatment ponds, bioswales and permeable pavements, to control the amount

[2] Located in Northern Lantau, Tung Chung Stream, with its high ecological significance, is identified by the Agriculture, Fisheries and Conservation Department as one of the "Ecologically Important Streams".

and quality of the runoff from the development and adjoining roads into Tung Chung Stream. The plants in the SUDS will serve as habitats of living organisms, thereby enhancing the biodiversity and landscapes.

Different from the conventional drainage systems, bioswales and permeable pavements can collect and filter the surface runoff. While some of the runoff may permeate into the underground space, the rest will flow into the stormwater attenuation and treatment ponds via the drainage systems, and to Tung Chung Stream afterwards. The stormwater permeated to the underground spaces via permeable pavements can supplement the underground water and mitigate the impact on the drainage systems caused by surface runoff, and hence reducing the demand for drainage pipeworks underground in the Area to release precious underground spaces for use by the other utility facilities. In addition, the stormwater attenuation and treatment ponds can serve as buffers and flood prevention purpose for Tung Chung Stream (**Diagram 1 in Appendix 3**).

(b) River Park

To promote a water-friendly culture and activities, we will construct a River Park at Tung Chung Stream. The consultants are carrying out the detailed design of the River Park. During the course of conceptualising the River Park, we have planned some green features to enhance the ecological environment of Tung Chung Stream. In the detailed design stage, we will also explore to introduce some smart elements in the project, with a view to facilitating the public enjoyment of the park facilities and enhancing the visitors' experience, including (**Diagram 2 in Appendix 3**):

- ✧ Revitalising about 415 m long channelised section of Tung Chung Stream, in which the concrete riverbed will be replaced with natural materials and water plants will be introduced as well, to enhance the ecological environment of Tung Chung Stream and improving the ecological connection between the upper and lower streams thereof.

- ✧ Installing various energy-saving and environmentally friendly architectural features, such as green roofs and vertical greening, stormwater recycling systems, a rain garden and

solar energy installations, to the Visitor Centre within the active zone of the Park.

- ✧ Introducing green elements to the Visitor Centre during the planning, design, construction and operation stages, with the objective of attaining the Platinum Rating of the BEAM Plus (New Buildings) Certification.

- ✧ Exploring the use of augmented reality technology in the guided tour services.

(c) Eco-shorelines

We will construct "eco-shorelines" along the shores on the reclaimed lands. In the future, there will no longer be concrete artificial seawalls only along the seashore of Tung Chung East, but eco-shorelines comprising mangroves or bio-blocks, allowing marine organisms to form an inter-tidal ecosystem over there and providing a scenic natural environment for public enjoyment.

We will plant mangroves or install bio-blocks on some newly-built sloping seawalls (**Diagrams 1 & 2 in Appendix 4**). The bio-blocks with various levels and sizes of cavities will retain sea water during low tide, thereby providing an appropriate habitat for marine organisms. In addition, the pH value of the bio-blocks is comparable to sea water, which will facilitate the growth and reproduction of inter-tidal species on the block surfaces.

While vertical seawalls will be constructed due to some other constraints, cavities and pots will be provided at appropriate locations to provide refuges and habitats for marine fauna and flora. In addition, the vertical surfaces will be constructed with eco-tiles which have rugged surfaces to allow easier attachment and growth by small organisms.

(d) District Cooling System

To further enhance energy efficiency and energy saving, we propose to implement a District Cooling System (DCS) in Tung Chung East by providing a centralised chilled water supply for the air-conditioning systems of non-domestic development in the Area (**Appendix 5**). The DCS will cover the air-conditioned floor area of about 778 400 square metres, including hotels, offices, sports

complexes, a police station, a fire station and retail shops, with a total cooling capacity of about 123 megawatt of refrigeration (MWr). We will construct a large scale air-conditioning system, which will produce chilled water with seawater at its central chiller plants and distribute the chilled water to consumer buildings in Tung Chung East through underground water pipeworks. The DCS mainly comprises chiller plants, a seawater pumping station, seawater pipe network, chilled water distribution networks and connecting facilities at consumer buildings.

In general, the energy efficiency of DCS is about 35% and 20% higher than those of the traditional air-cooled air-conditioning systems and individual water-cooled air-conditioning systems using cooling towers respectively. In addition to energy efficiency, the DCS will allow greater flexibility in consumers' building design, as there is no need at the part of individual consumers to install their own chillers and associated electrical and mechanical equipment at their buildings.

(e) E-Vehicle Charging Facilities

The Government actively promotes the wide use of e-vehicles in Hong Kong to improve the road-side air quality and reduce greenhouse gas emission. For the convenience of e-vehicle users, we plan to provide e-vehicle charging facilities at the appropriate locations in the TCNTE Area (**Appendix 6**). Reviewing the charging facilities available in the market, we will consult the relevant departments and give due consideration to the charging time, spaces, amount of electricity required and other factors in finalising the designs.

(f) Water Intelligent Network (WIN) System

We will work with the relevant department to introduce the WIN, which will make use of the advanced technology such as installation of sensor systems to collect and analyse the water flow, pressure (**Diagram 1 in Appendix 7**) and the other relevant network data to monitor the network conditions and assess the situation of water leakage or unlawful taking of water, etc. It will help the department concerned to decide timely the relevant network management measures for the District Metering Areas (DMA), thereby reducing the leakage and inconvenience caused by emergency repairs and road closures arising from main bursts.

(g) Automatic Meter Reading System for Water Supply System

In addition, we propose to collaborate with the relevant department to introduce automatic meter reading systems to collect real-time water consumption data remotely by means of smart water meters at customers (**Diagram 2 in Appendix 7**). Such data will not only allow us to accurately assess the leakage in the WIN's DMA, but also detect any abnormal changes in water consumption or leakage in the insider services of customers. We will provide the water consumption data to customers to raise their awareness of water conservation.

(h) Automatic Meter Reading System for Town Gas and Electricity Supply

To facilitate the development of the TCNTE Area into a smart community, we will liaise with the Town Gas Company and the electric supply company to take forward various smart meter reading system projects, including the Automatic Meter Reading System introduced by the Town Gas Company and the "Smart Energy Programme" rolled out by the electricity supply company.

SMART LIVING

7. Widely spread in the city and overlooking most facilities on the ground, lampposts can be the important resources for fostering Smart Living, apart from street illumination during night time, to provide more convenient and safer public services. We propose to work with the relevant bureaux and departments to implement "Multi-functional Smart Lampposts" (the smart lampposts) at appropriate locations under the TCNTE project. Equipped with smart devices such as sensors, the smart lampposts could collate a range of city data real-time, including the traffic, air quality and weather data, facilitating the relevant departments to step up the traffic and urban management effort. In addition, the smart lampposts can be the suitable venues for mobile network operators to install mobile base stations for launching the fifth generation (5G) mobile services. We will review with the relevant departments the practical needs and circumstances at various locations to explore the feasibility of installing various smart devices on the lampposts in the TCNTE Area (**Appendix 8**).

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ADVICE SOUGHT

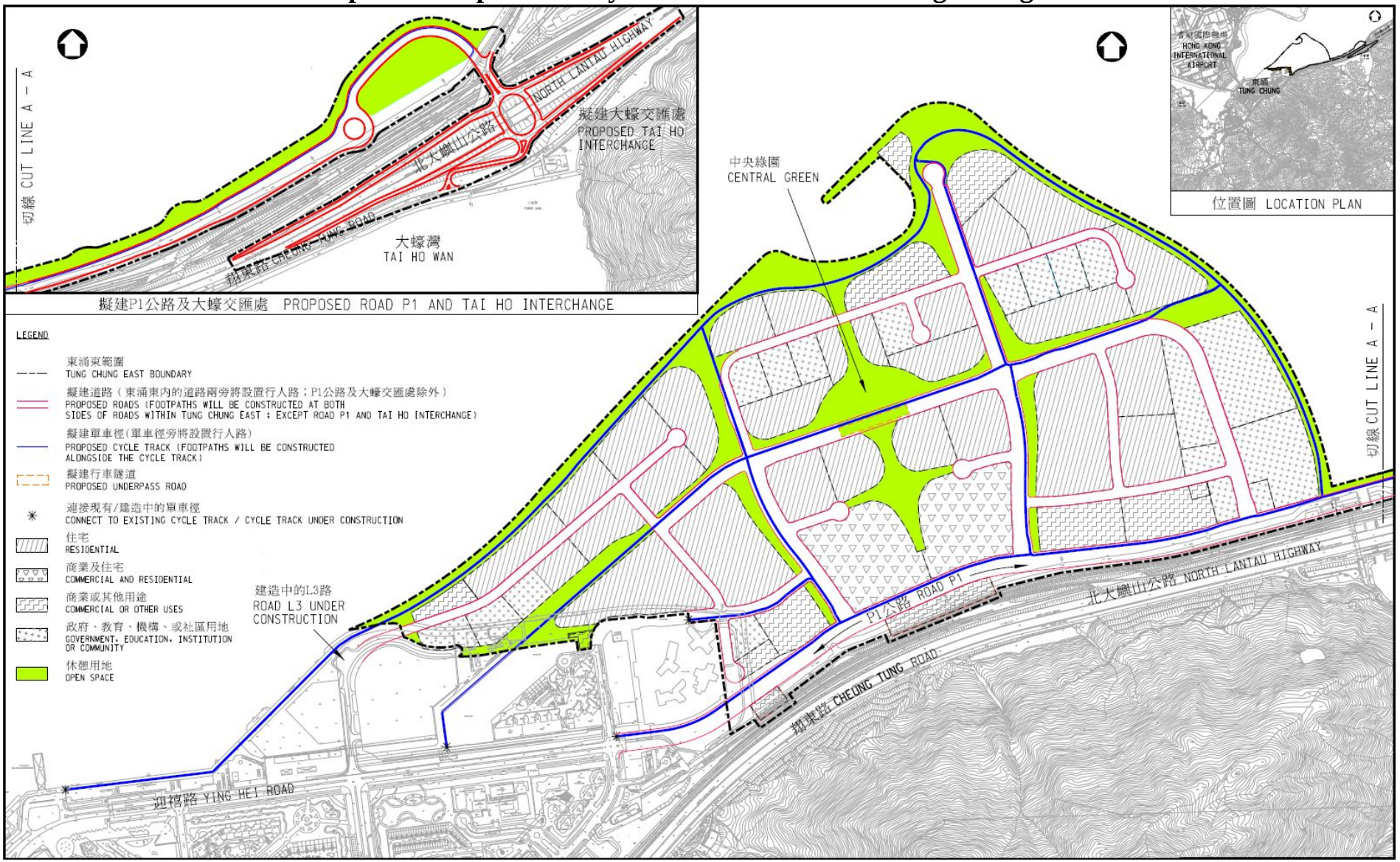
8. Members are invited to provide views on the proposed introduction of smart and low-carbon designs into the TCNTE project.

Civil Engineering and Development Department
June 2018

Appendix 1

(Translated Version)

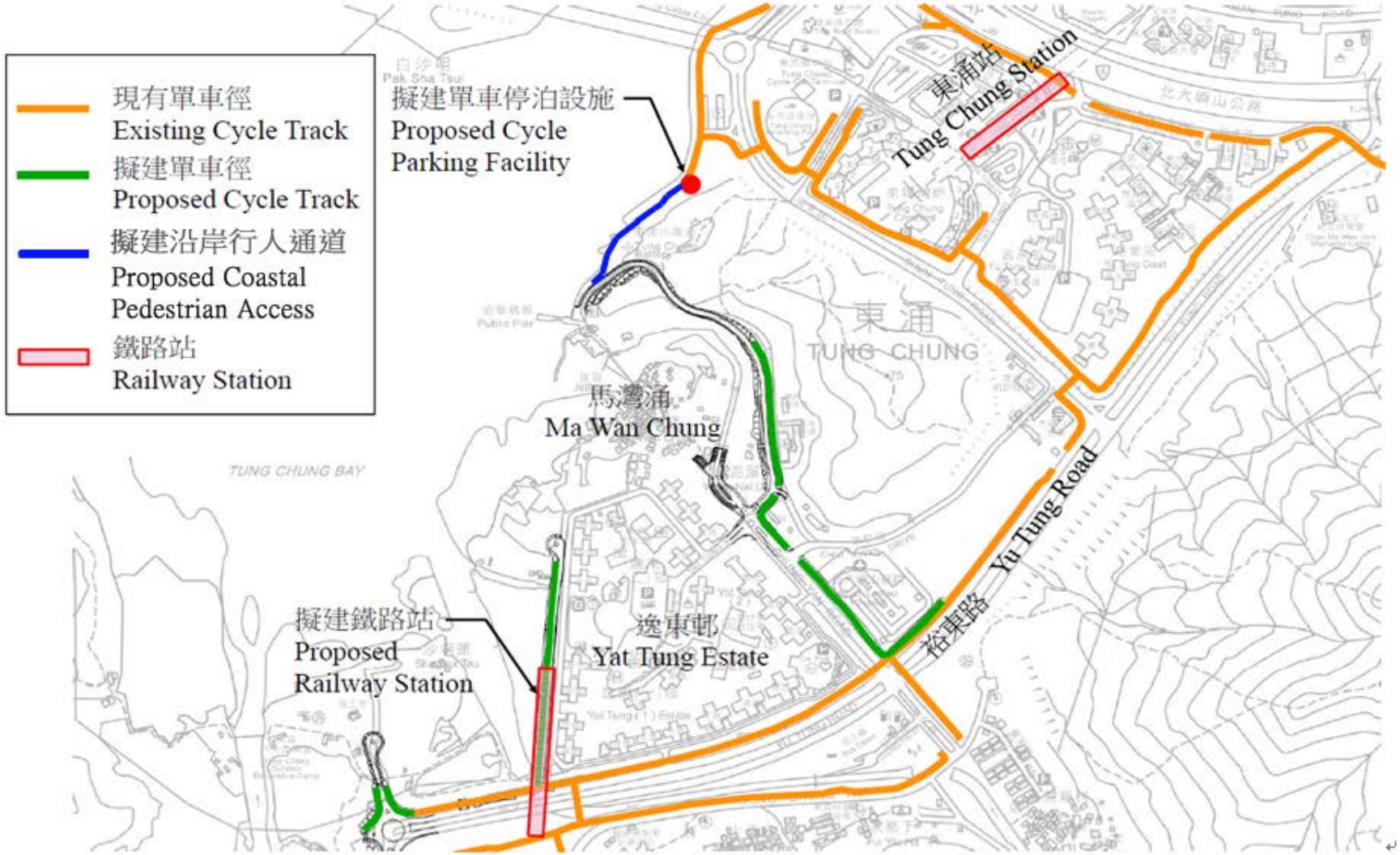
Proposed Footpath and Cycle Track Networks in Tung Chung East



Appendix 2

(Translated Version)

Proposed Coastal Pedestrian Access between Ma Wan Chung and Tung Chung Town Centre and Proposed Cycle Track Connecting Ma Wan Chung to Existing Cycle Track Network



Appendix 3

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Conceptual Design of Sustainable Urban Drainage System and River Park

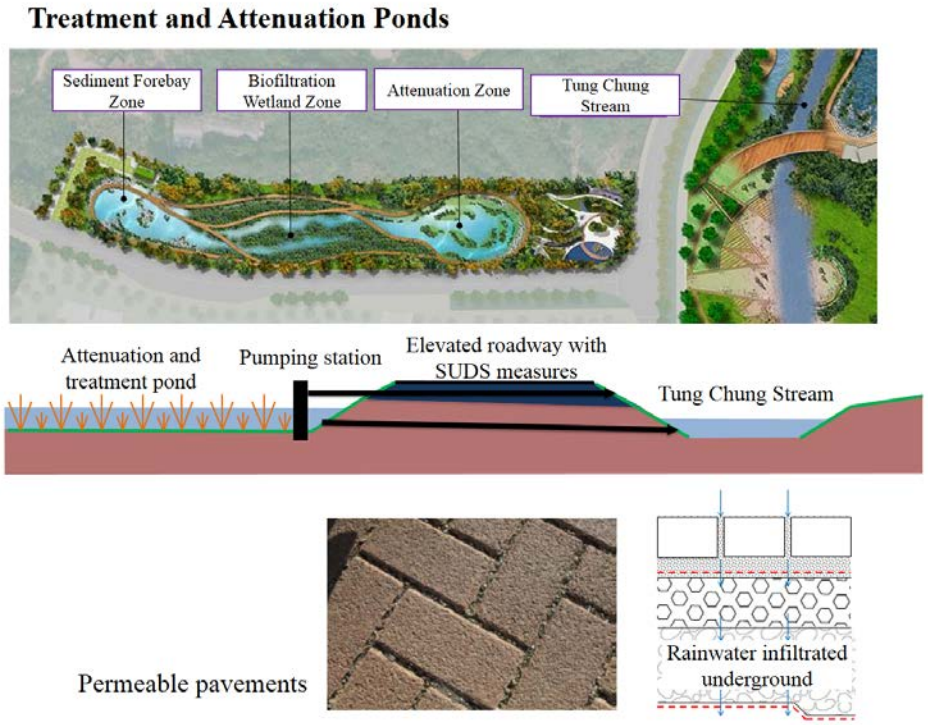

Diagram 1: Sustainable Urban Drainage System (SUDS)

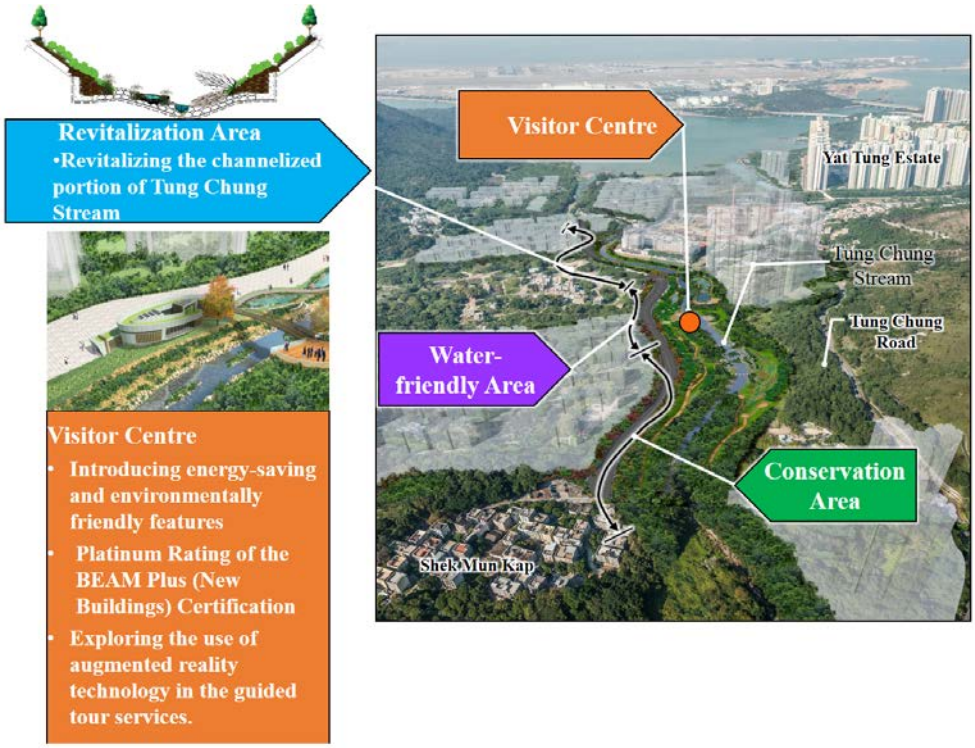

Diagram 2: Conceptual Design of River Park – Green Features and Smart Elements

Appendix 4

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Proposed Eco-Shorelines

Diagram 1: Mangrove Eco-shoreline

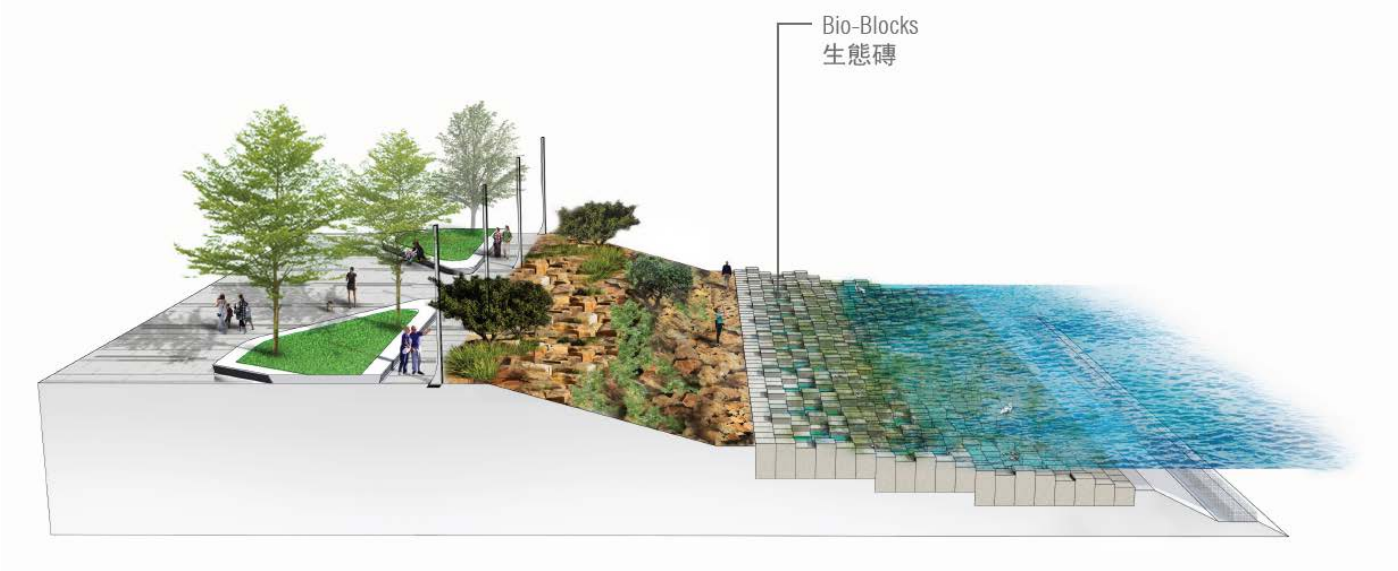

Diagram 2: Rocky Eco-shoreline

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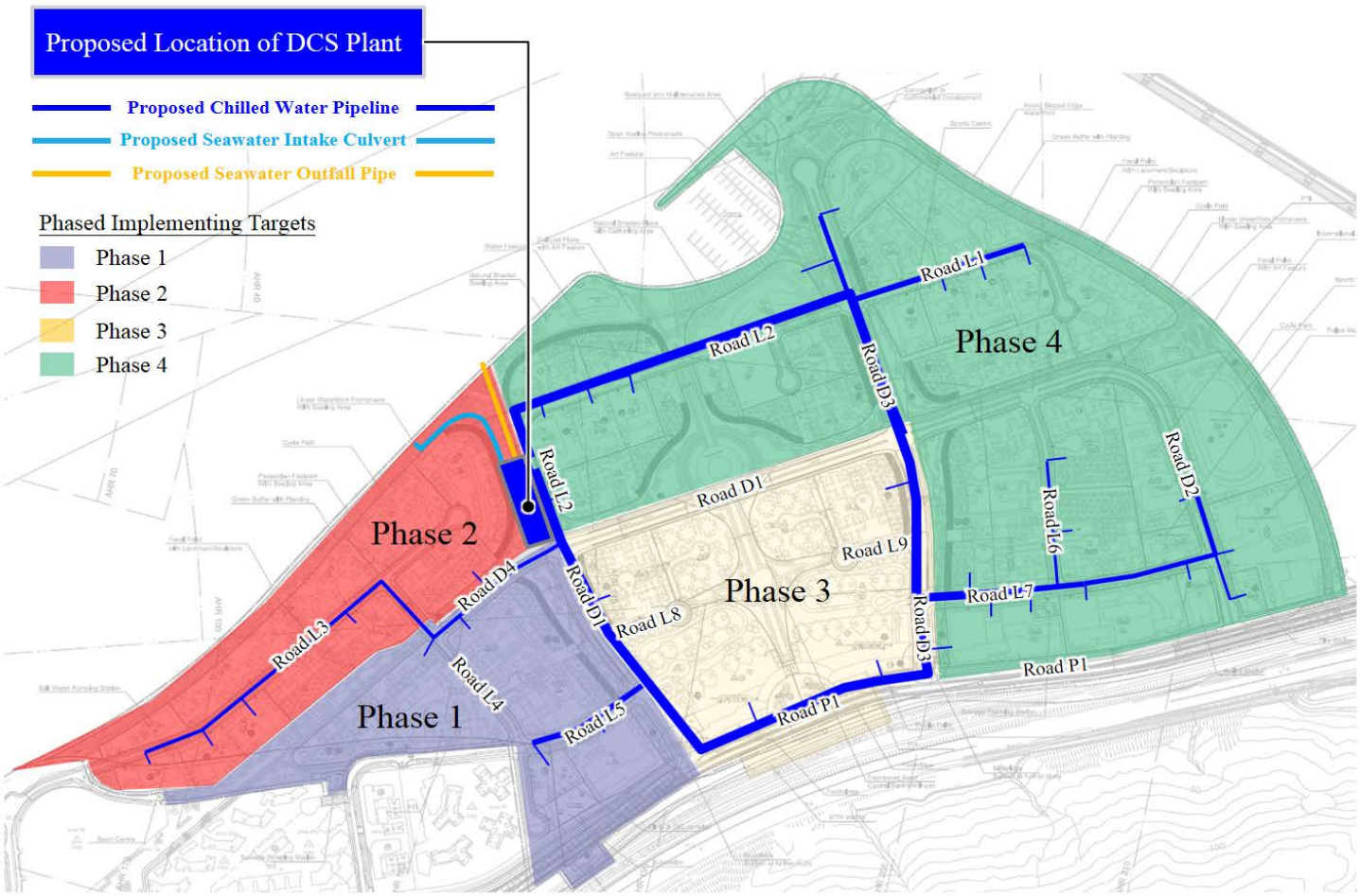
Proposed District Cooling System

District Cooling System (DCS) and the Phased Implementing Targets



Appendix 6

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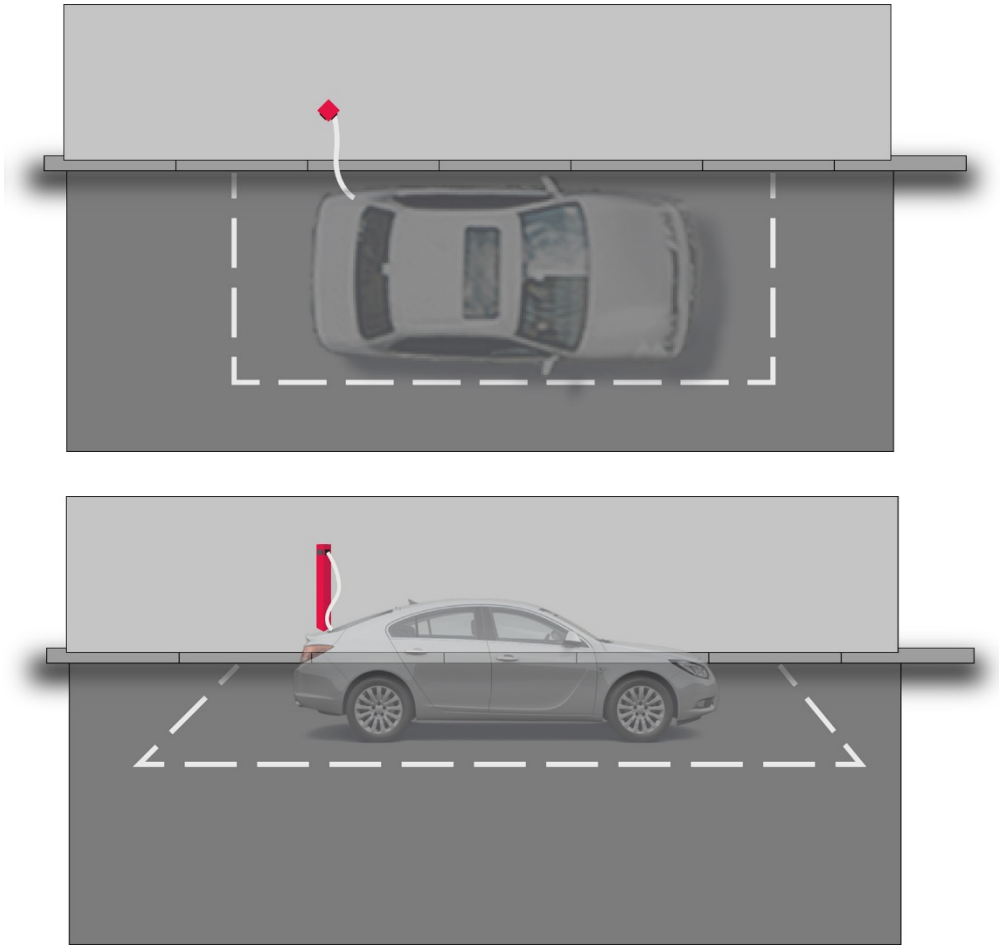
E-Vehicle Charging Facilities



Appendix 7

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Water Intelligent Network System & Smart Water Meters

Diagram 1: Water Intelligent Network System

Diagram 2: Smart Water Meters

Appendix 8

(Translated Version)

Sample Application of a Multi-Functional Smart Lamppost