2 Project Description

2.1 General Description of the Project

The Project comprises the development of LMC Loop (about 87.7ha) and associated supporting infrastructure / works within and outside the LMC Loop. Through the P&E Study, a Revised Preliminary Layout Plan (Revised PLP) for the development of the LMC Loop has been developed. Preferred options of traffic and transport, basic infrastructures and utilities provisions, off-site fishpond compensation area and temporary works area are proposed (**Figures 2.1a** to **2.1d**). The Revised PLP (**Figure 2.1b**) and associated infrastructure was formulated with reference to the relevant statutory town plans (including the Approved San Tin OZP (No. S/YL-ST/8), the Approved Ngau Tam Mei OZP (No. S/YL-NTM/12) and Approved Ma Tso Lung and Hoo Hok Wai Development Permission Area (DPA) Plan (No. DPA/NE-MTL/2)[1], Outline Development Plans, Layout Plans and other relevant plans as given in **Figure 2.1a**.

The LMC Loop will be developed with higher education as the leading land use, complemented by high-tech R&D and C&C industries. The total number of students and employees for LMC Loop will be about 53,000. The development plan, the associated infrastructures provisions and the major activities in the project scope are outlined below.

2.2 Need for the Project

2.2.1 Project Inception

The Project is required to meet the future needs for the development of Hong Kong (HK) and Shenzhen (SZ) and to consolidate the strategic position of the two cities in the region.

Located within the boundary area, the Loop (with a land area of about 87.7 hectares) is near the major transport nodes including the Lok Ma Chau Boundary Control Point (BCP), the MTR Lok Ma Chau Station of the Lok Ma Chau Spur Line and the San Tin Interchange.

The Loop is located to the north of the old course of the SZ River and was within the administrative boundary of SZ before the river was re-aligned in 1997. It had been used as a disposal site for mud extracted from the river training works, some of which were contaminated. As a result of the training of SZ River, the Loop now lies to the south of the re-aligned river course. The 'Order of the State Council of the People's Republic of China No. 221' (中華人民共和國國務院令第 221 號) in 1997 provides that after the realignment of SZ River, the administrative boundary of the HKSAR follows the new centre line of the river. As such, the Loop currently falls within the administrative boundary of HKSAR and is subject to the laws of HKSAR.

[1] Under Section 20(5) of the Town Planning Ordinance, the Ma Tso Lung and Hoo Hok Wai DPA Plan, which was first published in the gazette on 30 July 2010, is effective for a period of 3 years until 30 July 2013.

In the Chief Executive's 2007-08 Policy Address, the development of the Loop was identified as one of the ten major infrastructure projects for economic growth and to meet future development needs.

In view of the unique history of the Loop which was within the SZ's jurisdiction before 1997, HK and SZ Governments have agreed to jointly develop the site for mutual benefits of the two cities. At the first meeting of the "HK – SZ Joint Task Force on Boundary District Development" on 10 March 2008, co-chaired by the Secretary for Development and the Executive Vice Mayor of SZ Municipal Government, it was agreed that both sides would, on the principles of co-study and co-development, conduct a joint study on planning, environmental and engineering feasibility for the development of the Loop.

At the HK-SZ Cooperation Meeting on 13 November 2008, the two Governments signed a cooperation agreement on the undertaking of the P&E Study. It was also agreed that higher education might be developed as the leading use in the Loop, with some elements of high-tech R&D facilities and C&C industries. This would provide impetus for human resources development in South China, enhance the competitiveness of the Pearl River Delta, and benefit the long-term economic growth of the two cities.

The Project also ties in with the Framework Agreement on Hong Kong/Guangdong Co-operation (the Framework Agreement) which was signed between the two Governments in 2010. One of the major initiatives of the Framework Agreement is to promote collaborative development in Hong Kong and the PRD cities to form a world-class metropolitan region. To achieve this goal, Hong Kong and Guangdong Governments have put forward a number of specific policies and measures. On the education front, specific policies to support prestigious tertiary institutions from Hong Kong to jointly set up institutions of higher education in the PRD region with Mainland Educational Institutions; and to establish Hong Kong Guangdong Industry-University-Research bases, joint laboratories, joint engineering research centres, humanities and social sciences research bases and innovation and technology parks, support tertiary institutions from both places in undertaking key scientific and technology research projects of national, ministerial and provincial levels. The Project as one of the key collaborative developments under the Framework Agreement is to develop the LMC Loop with higher education as the leading land use, complemented by high-tech R&D and C&C industries under the principle of "co-study, co-development and mutual benefit".

2.2.2 Project Aspirations

During the pre-study public engagement exercise between June and July 2008 to collect public views and aspirations on the possible future land uses for the LMC Loop, a total of four Focus Group Discussion sessions, one Public Forum and a briefing were held. A similar exercise was also organized by the SZ authority. General optimism was observed among the participants, expressing a wide range of views regarding how to capitalise on the opportunity to develop the LMC Loop. Apart from higher education, high-tech R&D and C&C uses which are the basis of formulating the Recommended Outline Development Plan (RODP) (**Appendix 1-1**), the following possible land uses are among the public views suggested for the LMC Loop:

- a design / production studio and centre for multi-media and creative industry-related education / training;
- a gold trading centre;
- an exhibition and wholesale centre for products from Mainland China;
- an entrepôt, serving as a cargo drop-off / distribution centre;
- an institution hub housing special disciplines of study at the post-graduate level and with a global orientation;
- a data-processing centre to provide outsourcing services;
- a high and innovative technology research centre;
- a bio-medical complex comprising facilities for surgical operations, bio-tech research, medical referral services, and integrated Western and Chinese medicines under a medical tourism operational model; and
- an eco-park for eco-tourism.

Weaving among these various proposed land uses, the following common threads have emerged: (1) the development of the LMC Loop should leverage on Hong Kong's and Shenzhen's competitive advantages; (2) developments must have added value and potential for growth; (3) support of both Governments and their collaborative efforts are crucial; (4) public policies to facilitate the LMC Loop's development need to be deliberated; (5) early clarification on the LMC Loop's ownership and mode of development is needed; (6) the development of the LMC Loop should be considered in a wider geographical perspective; (7) developments should be sensitive to the environmental concerns; and (8) make good use of the uniqueness and strategic location of the LMC Loop.

According to the public views collected during the 2008 public engagement exercise, there is a general consensus on three major directions in which the Loop should be developed:

- Developments on the Loop must embody the Loop's unique attributes which are otherwise not available elsewhere in Hong Kong or Shenzhen;
- The Loop's developments must add value to Hong Kong's and Shenzhen's economy significantly; and
- Developments on the Loop must be sustainable and environmentally acceptable.

The above-mentioned principal tenets serve as the basis of analysis with a view to identifying the possible land use options for the Loop. As a result, four land use options are identified to have gained wider public support from the public engagement exercise:

- a design / production centre for multi-media and cultural and creative industries with related education / training facilities;
- an higher education hub housing special disciplines of study at the post-graduate level and with a global orientation;
- a high and innovative technology research centre; and

- a bio-medical complex comprising facilities for surgical operations, bio-tech research, medical referral services, and integrated Western and Chinese medicines under a medical tourism operational model.

Through subsequent meetings of the Joint Task Force, the LMC Loop is decided to be developed into creation place integrating design solutions that balance social, economic, environmental and physical parameters. Moreover, it might encourage social and community interaction for the formation of knowledge networks and vibrant cluster of activities. Upon due consideration of the public views collected in 2008, the Hong Kong and Shenzhen governments agreed that the LMC Loop be developed with higher education as the leading land use, complemented by new high-tech research and development and cultural and creative industries. The creative and inspiring environment will entice people to study and work in the LMC Loop.

2.2.3 Predicted Future Environment without Project

The LMC Loop previously served as a disposal site for mud extracted from the Shenzhen River training work, some of which were contaminated. The filled area was then capped with uncontaminated top soil. This area is now a combination of reedbed and grassland. The reedbed is self-sown and has formed in low-lying areas in which water does not drain away for at least part of the year. Most of the trees, apart from banana trees in the south, are self-sown trees. The area outside the LMC Loop is mainly comprised of grassland, agricultural land, fishponds and a few rural villages. Vehicle repair and demolition workshops are present along LMC Road and Ha Wan Tsuen Road.

To the west of the site lies the Lok Ma Chau BCP and MTR LMC Station. The area is characterised by infrastructure and compensatory wetland and planting surrounding the cross-boundary facilities. It extends in the south to the vehicular waiting areas for boundary crossing and open container storages at San Tin and roadside planting. To the south across the meander of Shenzhen River, the area is composed of vegetated ridges at LMC and Tai Shek Mo with knolls extending from Sandy Ridge to Lo Wu in the east and Ki Lun Shan in the south. On their lower slopes, areas of mixed woodland are dominated by planted species for either reforestation, landscaping or fruit production purposes.

To the north lies the trained Shenzhen River against the background of high-rise residential developments and facilities associated with the Shenzhen Huanggang boundary crossing, the counterpart to the LMC crossing, with its road development and extensive apron areas for cross-boundary traffic. To the east of the site lie managed and unmanaged fishponds and associated wetlands These wetlands are generally of high ecological values and form part of an extensive area of wetlands extending from Tsim Bei Tsui on the west side of Inner Deep Bay to Ng Tung River in the northeast. The LMC Loop site serves as an important linkage between these areas.

It is considered that the future environment of the Loop will change only gradually, as drier grassland succeeds to shrubland and, though in many years, woodland. Damp areas are likely to remain at an early successional stage for longer. In terms of the reedbed, this has reached its climax state, as Phragmites is a species that adapted to colonise ephemeral wetland areas quickly. This view is supported by similar experience of the Study Team at Mai Po. It took as little as

two years for the reeds to reach their maximum height after being cut / planted. The reeds in the Loop are at least 10 years old. Changes will occur, though slowly, as a build-up of sediment and organic material at the base of reeds eventually leads to a rise in ground level and its consequent drying out. Quick or major changes in the area would arise only from changes in rainfall patterns, which determine long-term water levels.

With regard to areas outside LMC Loop, most habitats conditions are expected to remain unchanged, albeit with the potential for ecological enhancement if active management measures were implemented. Some habitats may be expected to increase in ecological value in future as a result of ecological succession (for example the maturation of shrubland into woodland).

Without the Project, however, there will be hard to locate alternative sites for pioneering cooperation between Shenzhen and Hong Kong, for which alternative sites serving the same purpose may require more intensive infrastructures and more significant induced carbon emissions from logistics. In addition, there is no confirmed programme from Shenzhen side to bio-remediate the background odour from Shenzhen River to the proposed criterion under this EIA study.

2.2.4 Environmental Benefits/Dis-benefits for Feasible Development Options

The environmental benefits and dis-benefits of the above various development scenarios/options/land use are presented in **Appendix 2-1** and summarised below:-

Benefits

The major environmental benefits with the project in place include:

- Possible engagement with the SZ authorities to early discuss programme for bio-remediation of Shenzhen River to reduce odour source from Shenzhen River and the odour exposure to nearby villages.
- Remediation of contaminated land to reduce potential risk within the LMC Loop.
- Readily available location for pioneering cooperation between Shenzhen and Hong Kong, for which alternative sites serving the same purpose may require more intensive infrastructures and more significant induced carbon emissions from logistics.

The project will promote low carbon and green community for developing a sustainable, environmentally friendly, energy efficient and people oriented community in the LMC Loop. Green initiatives, such as clean fuels, low emission transport system, renewable energy, built form and design, and reuse of treated sewage effluent, etc., for the development of LMC Loop and associated infrastructure are being investigated (see **Section 2.3.4.2**). Should the green initiatives be taken forward, it would establish a showcase for low carbon community, encourage exchange of experience and to help promote the development of low carbon communities in the growing urbanisation of the Mainland.

In comparison with the options involving industrial and commercial uses, the Higher Education, High-tech R&D and C&C Industries project will induce less industrial and vehicular emission as a result of its daytime and night time operations while the eco-tourism or "No development" options will result in less or no environmental impact. This renders the eco-tourism or "No development" scenarios a preferred option from purely environmental perspective for the LMC Loop development site. However, in a bigger picture, the need to identify alternative sites serving the same purpose of the project may impose further requirements for more intensive infrastructures which will induce higher carbon emissions from the project and compromise the development principles of "Co-study, Co-development and mutual benefit" of the project. Thus, taking into account potential environmental impact of the alternative site scenario, the Higher Education, High-tech R&D and C&C Industries is considered the preferred option.

In particular, no industrial use is proposed and thus there will be no chimney emissions and impact on residential uses including those nearby villages and the proposed hostels within the LMC Loop.

Dis-benefits

More extensive supporting infrastructures such as additional sewerage, drainage and transportation will be required compared with eco-tourism or "No development" option. Thus, environmental impacts such as air quality, noise, ecology, landscape and visual impacts, cultural heritage, land contaminations, etc may be induced due to construction and operation of supporting infrastructures. Nevertheless, the acceptability of the overall environmental performance of the Project at all stages throughout implementation and the cumulative effects due to interfacing planned, committed and existing projects in the vicinity of the Project were demonstrated in this EIA report.

2.2.5 Consideration of Feasible Construction Methods among Development Options

According to **Appendix 2-1**, supporting infrastructures such as additional sewerage, drainage and transportation will be required for all development options. The formation of supporting infrastructures and the consideration of feasible construction method will be similar among all development options except there will be no construction impact without the Project in place. Details of construction methods are discussed in **Section 2.6**.

2.2.6 Informed Decisions to Recommended Development

Public aspirations, environmental factors, and their benefits and dis-benefits formed an important consideration in deriving the recommended preferred development options and Preliminary Outline Development Plan (PODP)(**Appendix 1-1**) to avoid adverse environmental impacts to the maximum practicable extent. After another round of consultation with major stakeholders held in July to September 2009, the major public views identified can be summarized as follows:

- Respect the ecological habitat and minimise impacts thereon in pursuing development so as to strike a balance between conservation and development.

- Respect the rights of private landowners and protect local character while allowing adequate development to take place to create opportunities for local development, social harmony and social inclusion.
- Upgrade existing road network and provide new infrastructure, where appropriate, to strengthen accessibility and connectivity of the LMC Loop and its surrounding areas to other parts of Hong Kong as well as to Shenzhen as part of enhancement in quality of life and well-being of existing and future communities.
- Allow flexibility in the land use, providing an enabling and interactive environment for different uses and users and hence contributing towards creating synergy between uses within the LMC Loop.
- Clarify on the policy support for the three major land uses and the mode of development, including simplified entry arrangement for the LMC Loop users, relaxation of quota for Mainland students, and any Government's financial support for the capital cost of higher education development, etc.

The abovementioned public views formed the major consideration in formulating the recommended development option, i.e. higher education, high-tech R&D and C&C uses.

2.2.7 Project Vision and Guiding Principles

The strategic location of the LMC Loop makes it the ideal project for Hong Kong and Shenzhen to showcase the cooperation of both cities in jointly developing this piece of land into an exchange zone that meets the future development aspirations of the Pearl River Delta.

Upon due consideration of the public views collected in 2008, the Hong Kong and Shenzhen Governments agreed that the LMC Loop would be developed with higher education as the leading land use, complemented by high-tech R&D and C&C industries in order to meet the aspirations of the local community in respect of the LMC Loop development. Associated infrastructures such as transportation, public utilities, water supplies and sewage treatment will also be needed in order to cope with the additional populations from the development.

The vision is to develop the LMC Loop as a hub for cross boundary human resources development within a sustainable Knowledge and Technology Exchange Zone (KTEZ). The Project will be developed according to the Guiding Principles below:

- Guiding Principle 1: Capitalize on the strategic location of the LMC Loop by adopting an efficient and flexible land use planning and design approach;
- Guiding Principle 2: Adopt a low carbon economy;
- Guiding Principle 3: Provide highly accessible and convenient connections to / from the LMC Loop with appropriate cross-boundary arrangements;
- Guiding Principle 4: Enhance environmental performance with reference to local characters; and
- Guiding Principle 5: Foster social harmony and vibrancy and promote local development.

In conceiving alternative feasible layout options, key environmental issues such as ecological impact of the development needs careful assessment in view of the presence of reed marsh, marsh, ponds and seasonal wetlands and the important ecological functional linkage provided by LMC Loop between Tsim Bei Tsui on the west side of Inner Deep Bay and Ng Tung River in the northeast. Other non-environmental factors such as planning parameters and transportation needs were also assessed in the technical assessments under the P&E Study. Relevant information regarding the formulation of layout and infrastructures is discussed in below sections.

2.3 Recommended Outline Development Plan and Revised Preliminary Layout Plan

2.3.1 Development Opportunities and Constraints

The opportunities and constraints on the development of LMC Loop are summarised below:

Development Opportunities

- The site created as a result of Shenzhen River regulation provides a piece of sizeable and flat land readily available for development.
- The site is close to Shenzhen's Futian commercial area, which is part of Shenzhen's central urban cluster, hence bringing economic benefit to Hong Kong and the Mainland, especially Shenzhen.
- The site is near the existing Huanggang Port and the MTR LMC Station of the East Rail Spur Line, hence allowing easy logistics to cross-boundary activities and enhancing close connections between Hong Kong and the Mainland.

Development Constraints

- There is no provision of public utilities, such as water, electricity, gas, drainage, telecommunication, etc. in the LMC Loop. There is no proper connection road with other areas.
- Existing odour emission from Shenzhen River poses a constraint. Nevertheless, the Shenzhen Municipal Government has implemented / will implement measures to tackle the problem, which include interception and banning of illegal sewage discharge, construction of large scale sewage treatment plants, upgrading of existing treatment plants as well as enhancement of the sewage and pollution discharge standards. Some of the measures have been stipulated in the 12th 5-year Plan of Shenzhen Water Supplies Development 《深圳市水務發展十二五規劃》[2-3].
- Both contaminated and uncontaminated mud have been deposited in the LMC Loop during river training. According to the latest land contamination assessment (see **Section 8**), de-contamination would be required in compliance with the EIA requirements before development.
- Ecological impact due to the development needs to be carefully assessed in view of reed marsh, marsh, ponds and seasonal wetlands.
- Lack of transport infrastructure meeting current standards and required population.

- The "no net increase in pollution load requirement in Deep Bay" policy may imply a higher discharge standard required in the design of sewage treatment strategy.

2.3.2 Consideration of Alternative Feasible Layout Options

In the early stage of P&E Study, a PODP was formulated in consideration of the project vision and Guiding Principles.

The PODP set out the proposed land use framework to guide the future development of the LMC Loop in terms of spatial land use arrangements, development intensities and height profile, major infrastructure networks, open space, and other urban design and landscape elements.

Three layout options, namely flexible, cluster and linear, had been investigated and formulated with regard to the overarching project vision and Guiding Principles. They were conceptually different and aimed to provide different urban design solutions and possibilities to optimize land utilization by allowing a variation in development phasing, building footprints and floor space / land use allocation requirements. These layout options are presented in **Appendix 2-2**.

The key considerations in deriving the layout options included ecological functional linkage and landscape concerns. These considerations are summarised in below:

Ecological functional linkage: In the LMC Loop, the presence of Phragmites reeds meant that reedbed-associated species would be the focus of avifaunal interest. In addition, there were records of Eurasian Otter in areas adjacent to the LMC Loop, and it had been reported as occurring in marsh in the LMC Loop by local fishermen interviewed for this Study. Phragmites reedbeds were generally regarded to be of moderate or high ecological value, and development of the LMC Loop would require mitigation in the form of compensatory managed habitat equivalent in area and function.

The fish ponds to the south and southeast of the LMC Loop, and the airspace above both of these fish ponds and the LMC Loop itself formed an ecological corridor linking wetlands at San Tin and the Mai Po Inner Deep Bay Ramsar Site with those at Hoo Hok Wai. In considering the direct and indirect impacts on flight line corridor, proper design of buildings and infrastructure layouts would be considered. Furthermore, infrastructural links might have the potential to seriously impact the function of the ecological corridor, and mitigation to avoid/minimize the impact would be required. Such mitigation might take the form of submerging below ground level any road together with planting of vegetation to preserve the ecological linkage and functions.

Landscape Concerns: The project would involve the loss of the existing grassland, marshes, trees and would cause change of local landscape character. Therefore the layout should be formulated with an integrated design approach responding to the local landscape context including both lowland rural landscape in the HKSAR and high-rise urban setting in SZ existing views and visual quality of visual sensitive receivers located immediate and at distance to the proposed works with the landscape mitigation measures successfully implemented.

Having reviewed and evaluated the three layout options against the Guiding Principles, the flexible layout option would perform more optimally in terms of

urban arrangement, social, environmental, and economic aspects. It was thus the preferred option and was recommended to be adopted for formulating the PODP for next stages of work. After devising the preferred layout option, three scenarios (with a total Gross Floor Area (GFA) of 1,200,000m^2, 1,500,000m^2, and 1,800,000m^2 by making reference to other sizable universities with similar scale and contexts) had been tested to determine the recommended development density. The evaluations of different options are discussed as follows.

2.3.2.1 Option 1: Flexible

The Flexible option (Figure 1 of **Appendix 2-2**) was based on the idea of an extensive, dense and continuous series of buildings on a structured grid layout. This option accentuated the idea of the gradual transition of the urbanized context of Shenzhen and rural landscape of Hong Kong via the KTEZ through a series of linear development strips that were designed to accommodate the flexibility to extend by increments southeastwardly according to the actual land use demand. These linear development strips could be also bundled together to form structured clusters, which allowed greater flexibility for phased development. The development strips were permeated by a network of open spaces that serves as 'green connectors' amongst developments as well as between developments and the natural surroundings. The merging of the green open spaces and the development strips resembled the interconnection of the rural Hong Kong and the more urbanized Shenzhen contexts in spatial terms similar to that of a pair of hands with interlocking fingers.

As the development strips could be subdivided into development plots of different sizes, this allowed a fine urban grain with human-scale environment to emerge. Spaces in between buildings and development plots could form part of the wider circulation network as well as provide pocket green spaces for leisure and passive uses. The central open space could serve as a multi-functional space where people can "go-to", "go-through", and "go-past".

2.3.2.2 Option 2: Cluster

The Cluster option (Figure 2 of **Appendix 2-2**) aimed to create a series of predefined development clusters that accommodated high-density buildings with a compact building footprint based on an overall loosely structured urban layout. Each cluster could emerge with a distinctive identity, be independent from each other, and have the flexibility to accommodate different building forms and disposition to suit the needs of the end-users. This design flexibility allowed a greater degree of autonomy for various users, whilst keeping the KTEZ as an intact community.

The loose urban layout and the individual clusters facilitated the permeation of a non-uniform network of continuous and dynamic green open spaces. Swerving between development clusters, these green open spaces seamlessly sew together the different development parcels as well as integrating the surrounding natural environments with the KTEZ. These interesting green transitional spaces also form a part of the wider circulation network within the LMC Loop.

2.3.2.3 Option 3: Linear

The Linear option (Figure 3 of **Appendix 2-2**) emerges from a compact linear building fabric that lined the northwestern edge along the Shenzhen River and southeastern edges of the site along the ecological zone. The development alongside the edges formed a chain of buildings with continuous façade. To allow for some variation in building form and height profile, landmark buildings could be located in selected prominent places along each of the two development strips.

Sandwiched between the two linear development strips was a belt of enclosed, continuous open space which served as the key element that glued together different developments as well as provide spaces for social gathering, recreation, and leisure activities. This central open space functioned as a key circulation feature and played a major role in facilitating access to different buildings and uses within the site.

2.3.2.4 Option Evaluation

The formulation of a robust and flexible development option was the key driver for the LMC Loop development. In the formulation process, priority was accorded to layout options that took into account the LMC Loop's uniqueness as the "bridging" element between HK and SZ, embodied the flexibility to cope with the changing planning circumstances, explored the development potentials of neighboring communities, supported an integrated infrastructure system, and applied sensitive design to enhance environmental and ecological values.

Urban design principles and concepts, together with the planning considerations formed the basis of the various considerations to be taken into account when formulating the PODP. In general, the urban design of the LMC Loop was intended to reciprocate with its adjacent surroundings to create harmonious transitional spaces which respect the existing and new settings. Urban design concepts such as creating a permeable and accessible urban structure, designing responsive building height profile and urban form, creating places with unique identity, while working with nature to achieve environmental harmony were key in guiding the formulation of the PODP.

One of the overarching considerations for the development of the LMC Loop was the need to ensure the developments set the context for the future and provide a framework that enabled further intensification as the development matures. On this basis, it was considered that the general layout of the LMC Loop should accommodate a flexible urban pattern that enabled the integration of various land use requirements as well as resilience to changes and phased development.

With thorough analysis of the 3 options, the Flexible development (Option 1) was recommended. It performed more optimally in terms of urban arrangement, social, environmental, and economic aspects. The design approach integrated the surrounding ecology and natural setting. The hierarchy of green spaces served multi-functions, including improvement of microclimate and air circulation, creation of visual corridors, and spaces for passive and active recreation. The comparison of the 3 layout options is presented in **Table 2.1**.

Table 2.1 Summary of considerations of the 3 layout options

	Option 1: Flexible	**Option 2: Cluster**	**Option 3: Linear**
Pros:	• Allow flexibility that	• Easier to define	• Better enclosure of public

	Option 1: Flexible	**Option 2: Cluster**	**Option 3: Linear**
	developments could be in place gradually from the NW side to the SE side depending on the actual land use demand. • Provide flexibility for future expansion. • Echo with the urban development on the Shenzhen side and the rural character on the Hong Kong side. • Provide different hierarchy of open spaces respecting ecology and river. • Easier to define development parcels for different users. • Improve internal connection. • Improve microclimate performance due to green pockets and varying building heights. • Provide integration with the surrounding areas. • Enhance of visual and perceptual linkage between Hong Kong and Shenzhen.	development parcels for different users. • Open to ecology and river, and integration with the surroundings. • Minimise conflict between different users.	environment. • Match with prevailing wind direction.
Cons	• Need improvement of a linking element such as footpaths or local roads for public environment.	• Limited opportunities to expand if needed. • Minimise opportunities for varying building heights.	• Create barrier to surrounding environment / ecology and minimise permeability. • Minimise visual or perceptual linkage between Hong Kong and Shenzhen. • Aesthetic quality of site diminishes with "wall buildings". • Development not open to the SZ River. • Limited adaptability to future growth and change. • Limited adaptability to break up the land parcels and create visual corridors linking up with SZ side. • Continuous facade line to the south of the site contradicts with the birds flight path.

2.3.3 Consideration of Scale of Development

The Hong Kong and Shenzhen Governments have a shared objective to optimize the utilization of the scarce land resources of the Loop. Based on the proposed land uses, options with varying scale of development (e.g. GFA, Plot ratio and building heights) were tested for flexibility, viability and attractiveness of the Loop for development. The GFAs of various existing universities and R&D/C&C developments are compared and presented in **Table 2.1a**.

Table 2.1a Comparison of GFA for various existing universities and R&D/C&C developments

University	Total GFA (m^2)
University of Hong Kong	580,893
Chinese University of Hong Kong	548,837
Hong Kong Science Park	220,000[2]
Hong Kong Cyberport	153,100[3]

In addition, three scenarios (total GFA of 1,200,000m^2, 1,500,000m^2, and 1,800,000m^2, including education, R&D/C&C) have been assumed and studied. The purpose of these test case scenarios was to provide a starting point as well as a platform for discussion on the development intensity of the LMC Loop and to illustrate the responsiveness of the flexible layout to different development densities in the event of changing circumstances related to the number of students and staff and land requirements.

Referring to the comparison, it is appropriate to allocate 720,000 m^2 GFA (which mean about 1.3 sizable university campus area) for Education uses while 411,000 m^2 GFA for R&D /C&C uses (which mean about 2 sizable R&D/C&C development).

Of the options considered by the authorities and assessed, it was considered that the development intensity of 1,200,000m^2 GFA (720,000 m^2 for Education, 411,000 m^2 for R&D/C&C and 68,600 m^2 for other land uses) was appropriate to achieve a critical mass that would make the project attractive for development, while having due regard to minimizing ecological and environmental impacts of the area. Based on the principle of sustainable development, the Loop development aims to encompass nature conservation and development that balances environmental, social and economic concerns.

The GFA, plot ratios and building heights are dependent parameters in terms of development scale. With the site area of LMC Loop of 87.7ha and the development intensity of 1,200,000m^2 GFA, the overall plot ratio will then be 1.37. Public opinion will also be one of the key considerations in designing the building heights. Details of plot ratio and building heights profiles are discussed in below sections.

2.3.4 Public Opinions

Upon completing the PODP, the PODP and the preliminary proposals for the Loop was put forward in the PE Digest under Stage 1 Public Engagement (PE) of

[2] Source: Hong Kong Science & Technology Parks official website
[3] Source: Approved Pok Fu Lam Outline Zoning Plan No. S/H10/15. It is assumed major R&D/C&C offices development are located at sub-zone 1 & 2 only while the others are residential development and waterfront areas.

this P&E Study to collect public views on the PODP. The Stage 1 PE was conducted from November 2010 to January 2011 under the P&E Study.

The key features of the PODP are highlighted as follows:

Overall Planning Concept

(a) To achieve the vision of fostering cross-boundary exchange of talent, knowledge and technology in the area, the Loop comprises five zones :-

  (i) 'Education Zone' for higher education development;

  (ii) 'Innovation Zone' as a hub for R&D and C&C industries. The location of the 'Education Zone' and the 'Innovation Zone' in close proximity to each other would facilitate cooperation between the higher education and R&D sectors;

  (iii) 'Interaction Zone', in the centre of the Loop, to serve as a public realm for passive recreation and social activities. It would be a focal point where informal interaction among different sectors of the Loop could take place;

  (iv) 'Ecological Zone', lying in the southern edge, mainly to preserve the existing bird's flight path and to compensate for the loss of existing reedbed in the Loop; and

  (v) 'Riverside Promenade' to provide a pleasant and attractive waterfront environment surrounding the Loop.

(b) To allow flexibility, the layout could be easily adapted to cater for different mix of the three main land uses proposed for the LMC Loop.

(c) Taking into account its location and surrounding development, a maximum GFA of about 1,200,000 m^2 (amounting to a gross plot ratio of 1.37) was adopted as a basis for formulating the PODP.

(d) To promote low carbon economy, a number of green initiatives such as the environmentally friendly transport system, district cooling system and on-site sewage treatment works with effluent recycling for flushing and irrigation were recommended as technical guidelines for future developers' considerations and the implementation of green initiatives will be subject to separate EIA studies (if identified as DPs) and engineering findings during detailed design stage.

Major Land Uses and Development Intensity

(e) On the basis that higher education would be the leading land use and previous submissions from the tertiary education institutes, about 22.8 ha of land, out of the total site area of 87.7 ha, was proposed for higher education development. The area could provide a maximum of 600,000m^2 GFA for academic purpose and a maximum of 120,000m^2 GFA for student hostel. It could accommodate a maximum of 24,000 students and 6,000 staff, with half of the students assumed to be resided in the Loop.

(f) Amounting to a total area of about 8.6 ha, sites were reserved in the eastern and western parts of the Loop for the other two main uses, i.e. R&D facilities and C&C industries. They were proposed to be located

into two clusters so as to facilitate phased development, and it was envisaged that the western part, accessible from the Lok Ma Chau Road, would be developed first.

(g) About 1.2 ha of land was reserved at the north-eastern part for commercial uses such as offices, retail shops and hotel to provide the necessary supporting services.

(h) Other supporting Government, Institution or Community (G/IC) uses like medical and health facilities and post office could be provided within the area reserved for higher education use. While the existing LMC Police Station would be able to serve the needs arising from the Loop, a site was reserved adjacent to the eastern approach road for the fire and ambulance services.

The major environmentally-related public views received on the PODP/preliminary development proposals and the corresponding responses are summarized in **Table 2.2** below.

Table 2.2 Major public views from the public engagement in 2011 and responses

Category	Major Views	Responses
Development scale	The green groups required that the study should encompass nature conservation and development within the LMC Loop and balance environmental, social and economic concerns: • The original character of the surrounding areas should be preserved and scarce land resources should be utilized in a sustainable manner. • Gross plot ratio of 1.37 and maximum building height of 15 storeys were on the high side. • Development scale might cause adverse impact on the ecological and visual integrity of the overall wetland habitat in the Deep Bay Area.	• A maximum GFA of 1.2Mm^2 is proposed in the LMC Loop. • The building height profile is adjusted and minimized to tackle potential impacts on birds' flight paths and visual impact on the sensitive receivers in the surrounding area. • An Ecological Area at the south of Area A adjacent to the Meander, which locates at the major flight lines, will be formed to compensate for the direct loss of reedbeds within Area A and off-site compensation will be implemented in San Tin and Hoo Hok Wai for the direct loss and indirect disturbance outside Area A.
Connection road alignments	• The feasibility of a direct link between the LMC Loop and the LMC MTR Station should be explored. • Inadequate capacity of existing LMC Road might not be able to cater for the additional traffic arising from the development of the LMC Loop. • For WCR, some demanded that	• A Direct Link to MTR LMC Station is included in the RODP. • The alignment of WCR is refined to avoid approaching the existing houses and part of LMC Road will be widened to cater for the anticipated traffic volume. • The alignment of the ECR is refined to minimise impact on wetland nearby. An underpass

Category	Major Views	Responses
	the future road works should not affect their houses and the existing living environment. • For ECR, the green groups expressed strong reservation in view of the possible adverse impact on Hoo Hok Wai and in turn the integrity and continuity of the wetland habitat in the Deep Bay Area.	cum depressed road option for the section of the ECR approaching the eastern entrance of the LMC Loop is proposed to minimize disturbance to the wetland habitat during operation.
Others	The odour problem of the SZ River, treatment of the contaminated mud in the LMC Loop and potential flooding risk to/control for the surrounding areas were also concerns raised by the local villagers.	• To tackle the odour problem of the Shenzhen River, the Shenzhen Municipal Government has undertaken steps/measures, including upgrading the existing sewage treatment works and constructing new ones. Among various methods, bioremediation are further looked into under the LMC Loop Study to address the odour problem of Shenzhen River. In addition, the Shenzhen River Contaminated Sediment Remediation Strategy Joint Study was on-going to formulate strategy to tackle environmental concerns including odour problem at Shenzhen River. • The LMC Loop will be formed to such site levels to avoid increasing flooding risks.

The majority view collected from the Stage 1 PE has shown support for the proposed development of the LMC Loop to be balanced with conservation under the principle of sustainable development. On land uses, there was general support for developing the LMC Loop for higher education as the leading land use to be complemented by high-tech R&D as well as C&C industries. Some, however, objected to the proposed development of the LMC Loop and advocated preservation of the ecological integrity and continuity of the Deep Bay wetland system.

Despite voices from some members of the public to exclude developments from the entire Loop so as to protect the ecological integrity of the area, it was generally agreed among other consultees that nature conservation should form an important part of the LMC Loop's development. Some, however, expressed no in-principle objection to the proposed development provided that its development intensity would be set with due regard to the ecological sensitivity of the surroundings and that effective measures would be implemented to mitigate and minimize any possible adverse environmental and ecological impacts. There was

general support for the low carbon concept, and some requested formulation of the corresponding benchmarking criteria.

The majority supported the provision of a convenient and highly accessible transport network for the LMC Loop with priority given to strengthening the external connections with the surrounding areas both in Hong Kong and Shenzhen.

2.3.4.1 Recommended Planning Parameters

With general support from the public and the stakeholders on the main proposed uses of higher education, high-tech R&D and C&C industries, the PODP has been refined to formulate the Recommended Outline Development Plan (RODP) in such a way as to allow the land use and floor space to be interchangeable among the high-tech R&D and C&C uses to meet any changing future demand. The vision, guiding principles and overall planning concept remain unchanged. The proposed development intensity and the land use mix would, however, be subject to the carrying capacity of the planned infrastructure and impacts on the environment.

According to the preliminary development parameters, the estimated total number of workers and students for the LMC Loop is approximately 53,000, based on a maximum Gross Floor Area (GFA) of 1,200,000m^2 and an overall plot ratio of 1.37 which include higher education, high-tech R&D facilities, C&C industries and supporting commercial usage at full operation. Higher education would occupy 60% of the total GFA, while the remaining GFA is distributed amongst other land uses including high-tech R&D facilities, C&C industries, supporting commercial, possible boundary crossing facilities, other government uses and ancillary offices. The provision of open spaces, amenity areas, and an ecological area, which comprise about 12%, 18% and 15% of total site area respectively, are also included in the RODP.

The RODP has incorporated a more dynamic height profile with gradation in building heights for the LMC Loop in response to the general environment of the area. Taller developments may be located at the western corner of the site in proximity to the western entrance of the LMC Loop to serve as a primary gateway for the site. Building heights along the Shenzhen River would be of lower rise and gradually rise towards the centre of the site and again gradually decrease towards the southern boundary of the site. Furthermore, the building height of the commercial sites near Hoo Hok Wai has been reduced to minimize the impacts of the proposed buildings on the birds' flight paths. The planning data for the LMC Loop development are presented in **Tables 2.3** and **2.4**.

Table 2.3 Overall GFA by land uses (including internal roads and local open space)

Land Use	**GFA (m²)**	**Approximate Site Area (ha)**
Education	720,000	22.8
Supporting Commercial (with Transport Interchanges)	60,000	1.2
Possible Boundary Crossing Facilities	8,000	0.8
Ancillary Offices (STW)	600 (excluding plants and equipments)	2.1

Land Use	GFA (m^2)	Approximate Site Area (ha)
Fire Station-cum-Ambulance Depot	-	0.4
Open Space	-	10.6
OU (AA)	-	15.9
Ecological Area	-	12.8
High-tech R&D / C&C Industries	411,000	8.6
Ancillary Offices (Provisional DCS)	400 (excluding plants and equipments)	1.6
Electricity Sub-station (2 nos.)	-	1.0
Roads	-	9.9
	Total: 1,200,000	Total: 87.7

Table 2.4 Height profile

Land Use	Building Height (no. of storeys)
Higher Education	Approx. 3 to 10
High-Tech R&D / C&C Industries	Approx. 6 to 12
Supporting Commercial	Approx. 8 to 9

2.3.4.2 Formulation of Recommended Outline Development Plan and Revised Preliminary Layout Plan

The following planning considerations were proposed within the framework of 1.2Mm^2 GFA.

Ecological Area at south of LMC Loop: With major birds' flight paths located at the south of LMC Loop, the Ecological Area would be located at south of LMC Loop to maintain the ecological linkage between the Meander, the nearby fishponds at the south and Hoo Hok Wai.

Plot Ratio and Height Profiles: Within the framework of 1.2Mm^2 GFA, the overall plot ratio will be 1.37. The building height profile was formulated with regard to the public comments and amenity/activity corridor. The low-rise building will be placed at the south and east of LMC Loop to minimize the impact to flight lines and EA. Tallest building will be located at the western and central part of LMC Loop, where ecological sensitivity is relatively less sensitive. The tallest buildings will be approximately 12 storeys from ground level (about 54 mPD).

Flushing Water Service Reservoir at Horn Hill: There is a need to maintain adequate head for flushing water supply. In order to save pumping energy for individual buildings, the flushing water service reservoir would be located at Horn Hill, which is the highest hill near LMC Loop.

Sewage Treatment Works at southeast corner of LMC Loop: Given the location of flushing water service reservoir at Horn Hill, the on-site sewage treatment works would be sited as close as possible, i.e. southeast corner of LMC

Loop. The buildings at the on-site sewage treatment works will be low rise and there will be minor human activities. Thus it has benefits on minimizing ecological impacts when compared with the alternative site at other locations within LMC Loop.

Amenity/Activity Corridor in north-south direction at centre of LMC Loop: The location of amenity/activity corridor is designed to facilitate the activities of the future users within the Loop and to complement the long-term proposals in Shenzhen so that a visual and wind corridor links up Shenzhen with Hong Kong.

The RODP has been further developed to formulate the Revised Preliminary Layout Plan (**Figure 2.1b**) taking consideration of further environmental assessment and Stage 2 Public Engagement from May to July 2012. Minor adjustments included the additional 50m buffer zones between Ecological Area and the development (see **Chapter 12**) and the requirement for centralised air conditioning in the first layer of buildings along the internal road (Road M1) (see **Chapter 4**).

2.3.4.3 Guidelines for Green Initiatives

To promote low carbon and green community, a number of green initiatives such as the environmentally friendly transport system, district cooling system and on-site sewage treatment works with effluent recycling for flushing, irrigation and make-up water for Provisional DCS were formulated as recommended technical guidelines for future developers' considerations. The implementation of these green initiatives will be subject to separate EIA studies (if identified as DPs) and engineering findings during detailed design stage. For the avoidance of doubt, the environmental impact associated with the proposed TSE reuse and Provisional DCS has been assessed in this EIA report.

Green initiatives for different themes including urban design and planning, green infrastructure, transport and logistics, energy, water, waste and materials that are applicable at both district and building level are listed in the **Table 2.5** below.

Table 2.5 Green initiatives in district and building levels

Themes	**Green Initiatives**
District Level	
Urban Design and Planning	Avoiding urban heat island effect.
	Creating a successful public space network.
	Improving street design and layout.
	Providing comfortable internal conditions.
Green Infrastructure	Integrating green space into urban areas.
	Protecting established wildlife habitats and using green spaces as wildlife habitats.
Transport and Logistics	Making a low-emission and car-free zone.
	Encouraging low carbon vehicle technologies and fuels.
	Promotion of walking and cycling.
Energy	Adopting district cooling system (Fresh Water Cooling Tower System using treated sewage effluent as Heat rejection) subject to further study.
	Selecting low carbon and renewable technologies.
	Improving building energy efficiency.

Themes		**Green Initiatives**
		Creating opportunities for new patterns of ownership of energy delivery system.
Water		Adopting water recycle strategies - Treated Sewage Effluent (TSE).
		Designing for sustainable water use.
		Integrating sustainable drainage systems into planning and design.
Waste		Formulating waste reduction strategies.
		Devising waste collection strategies.
		Integrating waste infrastructure.
		Exploring community waste management.
Materials		Selecting materials with lowest environmental impacts.
		Selecting materials from local/regional sources.
		Selecting materials from sustainable sources.
		Selecting materials with high recycled content such as reinforced glass paving block and ground granulated blast furnace slag (GGBS).
Building Level		
Renewable Energy		Solar hot water.
		Photovoltaics (PV).
Building Energy Efficiency	Passive Design	Proper building orientation.
		Daylighting.
		High performance facade. Vertical Shading. High thermal insulation performance glass. Use of automated blinds.
		Optimal window to wall ratio.
		Thermal mass.
		Improved air-tightness.
	Active Design	Energy Efficient Lighting System. High efficiency lighting fixtures. Lighting control.
		Energy efficient ventilation system. Hybrid ventilation. Demand control ventilation.
		Energy efficient air-conditioning system. Heat recovery. Free cooling. Equipment with Variable Speed Drives (VSDs).
		High efficiency lifts and escalators. Variable voltage variable frequency (VVVF) drives. Group selective collective control.
	Behavioural Change	Higher indoor set-point temperature.
		High efficiency electrical appliances.
Water Efficient Fixtures		Low volume/ dual flushing water closets.
		Low flow urinal with sensor control.
		Automatic control of taps and toilet flushing faucets with infrared sensors.

Themes	Green Initiatives
	Water Efficient Irrigation System.
Waste Reduction (Operational Phase)	Recycling Bins System (for paper, metals, plastics, fluorescent lamps, glass, toner cartridges, rechargeable battery, scrap electrical and electronic appliances, etc.). Turning food waste into eco-fertilizer.

The environmental benefits will be carbon reduction related to the implementation of proposed green initiatives such as improving building energy efficiency, using energy infrastructure and adopting renewable energy. However, the actual carbon savings achieved by those initiatives related to Building Energy Efficiency and Renewable Energy are subject to the extent of application by the building developers / owners, as well as the environmental awareness of the future occupants.

2.4 Key Infrastructures

In order to support the future development and population in LMC Loop, associated infrastructures will be required. These include:

- Ecological Area (DP1)
- Western Connection Road (DP2)
- Direct Link to MTR LMC Station (DP3)
- Drainage System under Internal Transport Networks (DP4)
- Sewage Treatment Works (DP5)
- Eastern Connection Road (DP6)
- Flushing Water Service Reservoir (DP7)

2.4.1 Consideration of Feasible Alternative Infrastructure Options

2.4.1.1 Ecological Area (DP1)

A 12.8 ha Ecological Area (EA) will be established to compensate for the direct loss of reed marsh area within LMC Loop. Alternative sizes would be either fail to fulfil the compensation needs (if too small) or unable to achieve the development needs (if too large). In order to enhance the ecological value of the EA, its location is arranged in response to the locations of most bird flight paths and linkages with the Meander and fishponds. Alternative locations and designs would deteriorate the function and values.

In addition, the EA will have a side function as a flood storage pond for the purpose of flood retention. The profile of EA has followed the recommendations of Drainage Impact Assessment Report.

2.4.1.2 Western Connection Road (DP2)

Provision of transportation infrastructure is required for accessing the LMC Loop and an access connecting the western part of the LMC Loop to the existing road

network has been proposed. According to the latest estimations, it is anticipated that the current Ha Wan Tsuen Road and LMC Road could not meet the future traffic need generated by the LMC Loop development. Thus, new road or improvement of existing road will be required. Several options have been investigated and the options considered for the major section of Western Connection Road (WCR)(**Appendix 2-3a**) are highlighted as follows:

- **Option W1:** As the existing access road of DSD along the northern boundary of LMC Loop will become the New Boundary Patrol Road and will still fall within the Closed Area in future, its direct use as the main access to the LMC Loop will not be appropriate, in view of complex security and management issues. In light of this, a new access road will run parallel to the future New Boundary Patrol Road, outside the Closed Area boundary. For security considerations, the access road will be at least 5.5m away from the New Boundary Patrol Road. This option makes use of the existing Lung Hau Road as the main access route, which is relatively new and wide and should be able to handle the additional traffic generated by the LMC Loop without the need for major improvement works. The new roundabout at the LMC Loop boundary joins together the new road connection, access point to the LMC Loop, New Boundary Patrol Road and Ha Wan Tsuen Road, allowing better accessibility to all the developments and roads in the area.

- **Option W2:** Similar to Option W1, but the new road connection makes use of the new turn-around facilities as proposed in the Frontier Closed Area (FCA) Study, to serve as a proper junction between the existing Lung Hau Road and the new connection to the LMC Loop. The new access road follows the existing tracks to limit the impact on the fish ponds. The linkage to the LMC Loop will be near the abandoned pier just off Ha Wan Tsuen Road.

- **Option W3:** This option makes use of the existing LMC Road and Ha Wan Tsuen Road, with minor works in the junction to Lung Hau Road. A new road would branch off from Ha Wan Tsuen Road into the LMC Loop just north of the existing Ha Wan Tsuen village. Currently, Ha Wan Tsuen Road is a single track access road under one-lane-two-way configuration with passing bays, road widening works would be required to convert it to a proper road access, and the road levels will need to be raised to above the flood levels. Noting the presence of potential Old & Valuable Tree (OVTs) along the eastern edge of Ha Wan Tsuen Road, the road will be widened towards the western side, thereby requiring the resumption of the adjacent privately owned fish ponds. Nevertheless, this option is recommended as it provides the most direct route to LMC Loop.

- **Option W4:** This scheme makes use of a large section of the existing Border Road, with the connection road more at the southern side of the LMC Loop instead of the west. As the existing Border Road is only a narrow track road, significant improvement and widening works will be required to make it adequate for serving as the main access route for the LMC Loop. The relatively narrow junction between LMC Road, Border Road and Lung Hau Road may need improvement to serve as the major access route. This option is not recommended as it will involve the most construction works, especially for the improvement of the existing Border Road.

- **Option W5:** This is similar to Option W4, but will utilize a shorter section of the existing Border Road, thus requiring less improvement works to the road.

Consequently, the connection road through the fish ponds will be longer, thus affecting more of those ponds although the route has generally followed the existing track alignments.

The abovementioned road options involved the possible utilisation of the existing LMC Road, and either of existing Lung Hau Road, Ha Wan Tsuen Road and Border Road. Option W3 is recommended for the WCR as it provides the most direct and convenient route to the LMC Loop. In addition, the reduced footprint from the options of widening of existing road would minimize dust and noise impact as well as generate lesser construction activities. The evaluation of environmental benefit/dis-benefit on WCR Options W1 to W5 are summarised in **Appendix 2-4**. Unlike some of the other options, this scheme need not utilize the existing Border Road, which might induce extensive geotechnical works engineering difficulties in road upgrading works due to limited flatlands. Furthermore, as this scheme does not directly pass through the existing villages, resumption of private land could be minimized.

The LMC Road Connection to Fanling / San Tin Highway is a direct and simple route to serve the future traffic requirement. Minimum footprint and construction extent was designed. Alternative alignments, such as further east or west would lead to longer span and overdesign.

2.4.1.3 Direct Link to MTR Lok Ma Chau Station (DP3)

The purpose of Direct Link to MTR Lok Ma Chau Station is to transport local Loop users to existing MTR networks and the cross-boundary Loop users to LMC Spurline Cross Boundary Control Point.

In considering the limited space for deep tunnel landing and large construction footprint due to cut-and-cover activities for shallow tunnel, tunnel is not proposed. While utilizing existing Border Road (from LMC Loop to LMC Station) may be an alternative, it is considered not an option from security considerations.

Therefore, viaduct is proposed to minimise the impact to existing fish ponds and the spans between piers are 30m to 60m. Due to security reason, cycle track and pedestrian path is not proposed.

Instead of at-graded road, viaduct could minimise the permanent encroachment to wetlands. In order to avoid reedbed loss within LMC Station, all the piers will be constructed on bunds between reedbeds. However, there will be temporary reedbed loss during construction phase for the purpose of site requirements. The maximum affected area is 320m^2, compared to the entire reedbed area of 4.76 ha. Although a longer span with suspension bridge might be an option to avoid reedbed loss, it requires high bridge tower with solid foundations which would induce impact to bird flight lines.

The locations of Direct Link will lie on a major flight path (See **Section 12**) across the Meander (**Appendix 2-3c**). The alignment of Direct Link options have been designed to follow the existing railway reserve of the LMC Spur Line as far as possible to minimise the ecological impact of the existing fish ponds and to locate away from the existing New Boundary Patrol Road to reduce the security impact.

Unlike the WCR and ECR, the configuration of Direct Link to MTR Lok Ma Chau Station is not limited to road-based. The available options could include

various transportation mechanisms in the form of Environmental Friendly Transport System (EFTS). In view of the relative short distance between the LMC Loop and MTR LMC Station, various forms of the Direct Link (**Appendix 2-3c**) had been considered:

- **Footbridge cum Travellator Option:** The Direct Link will be constructed in a form of footbridge, fitted with a travellator to cater for the surge flow during the peak hours. The eastern end of the footbridge connects directly into the activity zone within the LMC Loop, while the western end connects with the existing footbridge, directly linking into the LMC Spur Line BCP. The section of footbridge crossing San Sham Road will be enclosed for security reasons, and provision will be allowed for a possible exit near the eastern side to Ha Wan Tsuen to enhance the convenience of the footbridge to the locals.

- **Non Road-Based EFTS Linkage Option:** It comprises a viaduct linkage possibly in the form of an Automatic People Mover (APM) system. At the western end of the linkage, an EFTS station will be provided with a new footbridge connecting with the existing footbridge for a direct connection into the MTR LMC Station. On the eastern side, the Direct Link will be provided with a station at the western transport interchange of the LMC Loop, so that LMC Loop users could easily transfer to the internal public transport systems. Reserve will be allowed for the direct link to be further extended eastward towards the eastern transport interchange near the possible future pedestrian link with Shenzhen side.

- **Road-Based EFTS Linkage Option:** A road viaduct will allow a bus rapid transit system (BRT) using electric, supercapacitor or hybrid vehicles to provide transport connection between the MTR LMC Station and LMC Loop. As the road viaduct is intended for the use by public transport services and the number of pedestrians walking between the two areas will be minimal, it will not be necessary to provide footpath along the new road viaduct. The eastern end of the Direct Link connects with future WCR and could utilize the bridge of WCR crossing Meander such that no additional bridge is required. On the western end, as the current Transport Interchange (TI) outside the MTR LMC Station is already operating near capacity, the Direct Link will involve the construction of an elevated TI outside the station to cater for the new bus routes so that the operations of the existing ground-level TI will not be affected. The elevated TI avoids the existing emergency assembly area and the possible future extension reserve of BCP. Connection with the existing footbridge will be provided, linking the new TI with the MTR LMC Station.

The Road-Based EFTS Linkage Option will connect to the proposed WCR without additional structures above the Meander. Nevertheless, due to the design limitation of travellator and APM, viaducts crossing the Meander are unavoidable and thus induce additional ecological impact.

Financial and economic appraisals for the above mentioned options have also been carried out. In summary, the appraisals suggested that the Footbridge cum Travellator Option and Non Road-Based EFTS Linkage Option (Figure 6.3 in **Appendix 2-3c**) are not financially viable without government support.

Having considered the cost-benefit and possible ecological impact to major flight paths, Road-Based EFTS Linkage Option is selected and the alignment has been further fine-tuned to minimise the disturbance to the existing fishponds /

compensation reedbed as shown in Figure 6.4 in **Appendix 2-3c** and has been generally agreed with MTRC. The maximum disturbed reedbed area will be 320m^2 during construction phase only and the loss of sewage polishing function could be compensated by several options. Assessments on the loss of this reedbed are included in **Section 5** and **12**.

2.4.1.4 Drainage System under Internal Transport Networks (DP4)

The design of internal transport networks together with the associated utilities such as electricity cables, as well as drainage, sewerage and water supply networks is in response to the selected options of development layouts and external connections. In consideration of the relatively small scale of overall development area, a simple road circulation system has been proposed for the internal transport network. The alignment of the drainage system generally follows the internal transport network.

The existing drainage catchment within LMC Loop diverts runoff to Shenzhen River via the Meander or directly to Shenzhen River. The portion is about 30% to 50% of surface runoff will be diverted to the Meander. In the drainage network design, same strategy is adopted, i.e. excess runoff will be partially diverted to Shenzhen River and Ecological Area (instead of Meander to minimise the discharge to Meander) respectively. The runoff discharged to the Ecological Area will then be conveyed and discharged at the Shenzhen River. Alternative arrangement such as diverting all flows to one side of the EA is not preferable since it will involve larger extent of site formation to maintain the topography.

2.4.1.5 Sewage Treatment Works (DP5)

An on-site sewage treatment works will be provided in the east side of Area A for treatment of sewage arising from the development of LMC Loop. In order to comply with the requirement of "No net increase in pollution load requirement in Deep Bay" policy, two compensation options have been considered:

- **On-site compensation:** Flow from Shenzhen River is proposed to be diverted and mixed with the sewage treatment work (STW) effluent before being treated by biological filters, which will be installed inside the proposed onsite STW. The additional biological filters will reduce the pollutants in the diverted Shenzhen River water, therefore, compensate for the load generated from the development area.

  It is noted that the majority of existing pollution loadings to Shenzhen River is from Shenzhen side. With the loading from Shenzhen side expected to continuously reduce in the coming future (Item 7 of **Section 2.8.1**), this may result in a changing compensation requirement and lead to operation issues for a dedicated on-site STW facility. Therefore, this option is not recommended.

- **On-site STW cum Off-site compensation in Yuen Long Sewage Treatment Works (YLSTW) or Shek Wu Hui Sewage Treatment Works (SWHSTW):** While on-site compensation is not feasible in engineering consideration, provision of on-site STW cum off-site compensation by upgrading of Yuen Long Sewage Treatment Works (YLSTW) or Shek Wu Hui Sewage Treatment Works (SWHSTW) is considered. As the effluent from

the YLSTW/SWHSTW is discharged to the Deep Bay catchment area, the upgraded YLSTW/SWHSTW can be designed to compensate for the additional loads from the LMC Loop development area.

On the other hand, on-site STW cum off-site compensation is more flexible to the changing compensation requirement and thus this option is recommended. SWHSTW, which can be upgraded and is currently under planning for expansion to cater for the future increased flow from the NENT NDAs, will provide the off-site compensation for the additional loads from LMC Loop as there is currently no plan to upgrade YLSTW. Therefore, with consideration of works minimization (i.e. site footprints, programme, cost, etc), upgrading the existing SWHSTW for compliance with the "No net increase in pollution load requirement in Deep Bay" policy was recommended.

In addition, the at-graded layout of STW was selected due to cost-benefit consideration, reduced waste generation and reduced energy consumptions compared with underground options. In terms of STW design, screw pumps will not be used to minimise visual impact. Membrane Bio-Reactor (MBR) is recommended due to its compact size and efficiency compared to other conventional sewage treatment system.

2.4.1.6 Eastern Connection Road (DP6)

The LMC Loop will be commissioned in stages, whereby the traffic flows during the first stage operation would not warrant the need for the construction of a new road at the eastern side. It is also anticipated that the western connection road alone will not be able to handle the traffic generated by the LMC Loop during full occupation stage. Therefore, an additional road linkage at the eastern side of the LMC Loop area will be required. In addition, it could serve as a backup access route in the event of major accidents causing severe blockage to the WCR or seasonal traffic surges. Similar to the WCR, several alignment options have been investigated for the Eastern Connection Road (ECR) (**Appendix 2-3b**) as follows:

- **Option E1:** New road is to be constructed from the proposed road network of KTN NDA to the existing Border Road near Tse Koo Hang. Linkage to the LMC Loop branches off from Border Road near Horn Hill Police Operational Base. Apart from the short section across LMC Meander, the entire route will be at-grade road. For the sections along fishponds, the road will be slightly above grade on marshland near the fishpond bunds. There are concerns that the alignment over the fish ponds for this road option may pose potential disruption to the flight path of birds. Nevertheless, this option could reduce the direct loss of wetland among all other options, except Option E6.

- **Option E2:** Similar to Option E1, but the route will not utilize the existing Border Road, thus no major improvement works for that road is envisaged. The routing over the fish ponds is different from Option E1. This scheme is one of the preferred option due to its distinction of providing a more direct road connection to the LMC Loop via the fish ponds near Horn Hill.

- **Option E3:** Similar to Option E1 in terms of the utilization of the existing Border Road and the alignment for connection to the LMC Loop, but the road connection under this scheme passes through the existing village of Ma Tso Lung San Tsuen, bringing improved accessibility to the villages. By making use of the existing Ma Tso Lung Road for connection to the KTN NDA, the

construction works required and the cost implications of the scheme can be reduced. This scheme is not adopted mainly due to noise and air quality issues arising from the alignment passing through the existing villages. The widening of the village roads to a proper road may also generate complex land resumption issues.

- **Option E4:** This option provides the most direct route between the LMC Loop and the road network of KTN NDA, by tunnelling through the hill of Ma Tso Lung. There is no need to make use of the existing Border Road and Ma Tso Lung Road. Minor fishpond loss is anticipated since the routing will mainly align with fishpond bunds. Thus, this option could minimize the project footprints and the associated direct and indirect impacts. The long road tunnel means the maintenance and operation responsibility of the tunnel is not anticipated to be straightforward. It is also highlighted that a tunnel option will require large amount of energy for the lighting and ventilation operation.

- **Option E5:** Similar to Option E1, but this scheme has a straighter alignment near Tse Koo Hang by constructing a tunnel, which will bring better sightline visibility for the road. Nevertheless, the presence of a short tunnel brings the concerns similar to Option E4.

- **Option E6:** Similar to Option E4, but this scheme passes through the fish ponds via underground tunnel to provide the most direct route between the LMC Loop and the KTN NDA road network. Passing through the fish ponds via underground tunnel will mean utilizing more precious space inside the LMC Loop to accommodate the tunnel ramps. From a level of -15mPD up to +5.9mPD, the tunnel will take more than 500m length to raise to the site formation level. This will pose a major constraint to the land use within the Loop. To minimize the space required, the ramp curvature may be designed to be very tight, which may cause sightline issues. The extremely high cost involved in the construction and operation of the tunnel, and the possibility of occupying too much space inside the LMC Loop for the ramp, makes this scheme not preferable.

Among the above alignment options, Options E6 (tunnel-based) could induce a lesser wetland loss and lesser disturbance to surroundings than those for other options. However, Option E6 may impose planning and engineering constraints since it will take a longer length to rise to the site formation level within the LMC Loop. In addition, this option does not allow connection to the villages at Ma Tso Lung, thereby not benefiting improvement of the accessibility to these villages. The evaluation of environmental benefit/dis-benefit on ECR Options E1 to E6 are summarised in **Appendix 2-4**.

The alignments of Option E1 and E2, which strikes a careful balance by having the least overall environmental impact, requirement for land resumption, and associated cost of construction, were further investigated and refined in order to combine the environmental benefits of Option E6 and planning/operation advantage of Options E1 and E2. Three additional options, Options E7 to E9 have been considered as below:

- **Option E7:** This is a deep tunnel option with landing to ground level of public roads. The tunnel option is conceived with the intention of further minimizing the potential environmental impact generated from the ECR. The alignment provides the most direct route between the LMC Loop and the road network

of KTN NDA, by tunnelling through the Horn Hill without needing to make use of the existing Border Road and Ma Tso Lung Road. The ECR will be in a tunnel configuration through the existing fish ponds and across the Meander until rising up to ground level in the LMC Loop. To allow ecological impact to be kept minimal even during the construction stage, construction of the tunnels with Tunnel Boring Machine (TBM) is proposed for this scheme, whereby the existing ecological area on ground level will remain undisturbed. To cater for the carriageway width of the ECR, a circular diameter of at least 12m will be required for each tunnel tube, and to satisfy traffic and fire safety requirements a twin-tube configuration will be required. Taking into account the currently available GI data, the road level of the deep tunnel will therefore be at -30mPD. To allow a landing of the deep tunnel to the ground level public road, a 915m-long ramp will be required inside the LMC Loop, with the ramp entrance only 400m away from the western access point. This implies a tunnel vertical gradient of about 6%, which is unfavourable for bus and heavy vehicles.

- **Option E8:** This option is intended to address some of the drawbacks arising from the deep tunnel with ground-level landing option (Option E7). The road alignment of Option E1 is adopted, so as to improve accessibility to the adjoining villages, and to shorten the overall length of tunnel required. The road will gradually ramp down along the existing Border Road to -30mPD level, and cross the existing fish ponds and Meander using the deep tunnel TBM method so as to avoid any ecological impact. When reaching the LMC Loop, instead of providing a long ramp to reach the ground level, the eastern connection road will only rise to -9mPD road level, terminating at the underground Transport Interchange at the northeastern corner of the LMC Loop development. This will not only avoid causing a significant detour for people accessing the eastern part of the LMC Loop, but could also better interface with the currently proposed transport facilities in the development. However, a single-ended tunnel will induce safety and maintenance problems and this option is not selected.

- **Option E9:** While the deep tunnel options have the key advantage of generating minimal ecological impact to the existing fish ponds and the Meander, they also carry many significant drawbacks such as the land consumption in LMC Loop and safety issues. This option is intended to minimise the ecological disruptions by designing the carriageway at below-ground level, while eliminating the constraints generated by deep tunnel configurations. This option similarly adopts the Option E1 alignment, but instead of having a deep tunnel crossing through the fish ponds and Meander, the road passes through the fish pond as a depressed road and crosses the Meander and Ecological Area as a shallow underpass configuration. As the underpass section is only 200m long, it avoids the need of a full tunnel design and could also maintain a 2-way single carriageway configuration, unlike a possibility to over-design a deep tunnel as Option E7 and E8. Furthermore, as the road level of the underpass level is only -9mPD, the need for a long approach ramp will be eliminated, thus allowing a better interface with the internal road network and public transport services. The use of depressed road will mean some ecological disturbance during the operational phase, which

could be greatly reduced by the use of low level shrubs and trees on both sides to serve as visual barrier to the depressed road (See **Section 12** for details). Furthermore, animal overpass above the depressed road would be provided to maintain connectivity for terrestrial mammals.

Detailed comparisons of environmental benefits/dis-benefits on Options E7 to E9 is presented in **Appendix 2-4**. After careful balancing the various important considerations, Option E9 (Shallow Underpass) has been selected as the preferred option due to the following key advantages over the other alternatives:

- Use of underpass to cross underneath the meander avoids permanent operational phase impacts, in particular relating to disturbance to Eurasian Otter and the bird flight line corridor;
- The combined use of shallow underpass and depressed road under the fish ponds and Meander is a significant advantage over the open access road option, and minimizes any ecological impact of the operational phase to the maximum practical extent;
- Potential visual impact of the depressed road could be effectively mitigated by providing shrubs and trees on both sides;The short length of the shallow underpass strikes out the need for a full tunnel design. No mechanical ventilation and smoke extraction system is required for the underpass. This means significantly lower maintenance costs and resources (e.g. energy consumption), keeps the scale of road infrastructures more compatible with the overall scale of development, maintains a high-integrated road system, and is a significant advantage over the deep tunnel option;
- Can adopt a compact design, i.e. 2-way single carriageway configuration, whereas deep tunnel options requires dual 2-lane and double tube for safety reason which will result in overdesign;
- Shallow underpass option allows a higher flexibility for arrangement of public transport services for the Loop and the associated parking control strategy without causing major detours for Loop users, and does not undermine the effectiveness and functioning of the eastern connection road; and
- Minimal impact to the land use planning of the LMC Loop.

With these considerations in place, it is recommended to take Option E9 (Shallow Underpass) as the design for the ECR.

2.4.1.7 Flushing Water Service Reservoir (DP7)

The Treated Sewage Effluent (TSE) is proposed to be reused for non-potable uses such as toilet flushing, landscape irrigation and make-up water for provisional district cooling system (DCS), if proceeded.

Alternatives such as on-site storage or underground storage have been reviewed. These options could avoid additional project footprint. However, higher energy consumptions for pumping systems are anticipated when comparing to the option for Flush Water Service Reservoir. Thus, a Flushing Water Service Reservoir is

proposed in this EIA in considering a worst scenario consideration in terms of project footprint.

TSE from the STW will be diverted to a flushing water service reservoir and supplied to the development for non-potable use. The locations of flushing water service reservoir should be erected in hinterland and close to the STW such that adequate hydraulic head is maintained and energy consumption saving from pumping the TSE to the service reservoir can be realised when compared with the on-site options. In addition, in order to minimize workfront areas as well as the associated direct and indirect environmental impacts, the pipeworks associated with the flushing water service reservoir will mainly align with the ECR. Due to limited choice of hinterland available, a single option is proposed.

In order to reduce the size of flushing water service reservoir and the associated environmental impact, part of the TSE could be diverted to Provisional DCS directly instead of pumping to the service reservoir. However, in consideration of the worst case scenario for project footprint, this option has not been taken into account in the EIA study.

2.4.2 Key Infrastructure Requirements for Development Plan

2.4.2.1 Ecological Area (DP1)

A 12.8 ha of Ecological Area (EA) will be established in the south of Area A prior to reed marsh removal. A side function of the EA is to act as a flood storage pond. **Figure 2.2** and **2.3** shows the proposed onsite drainage arrangement to convey the storm runoff from Area A to the Shenzhen River.

After the development, part of the runoff will be conveyed via the EA to Shenzhen River which illustrates the hydraulic operation of the ecological area. The rest of the runoff will be directly conveyed to Shenzhen River through the new proposed outfalls. The proposed drainage system is primarily determined by following the topography and alignment of the future internal roads except for a small section where a drainage reserve has been provided. The proposed drainage in Area A will drain south-east to EA and discharge north-northwest to Shenzhen River respectively. As there is no excess runoff to the Meander, hydrology change will be negligible.

2.4.2.2 Western Connection Road (DP2)

The main purpose of Western Connection Road (WCR) is to provide a direct linkage between LMC Loop with the external road and highway network at the southern end of the connection road, i.e. San Tin Highway and Castle Peak Road. It is noted that San Tin Interchange, Pak Shek Au Interchange and the junction of LMC Road / Castle Peak Road will be operating near capacity taken into account the traffic generated by the development of LMC Loop. Therefore, a slip road and an additional junction connecting LMC Road and San Tin Interchange is planned (**Figures 2.4a** to **c**).

Towards the LMC Loop development, the layout of the proposed WCR is shown in **Figures 2.4a** to **2.10**. Under this scheme, the western part of LMC Loop would be connected to the external road network using the existing LMC Road and Ha Wan Tsuen Road (Option W3 in **Section 2.4.1.2**), which has the key advantage of

being the most direct route (via Ha Wan Tsuen Road) leading to the LMC Loop, and would not generate security and fire services concerns arising from the alternative of Lung Hau Road (which is the Emergency Vehicular Access for MTR LMC Station) as the main access road of a major development.

The existing LMC Road is a 2-lane single carriageway, though at certain locations its width is wider than a standard 2-lane carriageway. It is forecasted that with the LMC Loop development in place the volume of traffic flows along the LMC Road would exceed the current link-capacity of the road, therefore improvements to the LMC Road would be required. Under the western connection road design scheme, the southern section of the existing LMC Road is to be widened to a standard wide 2-lane (10m single carriageway) configuration with footpath and cycle track of standard widths, which would not only be able to cater for the anticipated traffic generated from the LMC Loop, but would also minimise the need for resuming existing privately owned structures along the LMC Road. The improvement of LMC Road to a wide 2-lane configuration would also enhance the overall traffic operations along the road, as the provision of public transport lay-bys along LMC Road is constrained by the need for private land resumption and public transport services could only carry out on-street pickup / drop-off activities. Moreover, LMC Road is lined with development plots with numerous local frontages to the main road. It is therefore anticipated that a wide 2-lane configuration could avoid through-traffic flows being disrupted by the on-street stops by public transport and the in/out maneouvring of vehicles to development plots. Similar wide 2-lane configurations have been successfully adopted at many locations in Hong Kong, such as Castle Peak Road (Castle Peak Bay Section), without causing any adverse traffic operational issues. Noise barriers will be provided along sections of LMC Road to address the potential noise issues generated by the LMC Loop development traffic and vehicular run-in will be provided to maintain access to existing land lots. Their cross-sectional designs are presented in **Figure 2.6**. For the northern section of the LMC Road near the junction with Ha Wan Tsuen Road, where the forecasted traffic flow volume is lower, the LMC Road will be realigned to a standard 2-lane single carriageway configuration. The current mini-roundabout junction between LMC Road / Ha Wan Tsuen Road / Lung Hau Road is proposed to be revised as a signalised junction, so that it could handle the anticipated LMC Loop development traffic more effectively.

Further north along the connection road, Ha Wan Tsuen Road is currently a sub-standard single track access road, improvement works will be required to widen the existing road to a proper 2-lane single carriageway with footpath and cycle track of standard widths as shown in **Figures 2.6** to **2.10** to cater for the traffic generated by the future LMC Loop development, allowing it to provide the most direct vehicular route to the LMC Loop. The two different road widening schemes proposed for Ha Wan Tsuen Road and LMC Road have taken in consideration of the differences in anticipated traffic flows and the main functional purpose between the roads. Ha Wan Tsuen Road is expected to serve primarily as the connection road to the LMC Loop, and the flows along the road would generally be the development traffic which could be adequately handled by a proper 2-lane single carriageway. On the other hand, the LMC Road will have to cater for both the background traffic flows to/from the MTR LMC Station and those accessing the LMC Loop development, therefore the forecast traffic flows at LMC Road would require a wide 2-lane configuration.

2.4.2.3 Direct Link to MTR Lok Ma Chau Station (DP3)

For the LMC Loop users to access the railway network, the nearest stations would be the existing MTR LMC Station and the future Kwu Tung Station. Both stations can provide easy accessibility to the rest of Hong Kong's railway network via the existing East Rail Link (ERL) and the future Northern Link (NOL), which provide direct connections to the existing MTR networks. In terms of physical proximity, the MTR LMC Station is closer to the LMC Loop, with a distance of approximately 1km from the station to the western boundary of the LMC Loop, making it more viable to provide a direct transport linkage between each other. Furthermore, as the station is directly connected via existing footbridge to the Shenzhen Futian Control Point, the provision of Direct Link to the MTR LMC Station will bring further convenience for cross-boundary users travelling to / from the LMC Loop.

The Direct Link to MTR LMC Station is designed as a road-based viaduct (**Figures 2.11a** to **e**). The eastern end of the Direct Link connects with Ha Wan Tsuen Road. On the western end, as the current public transport interchange (PTI) outside the MTR LMC Station is already operating near capacity, the Direct Link will involve the construction of an elevated PTI outside the station to cater for the new bus routes so that the operations of the existing ground-level PTI will not be affected. The elevated PTI avoids the existing emergency assembly area and the possible future extension reserve of LMC Boundary Control Point (BCP). Connection with the existing footbridge will be provided, linking the elevated PTI with the MTR LMC Station.

2.4.2.4 Drainage System under Internal Transport Networks (DP4)

The general transport strategy for the LMC Loop is to provide a pedestrian friendly campus environment. Transport strategy to minimize car movements inside the campus could be achieved by providing interchange facilities at both ends of the main access route. The layout of internal transport networks is presented in **Figure 2.1b**.

Two transport interchanges (TIs) are proposed with ancillary park-and-ride facilities such that most of the private cars will be parked at the fringe of the LMC Loop away from the main campus area. The main road is designed to be a 2-lane single carriageway and is expected to serve as the key route for the LMC Loop's internal development traffic. Two local branch-off roads / road reserve of single 2-lane carriageway configuration are arranged to allow provisions for the occasional goods delivery vehicles and Emergency Vehicular Access (EVA) to all areas of the LMC Loop.

The internal areas will be accessed mainly by walking and public modes of transport including environmentally friendly transport system / electric shuttle buses, which will be integrated with the cycling facilities as a comprehensive internal transport and pedestrian network. However, in consideration of the worst case scenario for traffic impact assessment, free vehicle movements were assumed within the internal transport networks. The EIA has also been conducted on this basis.

In addition to the internal transport networks, drainage systems (**Figure 2.3**), water supply networks and other utilities systems will be established to meet the development requirements. Excess runoff from drainage system will be directly discharged into Shenzhen River in a controlled manner with detailed scheme design to be developed. Silt traps and oil interceptors will be provided to the drainage systems at roadside runoff to ensure its water quality discharged to the flood retention pond (i.e. Ecological Area) and Shenzhen River. Freshwater supply will come from the proposed Kwu Tung North Fresh Water Service Reservoir (FWSR) in the future Kwu Tung North New Development Area (KTN NDA), of which the development details and technical assessment will be included in the NENT NDA PES.

2.4.2.5 Sewage Treatment Works (DP5)

An on-site sewage treatment work (STW) with design Average Dry Weather Flow of 18,000 m^3/day will be provided. About 10,460 m^3/day of Treated Sewage Effluent (TSE) may be reused for non-potable use (flushing, irrigation and make-up water for district cooling system) in ultimate scenario subject to further consideration. The treatment method will be Membrane Bioreactor (MBR) System. Under the policy of "No Net Increase in Pollution Load" in Deep Bay, off-site compensation will be made by upgrading the existing Shek Wu Hui Sewage Treatment Works under a separate project. The TSE will be reused for non-potable use (**Section 2.4.2.7**). This not only reduces water consumptions but also minimizes the amount of effluent discharge. The location of on-site STW is shown in **Figure 2.1b** and the detailed layout including the pipe networks is shown in **Figure 2.26a** to **c**.

2.4.2.6 Eastern Connection Road (DP6)

It is anticipated that the WCR alone will not be able to handle the traffic generated by the LMC Loop during the full occupation stage. As such, the provision of Eastern Connection Road (ECR) is necessary. The ECR is designed as a single 2-way carriageway configuration with footpath and cycle track of standard widths at the eastern side of the LMC Loop, linking it with the proposed road network of the future KTN NDA. The possibility of providing an alternative access to the KTN NDA and also downtown to Sheung Shui direction from the west had been previously considered, but the capacities of WCR will be overloaded due to lack of feasible alternative routes in the west and the fact that placing both external access points in the west would not resolve the emergency vehicle access route issue for the LMC Loop development, therefore it has been recommended to design the road configuration to the eastern side of the LMC Loop and linking it with the future KTN NDA.

Having considered the ecological importance of Meander and the nearby fishponds, a shallow underpass option has been adopted (Option E9 in **Section 2.4.1.6**). Layout of ECR is shown in **Figures 2.12** to **2.19**, while the schematic longitudinal section of the shallow underpass is shown in **Figures 2.20** and **2.21**. The proposed cross-sectional arrangements are presented in **Figures 2.22** and **2.23e**.

As the underpass section is only 200m long, a full tunnel design is not required. There will not be any mechanical ventilation and smoke extraction system required for the underpass. Furthermore, as the road level of the underpass level

is only -9mPD, the need for a long approach ramp has been eliminated, thus allowing a better interface with the internal road network and public transport services. The maximum vertical gradient of the depressed road is about 6.1%. There is a >500m uphill section between the Meander and Horn Hill, and therefore a climbing lane is proposed for the eastbound direction. To address the potential concerns of flooding, barriers above the flood-level will be provided on both sides of the depressed road, and pump systems will be in place for effective drainage. The use of depressed road will mean ecological disturbance during the operational phase could be greatly reduced by the use of low level shrubs and trees on both sides to serve as visual barrier to the depressed road. Furthermore, animal overpass above part of the depressed road would be provided to maintain connectivity for terrestrial mammals.

2.4.2.7 Flushing Water Service Reservoir (DP7)

Being one of the green initiatives and subject to further study, the TSE is proposed to be reused for non-potable purposes such as toilet flushing, landscape irrigation and make-up water for provisional district cooling system (DCS). The footprint of Flushing Water Service Reservoir is about 1350m^2 (**Figure 2.23f** and **2.26c**). The estimated amount of effluent to be reused within LMC Loop development is 10,460 m^3/day. The water quality for TSE reuse for various non-potable reuses are formulated with reference to the prevailing water supply guidelines and on-going TSE reuse projects for the intended non-potable water uses, balancing with practicality and anticipated end-user satisfaction.

The treatment of TSE up to the proposed reuse quality will be located within the on-site STW, including the chlorine contact tank, chemical storage, TSE storage and distribution pumps connecting to the service reservoir and supply pipe network.

2.5 Nature, Benefit and Scope of the Project

2.5.1 Nature of Project

The Project comprises the development and infrastructure within the LMC Loop (87.7 ha) as well as the infrastructure outside the LMC Loop for supporting the development. Higher education is the leading land use in the LMC Loop with some elements of high-tech R&D facilities and cultural and creative industries.

The Study Area comprises the area within the LMC Loop together with the adjoining area in Hong Kong (i.e. Area A, Area B and Added Area B in **Figure 1.1**).

2.5.2 Benefit of Project

With the strategic location of the LMC Loop at the boundary of Hong Kong and Shenzhen, the Project provides substantial long term mutual benefit to both Hong Kong and Shenzhen as well as the broader Pan River Delta region by developing a sustainable, environmentally friendly, energy efficient and people oriented community. On the other hand, development of a Knowledge and Technology Exchange Zone (KTEZ) will also act as an incubator to provide trained workforce promoting for the Pearl River Delta (PRD) Regions, as well as provide a platform

for collaboration among the academic research institutes and facilities with companies interested in developing joint ventures and professional partnerships.

The Project can also serve as an important bonding point and a hub for the regional co-operation between Hong Kong and Shenzhen. The closer co-operation would develop a world class metropolis comparable with Greater New York and Greater London as revealed in the second Hong Kong-Shenzhen Co-operation Forum in August 2007. It would facilitate skill and knowledge training, and facilitate long term economic development and co-operation for the two cities.

The development proposal is estimated to provide a total of 29,000 job opportunities in the LMC Loop in operational phase. It is anticipated to generate flow of economic activity to the surrounding local population and local businesses. Apart from the job opportunities directly created in the LMC Loop, there will be positive indirect and induced impacts due to creation of additional job opportunities in the rest of the Hong Kong economy. These new job opportunities associated with better technology and commercial facilities in the LMC Loop and the rest of Hong Kong will have a positive impact on income and employment rate.

The high value-added higher education, high-tech R&D and C&C industries within the LMC Loop will also provide synergies with eco-tourism and commercial proposals in the neighbouring developments of the Closed Area and the NENT NDAs. It also provides opportunities for upgrading of skills, increased labour productivity and long term employment opportunities to local residents. Provision of an integrated infrastructure system in the area as a whole would enhance connectivity and mobility and would provide opportunity for the population.

A real opportunity to further the economic and social development of Hong Kong and Shenzhen would be provided. The project will promote Hong Kong as an education hub in Asia. The knowledge-rich and diversified atmosphere can facilitate high-tech research and application activities, and in turn benefit the innovative economic activities which will enhance Hong Kong's long term competitiveness.

On the environmental front, the project will provide opportunities to initiate odour remediation in part of Shenzhen River to the proposed level and risk reduction due to land decontamination. Although there would be a certain extent of environmental dis-benefit and impacts due to the development, these impacts have been assessed and measures to avoid, minimize and mitigate these impacts have been proposed in this EIA.

2.5.3 Scope of Project

The location plan of LMC Loop development (Area A) is presented in **Figure 2.1b** and the associated infrastructures (within Area B & Added Area B) is presented in **Figure 2.1a**.

The off-site works will involve fishpond compensation only (**Figure 2.1c**) and there will be only normal fishpond operations. Thus, adverse environmental impact due to off-site works is not anticipated.

In addition to the LMC Loop development (Area A) and the associated infrastructures (within Area B & Added Area B), works area are proposed for the purpose of construction, road markings, haul roads, etc (**Figure 2.1d**). It should be noted that some of the works areas will involve minor activities such as road markings, rocks clearance (highlighted in **Figure 2.1d**), in which adverse environmental impact due to off-site works is not anticipated.

The scope of LMC Loop development is summarised in **Table 2.6** below.

Table 2.6 Scope of project

Phasing	Project Components	Works arrangement
Advance Works	Fishpond compensation	This project component is included in this EIA.
	Land de-contamination	This project component is included in this EIA.
	Establishment of Ecological Area (DP1)	This project component is included in this EIA.
Phase 1 Infrastructures	Site formations works	This project component is included in this EIA.
	Land reserve of boundary crossing facilities	In order to improve connection between the LMC Loop and Shenzhen, an area in the north corner of the Loop has been reserved for long term possible pedestrian linkage with SZ and associated boundary crossing facilities in the RODP. However, the exact landing points, alignment and feasibility of the linkages will depend on outcomes of further discussion and agreement between Hong Kong and Shenzhen Governments. As there is no implementation programme on this external linkage, detail assessment is not included in this study.
	Western Connection Road including the connections between LMC Road and Fanling/San Tin Highway (DP2)	This project component is included in this EIA.
	Direct Link to MTR LMC Station (DP3)	This project component is included in this EIA.
	Drainage System under Internal Transport Networks (DP4)	This project component is included in this EIA.
	Sewage Treatment Works (DP5)	This project component is included in this EIA.
	Provisional District Cooling System (Western)	The Provisional DCS is covered by the technical guidelines for the development plan subject to future developers initiatives (see Section 2.3.4). Nevertheless, in considering a worst case scenario due to additional construction and operation footprint and minor disturbance to the surrounding, this project component is included in this EIA.
	Bio-remediation for part of the	The bio-remediation works will be

Phasing	Project Components	Works arrangement
	Shenzhen River near the LMC Loop	conducted by the project proponent. This project component is included in this EIA.
	Landscaping Works at Open Spaces	This project component is included in this EIA.
Phase 1 Buildings	Construction and operation of Phase 1 Buildings	This EIA will include these buildings as sensitive receivers in the assessment. The environmental impact due to building heights profiles and locations are included in this EIA. Construction and operation of buildings will be under a separate study.
	Construction and operation of fire station cum ambulance depot	This EIA will include the fire station as air sensitive receivers in the assessment. The environmental impact due to building heights profiles and locations are included in this EIA. Construction and operation of fire station cum ambulance depot will be under a separate study.
Phase 2 Infrastructures	Provisional District Cooling System (Eastern)	The Provisional DCS is covered by the technical guidelines for the development plan subject to future developers initiatives (see **Table 2.5**). Nevertheless, in considering a worst case scenario due to additional construction and operation footprint and minor disturbance to the surrounding, this project component is included in this EIA.
	Eastern Connection Road (DP6)	This project component is included in this EIA.
	Flushing water Service Reservoir (DP7)	The TSE re-use is covered by the technical guidelines for the development plan subject to future study (see **Table 2.5**). Nevertheless, in considering a worst case scenario due to additional construction and operation footprint and minor disturbance to the surrounding, this project component is included in this EIA.
	Landscaping Works at Open Spaces	This project component is included in this EIA.
Phase 2 Buildings (Full operation)	Construction and operation of Phase 2 Buildings	This EIA will include these buildings as sensitive receivers in the assessment. The environmental impact due to building heights profiles and locations are included in this EIA. Construction and operation of buildings will be under a separate

Phasing	Project Components	Works arrangement
		study

Other project components that are related to the implementation of LMC Loop Development but under separate EIA studies are summarised in **Table 2.7**.

Table 2.7 Other projects related to LMC Loop Development but under separate studies

Phasing	Projects	Description
Phase 1 Infrastructures	Kwu Tung North Fresh Water Service Reservoir	Fresh water supply to LMC Loop will be provided by Kwu Tung North Fresh Water Service Reservoir in the future KTN NDA. The EIA of this project will be included in the NENT NDA PES.
Phase 1 Infrastructures	Upgrade of SWHSTW	Upgrading of SWHSTW for off-site compensation to comply with the "No net increase in pollution load" in Deep Bay policy. The EIA of this project will be included in the NENT NDA PES.

2.6 Construction Method

Feasible alternative construction methods, sequence of works and staged implementation have been explored and their environmental benefits / dis-benefits are presented in **Appendix 2-5**.

The preferred construction methods, sequence of works and staged implementation are presented in following sections:

2.6.1 Advance Works

2.6.1.1 Fishpond Compensation

Fishponds alongside the external connection roads are high ecological value habitat. Direct loss and indirect disturbance to adjacent fishponds are anticipated. Compensation of fishponds is therefore required before the major construction. The locations of fishponds intended for compensation will be mainly to the west of Area A and other offsite area such as Hoo Hok Wai and San Tin (**Figure 2.1c**). No construction work is required to these offsite areas. The works in offsite area will only involve normal fishpond operation such as fish cultivations. Details of compensation principles and operations are discussed in the **Chapter 12** of this EIA report.

2.6.1.2 Land De-contamination

The LMC Loop was the disposal site of approximately 1Mm³ of contaminated mud and 3Mm³ of uncontaminated mud during the Shenzhen River Training Works Stages 1 and 2. Hot spot areas within LMC Loop identified for decontamination is required in accordance with the Land Contamination Assessment study. In-situ treatment will be adopted for the decontamination on-site. Excavated soil after treatment will be backfilled in underground within LMC Loop. No off-site disposal of contaminated soil is necessary. The method of de-contamination is covered in **Chapter 8** of this EIA report.

2.6.1.3 Establishment of Ecological Area

A major feature of the Lok Ma Chau Loop is the existing reed marsh area mainly within the centre of LMC Loop. It is a high ecological value habitat and ecological survey has been carried out to identify the coverage of the reed marsh area. Compensation for loss of reed marsh area will take the form of an Ecological Area (EA) in the south of LMC Loop adjacent to the Meander for the purpose of minimizing and mitigating adverse ecological impact. In order to comply with the "no net loss" in wetland principle, the EA will be established prior to reed marsh removal. In addition, a 100 metre no-major-work buffer area around the existing reed marsh will be established during the land filling works within the Loop.

The programme strategy is to carry out filling work at the western side outside the buffer area of the reed marsh, in parallel with the reed marsh establishment work at the EA. The existing reedbed will first be transplanted based on experience from similar development in Mai Po area. The reedbed will first be transplanted to a nursery area for a 12-month growing and strengthening. Meanwhile, excavation of the EA will be carried out. A 3 month period is then allowed for the transplant of the reedbed and 12 month for the establishment in the EA. It is planned that the establishment will provide sufficient compensation for the removal of the existing reedbed. A further 12-month growing is allowed for the further establishment of the EA to maximise the ecological value. This programme arrangement is in response to the public high expectation / concern on the ecological performance of the reed marsh. Details of the EA operation and function are presented in **Section 12** in this EIA report.

2.6.2 Phase 1 Infrastructures

2.6.2.1 Site Formation Works

Area A is currently relatively flat at a reduced level of +4.5 to +6.0mPD. The drainage impact assessment indicates that site formation levels at about +5.90mPD would be adequate in terms of coping with the risk of flooding.

Fill would be imported to the Site to fill the area to the site formation level, with necessary allowance for consolidation. Appropriate sources of fill material would be identified in consultation with the Public Fill Committee and Environmental Protection Department. Public fill from the fill bank will be adopted as far as available. The trucks logistic route for public fill import will be ingress from existing Sai Kwo Road and egress at Ha Wan Tsuen Road/Lok Ma Chau Road (**Figure 2.24**). Minor road improvement works at Ha Wan Tsuen Road will be carried out to form the haul road. The haul road network will also serve the entire Phase 1 Infrastructures such as Western Connection Road, Direct Link to MTR LMC Station and LMC Loop development.

Apart from in-situ treatment of contaminated material for on-site backfilling, ground improvement work is also required for the remaining on-site uncontaminated material, so as to speed up the primary settlement and minimise the settlement problem for the future building and utilities. In order to avoid secondary environmental impact, external disposal of the spoil material will be minimized as far as technically practicable subject to works programme. Instead, in-situ ground treatment methods such as surcharging and provision of wick

drains would be identified for mitigation of the possible effects of residual and differential settlement.

The phasing programme of the site formation has been optimised to minimize the impact to the wetlands in Deep Bay. There will be 7 working zones established during site formation work, namely Zones 0 to 5 and Zone EA (**Figures 2.25a** to **d**).

Site formation works of the WCR and ECR are scheduled for different time periods to avoid concurrent direct ecological impact. However, to facilitate the target of first population intake by Year 2020, construction activities in different zones are closely linked to each other. During first stage of construction, Zones 1 & 2 are building sites and hence construction activities cannot be avoided. Zone EA is the area for reedbed compensation and is essential to mitigate for reedbed habitat loss. Zones 0 & 5, whose land uses are relatively less sensitive to long-term settlement, are designated as for on-site swamp deposit disposal. The EA Zone cannot be constructed without the utilization of these zones for disposal. The eastern part of Zone 3 is planned for essential infrastructure such as the sewage treatment plant and the fire station cum ambulance depot. Construction of these facilities has to be carried out at the same time as the higher education building construction. Although the western parts of Zones 3 and 4 have no building work, these areas will be assigned to reuse the surplus surcharge from Zones 1 and 2 as fill material for Zones 3 and 4, in order to prevent double-transportation of fill material and unnecessary increase in external traffic and the associated dust and noise issues.

2.6.2.2 Land Reserve of Boundary Crossing Facilities

A 0.8 ha of Government ("G") zone is reserved in the north corner of the LMC Loop in the Revised PLP (**Figure 2.1b**) for the purpose of possible future boundary crossing facilities and necessary Government uses. As there is no implementation programme for this external linkage, detailed assessment is not included in this study.

2.6.2.3 Road Infrastructures

The proposed road infrastructure work includes road networks (including major roads connections and haul roads (**Figure 2.24**)), the associated drainage systems, sewerage networks, water supply networks and utility construction to support the LMC Loop development. The road infrastructures during Phase 1 Construction are listed below:

- Western Connection Road (DP2)
- Direct Link to MTR LMC Station (DP3)
- Drainage System under Internal Transport Networks (DP4)

Typical construction method for earthwork, utilities laying and paving will be adopted.

During excavation works for bridge pier construction, silt curtains with diaphragm walls will be deployed for protecting fishponds or nearby rivers. All the bridge

pier construction or road widening work will be carried out within a cofferdam and thus the affected fishponds/rivers will be kept in dry condition.

With regard to the road work spanning over the Meander, a bridge structure with intermediate support at the Meander, can be considered. This arrangement is identical to the existing adjacent Border Road crossing the Meander.

The road work will inevitably encroach some of the existing fish ponds, which will requires fishpond compensation. Fill material will be brought in to raise a portion of the pond to the required road level. The sediment in the pond will be left in-situ as far as technically practicable. Ground improvement work will be applied in this area.

The road infrastructures will be in operation prior to first population intake of the Phase 1 Buildings (**Section 2.5.6**).

2.6.2.4 Sewage Treatment Works (DP5)

Construction activities for on-site sewage treatment works (STW) would include concrete foundation works, formworks, superstructures and the associated pipeworks. The on-site STW will be in operation prior to first population intake of the Phase 1 Buildings (**Section 2.5.6**). The operational details of STW are assessed in **Chapter 6** of this EIA report.

2.6.2.5 Provisional District Cooling System (Western)

Construction activities for provisional district cooling system (DCS) would include concrete foundation works, formworks, superstructures and the associated pipeworks. The Provisional DCS is covered by the technical guidelines for the development plan subject to future developers' initiatives (see **Table 2.5**).

2.6.2.6 Bio-remediation

On-site bio-remediation will be conducted at the portion of Shenzhen River near the LMC Loop to tackle the current odour issue. The project proponent will implement bio-remediation works along the Shenzhen River within 500m assessment area of the LMC Loop Development. Subject to the progress and recommendation of Shenzhen River Contaminated Sediment Remediation Strategy Joint Study (See **Table 2.9**), the odour impact from Shenzhen River on the Loop development might be further reduced. The assessment for odour mitigation by bio-remediation is given in **Chapter 3** of this EIA report.

2.6.2.7 Landscaping Works at Open Spaces

Landscaping works at open space (**Figure 2.1b**) will be conducted after site formation works. As it will mainly involve planting and minor pedestrian facilities, environmental impact is not anticipated.

2.6.3 Phase 1 Buildings

The first batch of population intake will commence around Year 2020. The building arrangements will align with the RODP. Phase 1 Buildings will be

mainly the western part of LMC Loop in the RODP (**Figure 2.1b**). Apart from the educational purpose, complemented with high-tech R&D and C&C industries, the operation of Phase 1 Buildings will also include a fire station cum ambulance depot and electricity substations. Interchangeability of high-tech R&D and C&C industries are allowed to maximise future development flexibility. Construction activities would include concrete foundation works, formworks and superstructures.

2.6.4 Phase 2 Infrastructures

2.6.4.1 Provisional District Cooling System (Eastern)

Construction activities for provisional district cooling system (DCS) would include concrete foundation works, formworks, superstructures and the associated pipeworks. The Provisional DCS is covered by the technical guidelines for the development plan subject to future developers' initiatives (see **Table 2.5**).

2.6.4.2 Eastern Connection Road (DP6)

The construction of ECR and the associated drainage systems, sewerage networks, water supply networks and utility construction will include earthwork, utilities laying and paving. With regard to the road work crossing the Meander, a underpass structure beneath the Meander will be constructed to minimize the long-term disturbance to the bird flight path. Diaphragm walls or cofferdam will be deployed during underpass construction crossing the Meander in order to separate the river water from the construction site.

The ECR will be in operation prior to full population intake of the Phase 2 Buildings (**Table 2.6**).

2.6.4.3 Flushing Water Service Reservoir (DP7)

Facilities for treated sewage effluent (TSE) reuse involved the flushing water service reservoir and the associated pipeworks (where pipeworks are included in DP6). The area of water service reservoir will be about 1,350 m^2. The major construction works will include earthwork, slopework (including soil nailing and retaining walls), concrete works for service reservoir structure and construction of maintenance road near the ECR.

TSE re-use is part of the technical guidelines for the development plan subject to future developers' initiatives (see **Table 2.5**).

2.6.4.4 Landscaping Works at Open Spaces

Landscaping works at open space (**Figure 2.1b**) will be conducted after site formation works. As it will mainly involve planting and minor pedestrian facilities, environmental impact is not anticipated.

2.6.5 Phase 2 Buildings (Full Operation)

The Phase 2 building arrangements will align with the RODP (**Figure 2.1b**). Under full operation, the total GFA for both Phase 1 and Phase 2 Buildings will be 1,200,000 m^2. About 23 ha of land are allocated for higher education use within the LMC Loop. Facilities including teaching, research, library, ancillary offices, student hostels and other facilities ancillary to higher education would be provided in areas zoned for education use. It is anticipated that the Education Zone could accommodate one or more higher education institutions. Taking into account the surrounding context, the height of buildings in the education sites could range from about 3 to 10 storeys. To minimize the possible impacts on the bird's flight path, surrounding natural setting and the visual impact, the education sites along the Ecological Area would be subject to a lower building height restriction and are encouraged to be heavily landscaped to blend in with the natural environment.

The higher education use is intended as the leading land use in the LMC Loop development, and integration of education, research and application activities in the education institutions and with other high-tech R&D and C&C uses provided for within the broad land use framework of the RODP.

About 8.6 ha of land within the LMC Loop is allocated for high-tech R&D and C&C industries uses. The establishment of high-tech R&D uses in the LMC Loop could allow synergy between R&D uses and the higher education institutions, therefore the provision of R&D uses in close proximity to educational facilities would allow more flexibility in land use as well as promote the formation of "research packs" with the educational institutions. The facilities are to stimulate the interflow of different operators, researchers and academia which could possibly establish a "clusters" that benefit from the synergistic effect. High-tech R&D uses could include offices and research spaces etc specifically related to commercial high-tech R&D.

With regard to cultural and creative industries, possible uses include offices, workshops and performance space. The nature and actual mix of high-tech R&D and cultural and creative industries would depend on market demand. As such, interchangeability of high-tech R&D and C&C industries uses are allowed in order to provide greater development flexibility for future developers/users.

2.7 Tentative Implementation Programme

It is anticipated that the LMC Loop will be commissioned in phases, with the users during the first stage operation to be approximately half of the total students and employees.. The tentative implementation programme is attached in **Appendix 2-6** and summarised in **Table 2.8**.

Table 2.8 Summary of tentative implementation programme

Phasing	Description of Work	Time Line
Advance Works	Fishpond compensation	Late 2013/Early 2014 – 2015
	Land de-contaminations	
	Establishment of Ecological Area (DP1)	
Phase 1 Infrastructures	Site formations works	2015 – 2020
	Land reserve of boundary crossing facilities	
	Western Connection Road including the	

Phasing	Description of Work	Time Line
	connections between LMC Road and Fanling/San Tin Highway (DP2)	
	Direct Link to Lok Ma Chau Station (DP3)	
	Drainage System under Internal Transport Networks (DP4)	
	Sewage Treatment Works (DP5)	
	District Cooling System (Western)	
	Bio-remediation for part of the Shenzhen River near the LMC Loop	
	Landscaping Works at Open Spaces	
Phase 1 Buildings	Construction and operation of Phase 1 Buildings	Construction: 2016 to 2020 Operation: 2020 onwards
	Construction and operation of fire station cum ambulance depot	
Phase 2 Infrastructures	District Cooling System (Eastern)	2021 - 2027
	Eastern Connection Road (DP6)	
	Flushing Water Service Reservoir (DP7)	
	Landscaping Works at Open Spaces	
Phase 2 Buildings (Full Operation)	Construction and operation of Phase 2 Buildings	Construction: 2024 to 2027 Operation: 2027 onwards

2.8 Concurrent Projects and Evaluation of Potential Cumulative Impacts

2.8.1 HKSAR

The evaluations of cumulative impacts due to the above concurrent projects and consequential development are presented in **Table 2.9**.

Table 2.9 Evaluation of cumulative impacts due to concurrent projects in HKSAR

Concurrent Projects		Evaluation
1	Agreement No. CE42/2006(TP) Planning Study on Liantang/Heung Yuen Wai Cross-boundary Control Point and its Associated Connecting Roads in Hong Kong – Feasibility Study	A new Boundary Control Point (BCP) is proposed to be constructed at Heung Yuen Wai. The site location of this project is about 8.6 km away from the LMC Loop which is far away from the LMC Loop Study Area. Cumulative environmental impact is not anticipated.
2	Agreement No. CE60/2005 (TP) Land Use Planning for the Closed Area – Feasibility Study (FSCA)	The new Closed Area boundary is put in place in late 2011 / early 2012. Since this project is in a strategic planning project, there is no major implementation programme for the associated infrastructures. Cumulative impacts from this Project are therefore not considered.
3	Agreement No.	This project aims to provide an extension to the proposed

Concurrent Projects		Evaluation
	CE22/2006(HY) Cycle Tracks Connecting North West New Territories with North East New Territories – Investigation, Design and Construction	cycle track network in the New Territories and associated supporting and recreational facilities; comprising 3 major sections and 3 minor sections. Only the Lok Ma Chau Minor Section will have interface with the LMC Loop. According to the website of CEDD, there is no solid programme for this minor section. Cumulative impacts from this Project are therefore not considered.
4	Agreement No. CE61/2007(CE) North East New Territories New Development Areas (NENT – NDA) Planning and Engineering Study - Investigation	The NENT-NDA includes three sites, i.e. Kwu Tung North NDA, Fanling North NDA and Ping Che/ Ta Kwu Ling (PC/TKL) NDA. Only the Kwu Tung North NDA lies on the LMC Loop Study Area of 500m coverage. Since the construction programme is likely to be concurrent with the LMC Loop, cumulative impact will be assessed for both construction and operational phases. According to the latest information, the implementation of PC/TKL NDA will be subject to re-planning and not included in this EIA.
5	Construction of a Secondary Boundary Fence and new sections of Primary Boundary Fence and Boundary Patrol Road	The existing boundary fence from Mai Po to Lin Ma Hang will be removed and a secondary boundary fence will be erected under this project. The adjacent construction activities to the LMC Loop Study Area includes the section between Ma Tso Lung and Hoo Hok Wai will be removed and replaced by a new boundary fence along the south bank of Shenzhen River. The whole construction commenced in late 2009 for substantial completion in late 2012. Since this project will be completed prior to the commencement of LMC Loop construction, cumulative environmental impact is not anticipated.
6	The proposed Northern Link of the railway	The proposed Northern Link will connect the East Rail Line and West Rail Line in the northern New Territories, provide connection to the Lok Ma Chau Spur Line Control Point. Depending on the major role to be played by the Northern Link, it could be connected to the Lok Ma Chau Spur Line either at Kwu Tung or Lok Ma Chau. This project is still in planning stage and there is no implementation programme yet. Cumulative impacts from this Project are therefore not considered.
7	Shenzhen River Contaminated Sediment Remediation Strategy Joint Study 《深圳河污染底泥治理策略合作研究》	To tackle the odour problem of Shenzhen River, a joint study has commenced in Year 2009 entitled "Shenzhen River Contaminated Sediment Remediation Strategy Joint Study"《深圳河污染底泥治理策略合作研究》by the EPD and Shenzhen River Regulation Office(深圳市治理深圳河辦公室). The study includes data collection, remediation plan and remediation implementation. This project will provide the means to remediate the odour issue from the Shenzhen River. As odour remediation of contaminated sediment has numerous successful examples

Concurrent Projects		Evaluation
		both in Hong Kong and overseas, proposals for remediations of odour impact from the Shenzhen River under the joint study are subject to the agreement of Hong Kong and Shenzhen governments.
8	Agreement No. CE 20/2004(EP) North East New Territories (NENT) Landfill Extension – Feasibility Study	A Strategic Plan under this Study was developed for the landfill extensions and new sites for the disposal of solid wastes in the next 50 years. The proposed extension is southeast adjacent to the existing NENT Landfill and at about 8 km away from the LMC Loop. Thus, cumulative environmental impact is not anticipated.
9	Development of a Poultry Slaughtering and Processing Plant in Sheung Shui	According to the Government Press Release on 1st June 2010, the development of a poultry slaughtering centre would be shelved. Cumulative impacts from this Project are therefore not considered.
10	Regulation of Shenzhen River Stage IV	This project forms a part of Drainage Master Plan Study in Northern New Territories. The location of this project is about 7km upstream to the LMC Loop, which is considered far away. The environmental impact including water quality would be mitigated to acceptable levels. Thus, cumulative environmental impact is not anticipated.
11	Drainage Master Plan Review for Yuen Long and North Districts	In view of changes in land uses and new developments planned within the northern area, this project has conducted numerical models for evaluating the hydraulic performance of the major rivers/channels. Further drainage improvement works for major rivers, upstream channels and the local flooding spots would be proposed by this project. The proposal was finalized in late 2011. All the proposed works under DMP are far away from the water bodies of LMC Loop and will not induce adverse cumulative impact.
12	Study of Development Potential of Hoo Hok Wai	According to the Land Use Planning of Closed Area (FCA), further study is recommended to examine the potential for the development in Hoo Hok Wai. This project forms an extension of FCA regarding to its recommendation. This project is still in planning stage and there is no implementation programme yet. Cumulative impacts from this Project are therefore not considered.
13	Land Use Review in Area B and its adjoining area	A separate Land Use Review in Area B and its adjoining area of the LMC Loop is being undertaken to explore the development opportunities in Area B and its surrounding areas. Further studies may be required to ascertain the feasibility of the proposed land uses if they are to be taken forward as a result of this review. As such, there is no development proposal/implementation programme yet identified for the land within Area B and its adjoining areas of the LMC Loop. Cumulative impacts are therefore not considered.

2.8.2 Mainland

2.8.2.1 Operation of Area C

The conceptual planning is formulated with regard to the long-term development objectives whilst meeting the short and medium term development needs for Shenzhen. In the short and medium term, Area C will mainly retain the present land uses and facilities, but will reserve space and facilities for the integral development with Area A in the future. In the long term, the conceptual plan will be implemented in accordance with the planning intention to promote cooperation between Hong Kong and Shenzhen as well as integrate with the physical development of Shenzhen. The proposed developments will mainly be concentrated at the current Huanggang Boundary Control Point (BCP), which may have opportunity to be released for development after the Liantang/Heung Yeung Wai BCP commences operation. According to the current development proposal, Area C will accommodate high-tech R&D, residential, commercial and other related uses which would be complementary to the development of the Loop and the total GFA will be about 1,500,000m^2. To facilitate future cross-boundary movements, a possible pedestrian linkage and associated boundary crossing facilities is reserved in the northeastern part of the LMC Loop. Since Area C is already a developed area with adequate infrastructure supports such as road works, the construction of Area C will only involve common building works in urban area. Therefore, potential cumulative environmental impact is not anticipated.

2.8.2.2 Chimneys

The nearest potential industrial land use is located within the Futian Bonded Zone in Futian District at more than 500m away from the Study Area. In addition, Area C will accommodate high-tech R&D, residential, commercial and other related uses and no chimney will be erected. Given the chimney emissions in the mainland side are far away (>500m) from site, thus potential environmental impact is therefore not expected.

2.8.2.3 Shenzhen River

Given the spread of contaminated sediments across the Shenzhen River which generates the odour, is originated from the same nearby discharge points on the Shenzhen side, there is potential cumulative odour impact from the river. The impact evaluation is addressed in **Chapter 3**.

2.8.2.4 Binhe Sewage treatment Works

The Binhe Sewage treatment Works is at about 1.8 km upstream from the boundary of LMC Loop on Shenzhen side. In addition, as Phase II sewage treatment facilities of Binhe Waste Water Treatment Plant are fully enclosed or covered by an open garden, cumulative odour impact is not anticipated though it is included in the odour analysis in **Chapter 3**.

2.9 Reference

[2-1] 深圳市治理深圳河辦公室, 深圳河污染底泥治理策略合作研究生化處理技術實驗室試驗研究實驗報告合同編號： SZR—WRDN—YJ—SHSY (English translation: Shenzhen River Regulation Office, Shenzhen River Contaminated Sediment Remediation Strategy Joint Study)

[2-2] Greater Pearl River Delta Business Council, Hong Kong/Shenzhen Co-operation Meeting

[2-3] 深圳市水務發展十二五規劃 (English translation: 12th 5-year Plan of Shenzhen Water Supplies Development)