



Agreement No. CE 11/2015 (HY)

Technical Study on Transport Infrastructure at Kennedy Town for Connecting to East Lantau Metropolis – Feasibility Study





土木工程拓展署

Civil Engineering and Development Department

Civil Engineering Office

Agreement No. CE 11/2015 (HY)
Technical Study on Transport Infrastructure at Kennedy Town for
Connecting to East Lantau Metropolis - Feasibility Study

Executive Summary (Final)

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AECOM ASIA COMPANY LIMITED

Please note that the Technical Study on Transport Infrastructure at Kennedy Town for Connecting to East Lantau Metropolis – Feasibility Study is a technical study of preliminary nature only aiming at identifying possible options for the Transport Infrastructure. All technical assessments have been conducted based on preliminary assumptions, which may include sensitive/confidential information related to other developments. All findings and recommendations of this study will be reviewed and updated in later stage of the project.

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EXECUTIVE SUMMARY

1 INTRODUCTION

1.1 Background

- 1.1.1 On 21 July 2015, Civil Engineering and Development Department (CEDD) commissioned AECOM Asia Company Limited (AECOM) as the Consultants to undertake a technical study (the “Study”) on Transport Infrastructure at Kennedy Town for connecting to the proposed East Lantau Metropolis (ELM). The objective of the Study is to identify possible technically feasible schemes for the Transport Infrastructure (TI) taking into account the existing, planned and potential developments at Kennedy Town and potential interface with ELM and assess the preliminary impacts on the developments at Kennedy Town due to the Transport Infrastructure.
- 1.1.2 Kennedy Town is located at the north-western end of Hong Kong Island and has been served by the West Island Line starting from end 2014. Capitalizing on the enhanced traffic connection, there is an opportunity to increase the housing supply and Government, institution and community facility in the western part of Kennedy Town to better meet the needs of the community. The waterfront area of Kennedy Town may also be enhanced with a view to reserving the waterfront area for public enjoyment.
- 1.1.3 As set out in the 2014 Policy Address, the Government will explore ways to further develop the eastern waters off Lantau Island and neighbouring areas, with a view to developing an East Lantau Metropolis for accommodating new population. It will also become the third core business district in addition to Central and Kowloon East for promoting economic development and providing job opportunities.
- 1.1.4 New or upgrading of existing highway and railway infrastructure works (the “Transport Infrastructure”) is required to provide transport links, among others, between western Hong Kong Island and East Lantau Metropolis near Kau Yi Chau. It will affect some areas of Kennedy Town including site(s) at Kennedy Town as well as its nearby area/nearshore reclamation of Hong Kong Island necessary for accommodating the Transport Infrastructure (KT Site). It may have direct interface with land use proposals and their implementation programme at Kennedy Town, and the adjacent areas of Hong Kong Island. The Transport Infrastructure should be properly planned to minimize the implications and restrictions on the land use proposals.

1.2 Study Objectives

- 1.2.1 This Study aims to identify possible Highway and Railway Connection Schemes for Transport Infrastructure connecting ELM (near Kau Yi Chau) and Kennedy Town and assess the preliminary impacts on the developments at Kennedy Town due to the Transport Infrastructure. The study area is shown in **Diagram 1.1**. Scenarios for the Highway and Railway Connections are listed below:
- Highway Connection
 - Scenario 1 - without linkage to the potential Route 4 Extension¹ (R4E)
 - Scenario 2 - with linkage to the potential Route 4 Extension (R4E)
 - Railway Connection
 - Scenario 1 - extension of the Island Line
 - Scenario 2 - a new railway line

¹ Extension of Route 4 from Kennedy Town to Aberdeen (previously known as Route 7)

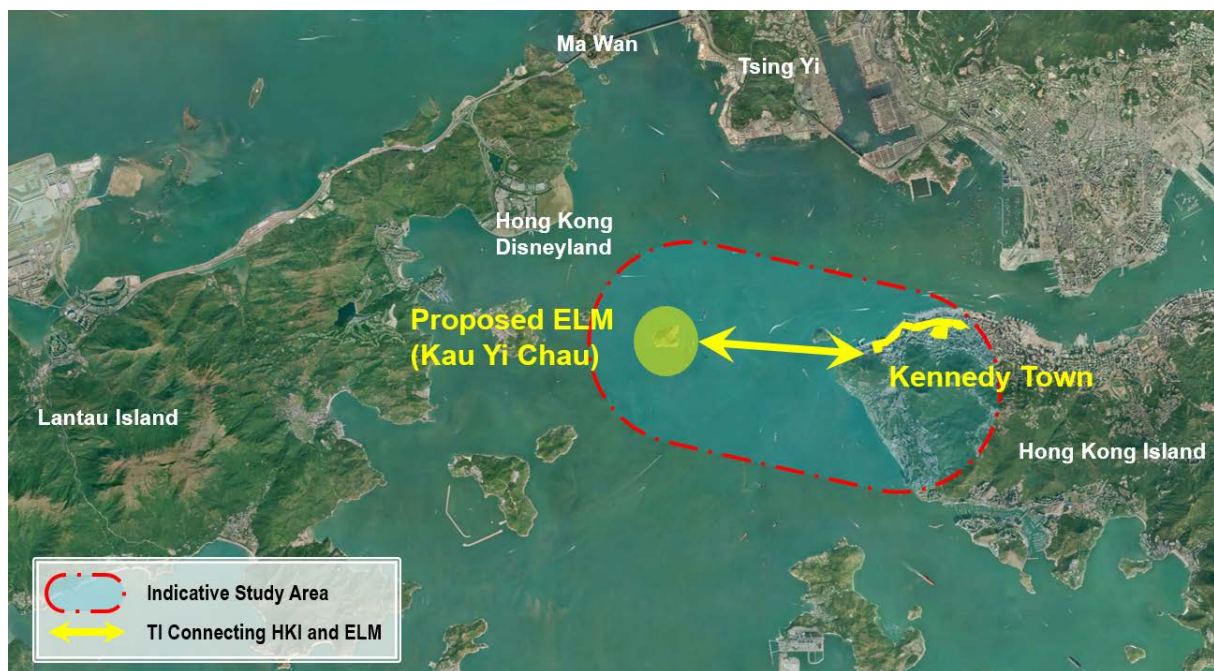


Diagram 1.1 Study Area

- 1.2.2 Firstly, a baseline profile of the Study Area has been established by making reference to previous and on-going Government studies, public resources and research findings. Secondly, the opportunities, constraints and key issues for the Transport Infrastructure were identified.
- 1.2.3 The Transport Infrastructure will run across a number of fairways and channels, including but not limited to Southern Fairway and Western Fairway. The preliminary feasibility of different structural forms of Transport Infrastructure, including submarine tunnel and bridge options has been assessed. The pros and cons of various structural forms have been evaluated.
- 1.2.4 The Transport Infrastructure connecting ELM and Kennedy Town will include highway and railway connections. Various conceptual schemes of highway and railway connections under the Scenarios listed above have been studied and the possible schemes have been identified. The key issues and constraints associated with the possible schemes have been highlighted in this Study and the way forward is recommended for further studies in the future.

1.3 Purpose of Executive Summary

- 1.3.1 This Executive Summary summarizes the key findings, recommendations and conclusions of the Study.
- 1.3.2 This Executive Summary comprises the following sections:
- Section 1 introduces the background of the project and study objective;
 - Section 2 presents the findings of the technical studies for the Transport Infrastructure;
 - Section 3 outlines the possible alignment schemes for highway connection;
 - Section 4 outlines the possible alignment schemes for railway connection;
 - Section 5 summarizes the potential implications on the developments at Kennedy Town;
 - Section 6 concludes the Study and recommends the way forward.

2 TECHNICAL STUDY ON TRANSPORT INFRASTRUCTURE

2.1 Baseline Review

Constraints at the Kennedy Town Area

- 2.1.1 The Transport Infrastructure shall avoid impact on the Land Use Review on the Western Part of Kennedy Town (**Diagram 2.1** refers) as far as practicable and should not affect the programme of its implementation. Furthermore, the Protection of Harbour Ordinance should be placed at the highest consideration in the planning of alignment of the Transport Infrastructure. The extent of reclamation, if any, must be kept to a minimum. Various planned and potential developments, as well as planned infrastructure works, will be taken into account in the traffic and transport impact assessment of the Transport Infrastructure. Various road and railway alignments will be developed and assessed by taking into account the site constraints.

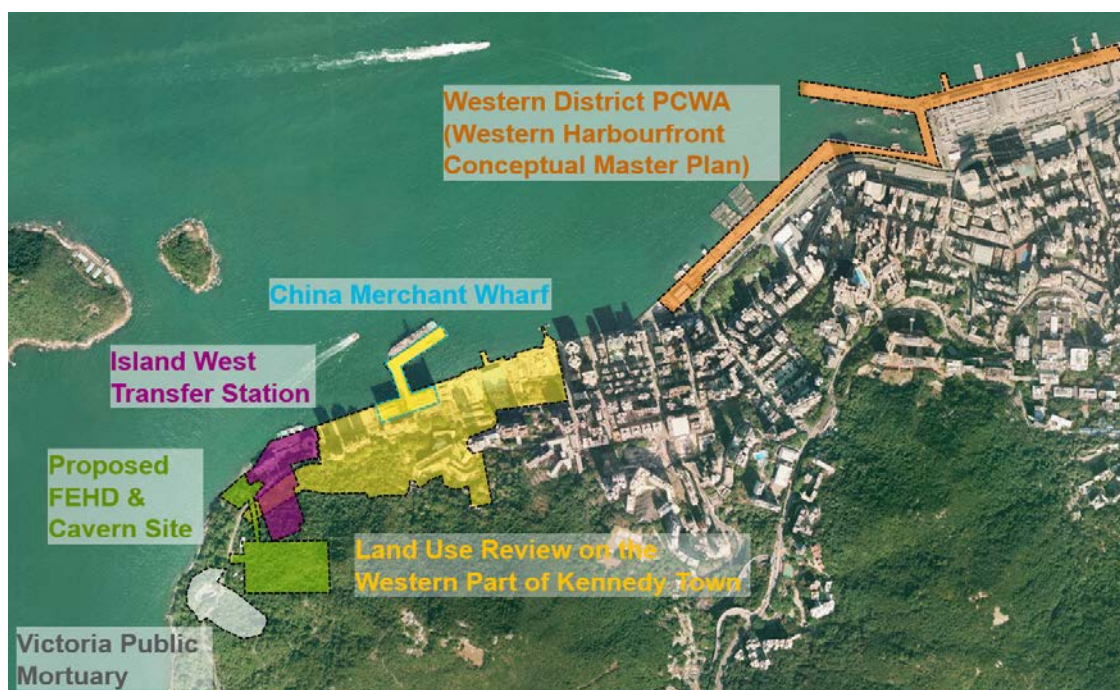


Diagram 2.1 Constraints at the Kennedy Town Area

Marine and Air Traffic

- 2.1.2 The alignment of the Transport Infrastructure will run across various busy fairways and channels, as shown in **Diagram 2.2**. The implication to marine traffic has to be considered in the assessment of various alignment options and structural form. Similarly, the Transportation Infrastructure shall avoid infringing the Airport Height Restriction and affect the operation of helicopter.

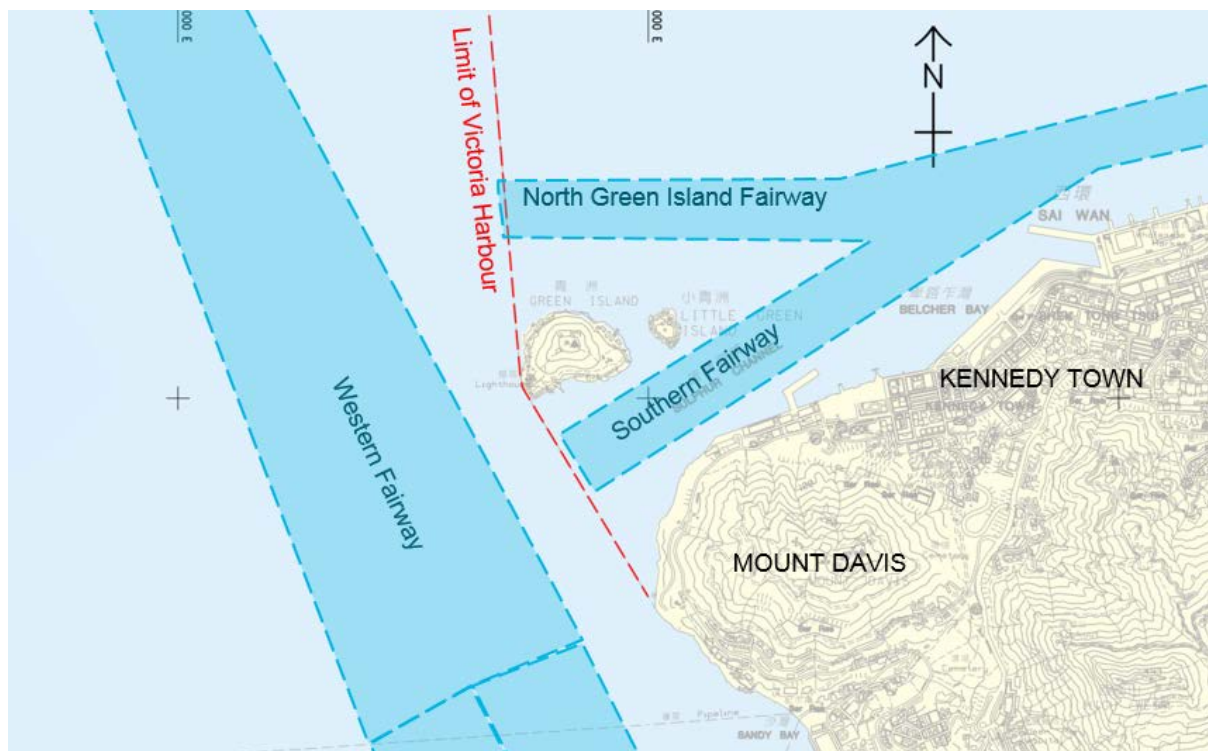


Diagram 2.2 Main Fairways and Limit of Victoria Harbour in the Study Area

Protection of the Harbour Ordinance (PHO)

- 2.1.3 As stipulated in paragraph 5 of Housing, Planning and Lands Bureau Technical Circular No. 1/04, the Government will not undertake any further reclamation in the harbour apart from the Central Reclamation Phase III and the reclamation proposals for Wan Chai North and South East Kowloon. In this regard, there shall be an assumption of zero reclamation when considering any proposals of the Transport Infrastructure. Kennedy Town currently enjoys an extensive shoreline of the Victoria Harbour. The introduction of Transport Infrastructure at Kennedy Town could potentially necessitate temporary or permanent reclamation works at the Victoria Harbour. As a result, PHO should be taken as a primary consideration in the formulation of alignment options for highway connection of the Transport Infrastructure. Limit of Victoria Harbour is indicated in **Diagram 2.2**.

Major Considerations in Developing the Highway Connection

- 2.1.4 The draft Kennedy Town & Mount Davis Outline Zoning Plan (OZP) No. S/H1/20 to reflect the findings of the Land Use Review on the Western Part of Kennedy Town was gazetted on 11 March 2016 and amended on 1 August 2017. In view of the pressing need and priority for housing supply, it is prudent that the Transport Infrastructure shall not compromise the proposed new housing provision, open space and other supporting and GIC facilities to meet local needs in Kennedy Town.
- 2.1.5 In 2013, the Central and Western District Council commissioned a study to formulate a waterfront enhancement proposal for the 2.4 km long stretch of waterfront between the Western Wholesale Food Market and the Western District Public Cargo Working Area (WDPCWA). This study proposes the creation of an iconic and vibrant waterfront attraction for public enjoyment under the Western Harbourfront Conceptual Master Plan. The revitalization of the western harbourfront will improve the physical environment and attractiveness of the Kennedy Town area. The construction of the initial stage already commenced in early 2016 for

completion and opening in around late 2017 under the Signature Project Scheme in Central & Western District. There is currently no implementation programme for the further stages.

- 2.1.6 As the Transport Infrastructure is proposed to connect to the existing reserved stub ends at Connaught Road West Flyover and turns southwards to run along WDPCWA, the waterfront open space proposed for WDPCWA under the Western Harbourfront Conceptual Master Plan may be affected. Instead of the open space, other means of enhancement to the harbourfront will be explored.
- 2.1.7 Amidst the transformation of Kennedy Town, local aspirations had been expressed regarding the new developments to be introduced to the area. In view of the local aspiration on the future development of Kennedy Town, the Transport Infrastructure shall strive to provide opportunities to respond to local views as much as possible. The traffic connections between the potential strategic road, e.g. the Transport Infrastructure and Route 4 Extension, and the potential traffic impact on local road networks at Kennedy Town shall be taken into consideration.

Major Considerations in Developing the Railway Connection

- 2.1.8 Kennedy Town has been transforming in recent years with the pace of redevelopment accelerating greatly with the introduction of MTR West Island Line service to areas which greatly enhances the accessibility and connectivity of the area, resulting in more diversified shops and services emerging in Kennedy Town.
- 2.1.9 The government has been making great efforts in increasing housing supply to address territorial housing needs. It is prudent that the Transport Infrastructure shall maintain the original housing supply and area proposed for government, institution and community (GIC) and open space uses.
- 2.1.10 The government has also been trying to relocate existing NIMBY facilities (such as sewerage treatment works, refuse collection facilities) into cavern to increase land supply for housing development. The reprovisioning of the Victoria Public Mortuary (VPM) comprises of a 4-storey mortuary building at a site along Victoria Road. Besides, the cavern currently used as MTRCL's magazine storage would be used to accommodate the mortuary facility, which is a low traffic generator and its impact to the traffic flow at Victoria Road is limited. The railway alignment will be required to explore and to avoid / minimize the potential impact to the cavern developments.

2.2 Preliminary TTIA Summary

- 2.2.1 This Feasibility Study aims to identify possible highway and railway connection schemes for Transport Infrastructure connecting ELM and Kennedy Town and assess the preliminary impacts on the developments at Kennedy Town due to the Transport Infrastructure. The Preliminary Traffic and Transport Impact Assessment (Preliminary TTIA) carried out under this Study was to facilitate the development of possible highway and railway connection schemes between ELM and Kennedy Town only and has been based on various assumptions made on traffic forecasts and related developments. A detailed TTIA should be carried out in future to verify the assumptions and to update the results. The initial concept for connections to ELM is shown in **Diagram 2.3**.

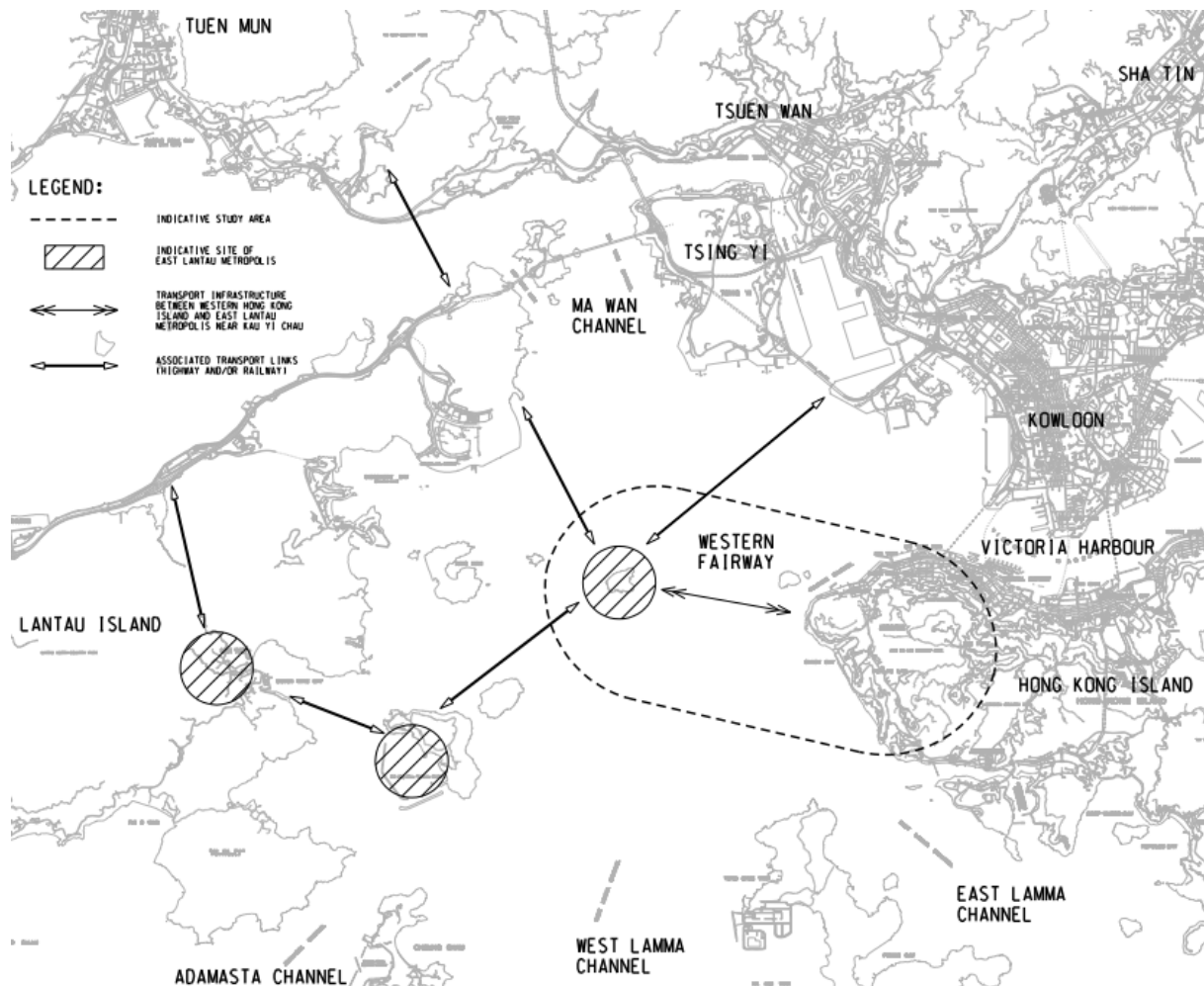


Diagram 2.3 Initial Concept for Connections to ELM

Highway Connection Forecast

- 2.2.2 For initial development at ELM, the road link between Kau Yi Chau and Kennedy Town could be operated within the design capacity. Thus, a dual-3 carriageway would be sufficient to handle the traffic demand of ELM and all other through traffic. It is necessary to review all the relevant assumptions including the development sizing, land use options and detailed planning data of ELM for further assessment in future studies.
- 2.2.3 For full development at ELM, the through traffic travelling between NWNT and Hong Kong Island via ELM is an important factor causing the traffic demand to exceed the capacity of the road links between Kau Yi Chau and Kennedy Town as well as between Kau Yi Chau and North Lantau. Thus, the proposed transport infrastructures between ELM and other developments as well as the number of lanes for road links between Kau Yi Chau and North Lantau is required to be examined in future studies with detailed planning data of ELM.
- 2.2.4 One of the functions of proposed Route 4 Extension is to provide the bypass road connecting Aberdeen and Kennedy Town which is parallel to the existing Pok Fu Lam Road. It could share the traffic flows running on Pok Fu Lam Road. The most critical section of Pok Fu Lam Road would be located near "The Belcher's".

Railway Connection Forecast

- 2.2.5 For initial development at ELM, the new railway line scheme with interchange at Kennedy Town has a lower patronage flows (KYC-KET) than the extension of ISL railway scheme. With inclusion of the ELM patronage, the highest line segment of Hong Kong Island Line is between Central and Sheung Wan with around 61,000 patronage flows.
- 2.2.6 For full development at ELM, two new railway lines connecting between (i) Kau Yi Chau and West Kowloon; and (ii) Kau Yi Chau and North Lantau could release the patronage generated from ELM. The highest line segment of Hong Kong Island Line is between Sheung Wan and Central during the morning peak with around 54,000 patronage flows.

2.3 Possible Route Options and Structural Forms

- 2.3.1 There are two possible routes, namely “offshore” and “inland” routes, for the Transport Infrastructure to run across the fairways and channels towards ELM.
- 2.3.2 From the reserved stub end at the existing Connaught Road West Flyover, the Transport Infrastructure can either turn offshore for a more direct route, or turn inland and run through Kennedy Town and Mount Davis to minimize the impact on Victoria Harbour.

Offshore Route Options

- 2.3.3 For the offshore route option, the Transport Infrastructure turns seawards (northwards) after the connection with existing Connaught Road West Flyover and runs west outside the footpath of Hong Kong Island.
- 2.3.4 The offshore route would be the most straight forward option. The Transport Infrastructure would head west directly outside Kennedy Town. The Transport Infrastructure would not run across Kennedy Town and Mount Davis. This route can avoid affecting the existing and planned developments within the area of the Land Use Review on the Western Part of Kennedy Town.
- 2.3.5 According to Section 3 and 4 below subject to the design requirements, the offshore route may require reclamation within Victoria Harbour. The reclamation may be temporary, permanent or a combination of both. The reclamation and structure of the Transport Infrastructure may have possible visual impact to the surrounding area.
- 2.3.6 The offshore route would need to run across the Western and Southern Fairways, thus causing more impact on the marine traffic.
- 2.3.7 Also, the Transport Infrastructure would very likely affect the operation of China Merchant Wharf during construction stage. The impact on the operation of China Merchant Wharf upon completion of Transport Infrastructure needs to be further assessed.

Inland Route Options

- 2.3.8 Inland route options are considered in order to avoid reclamation within Victoria Harbour.
- 2.3.9 After stub ends at Connaught Road West Flyover and running along the WDPCWA, the Transport Infrastructure would turn southwards to cross Kennedy Town and Mount Davis.
- 2.3.10 The Transport Infrastructure would turn northwards and head towards ELM after passing the limit of Victoria Harbour.

- 2.3.11 By adopting inland route, reclamation within Victoria Harbour would be significantly reduced or eliminated. This route would avoid running across the Southern Fairway. However, it would still inevitably run across the Western Fairway, thus causing similar impact on the marine traffic.
- 2.3.12 However, the inland route would face significant constraints from the existing and committed developments in Kennedy Town. These constraints and associated impacts on the Transport Infrastructure need to be further assessed.

Possible Structural Forms

- 2.3.13 Possible structural forms include submarine tunnels and long span bridges as listed below:
- Immersed Tube Tunnel (IMT);
 - Tunnels by Tunnel Boring Machine (TBM);
 - Cable Stayed Bridge;
 - Suspension Bridge; and
 - Hybrid of Cable Stayed Bridge and Suspension Bridge.

Summary

- 2.3.14 Under the Study, after in-depth comparison of different options in terms of their environmental, marine traffic and port operations impacts, cost and speed of construction, resistance to wind and seismic activities, safety of construction, flexibility of profile and vulnerability to damage, it is considered that offshore routes are feasible for highway connection in the form of tunnel and bridge. While only inland railway tunnel would be feasible for railway connection.
- 2.3.15 In relation to the highway connection, only tunnel form would be able to achieve zero permanent reclamation within Victoria Harbour. Bridge form would involve permanent reclamation due to the pile caps and affected water area underneath the bridge. The bridge form would also impose permanent constraints on vessel aircraft, and would cause more significant landscape and visual impact to the surrounding areas. Therefore, tunnel form is recommended under this Study. Subject to further studies, we do not preclude the bridge form if the associated impacts could be mitigated and justified.
- 2.3.16 For the structural form, the horizontal alignments for both highways and railway connections can be achieved by tunnel in the form of IMT or TBM as discussed above. Both IMT and TBM will inevitably have different issues, such as impacts on marine traffic during construction, land requirements at Kennedy Town, permanent reclamations within Victoria Harbour, etc. This preliminary Feasibility Study identifies these issues and records them for future studies, to ascertain the various temporary and permanent impacts and to determine whether there are surmountable or insurmountable issues as well as whether mitigation measures are available. From this Study, it is initially assessed that both IMT and TBM options are to be technically feasible and the environmental impact, while it is greater for IMT tunnel, could be acceptable². The impact on marine traffic of IMT and TBM will need to be fully ascertained in future studies with a detailed Marine Traffic Impact Assessment and stakeholder consultations to look into any possible mitigation measures. In consideration of the requirements of PHO and HPLB TC No. 1/04, any new proposals should start with an assumption of zero reclamation within Victoria harbour. Both tunnel construction methods shall be re-visited in future studies taking into consideration of the findings from Marine Traffic Impact Assessment. IMT also has a number of advantages relating to gradients, cross passage requirement, construction safety, construction cost and programme. It is therefore recommended that the IMT tunnel as one of the possible structural forms for the Transport Infrastructure across busy fairways and channels under this assignment. Followings are the limitations for adopting TBM tunnelling

² Environmental impacts associated with the construction options of IMT and TBM will need to be assessed fully in a future Environmental Impact Assessment (EIA) study in order to identify the necessary environmental mitigation measures and to ascertain the environmental acceptability.

scheme for the proposed Transport Infrastructure identified under the Study for further assessments in future studies.

- 2.3.17 With regards to the offshore route, the proposed landfall will be located at the north of Kennedy Town. There is lack of a suitable undeveloped coastline for the landfall connection, construction of the portal for the submarine tunnels and the approach structures. Restriction on permanent reclamation under the Protection of the Harbour Ordinance is a major constraint that has to be considered. The vertical profile of the proposed Transport Infrastructure is mainly controlled by the vertical gradient of the approach ramp and the soil cover below the seabed. The extent of permanent reclamation for TBM will therefore be significantly larger than that for IMT tunnel since TBM tunnel will be relatively deeper in order to obtain adequate ground cover for boring.
- 2.3.18 With regards to the inland route, the proposed landfall will be located at the west of Mount Davis where high rock head is expected. When TBM tunnelling method is adopted, the TBM shall be equipped with cutter discs and stone crusher for rock excavation. The rate of boring will become slow and damage of cutter tools are anticipated. Given the high hydrostatic pressure, for cutterhead maintenance would have to be carried out under compressed air condition. This is a very high risk construction activity.
- 2.3.19 In relation to the railway connection, vertical profile and its gradient is critical to railway construction. Vertical profile of TBM tunnel would be deeper than that of the IMT tunnel in order to have adequate ground cover for boring. As a result, it would constraint the feasibility of adopting TBM tunnelling for the railway connection to the existing Kennedy Town Station of the West Island Line due to substantial level difference.

2.4 Scheme of Transport Infrastructure with Combined Highway and Railway Connections

- 2.4.1 Based on the highway and railway horizontal alignment requirements as well as the constraints identified in the Study, the tunnel will be merging at approximately half way across the Western Fairway. This option is not preferred as it will limit the alignment flexibility at ELM and increase the engineering complexity with construction of a tunnel junction within Western Fairway which has an average depth of approximately -30mPD, thus implication to construction risk and cost. Construction of the tunnel junction would require temporary reclamation of approximately 25Ha within the Western Fairway and would cause severe disruption to the existing traffic along the Fairway during construction. The impact to the Western Fairway for the combined connection is considered to be unacceptable as Western Fairway is the only major route to Kwai Tsing Container Terminals with no restriction on aircraft. **Diagram 2.4** indicates the approximate alignment and tunnel junction location of the combined route. It is expected that the cost benefit of a combined connection would diminish if the tunnel junction is located to the west of the Western Fairway. The scheme with combined Highway and Railway Connections would need to be reviewed in future studies if the alignments of the possible schemes are different as a result of changes to the consideration of the Study.

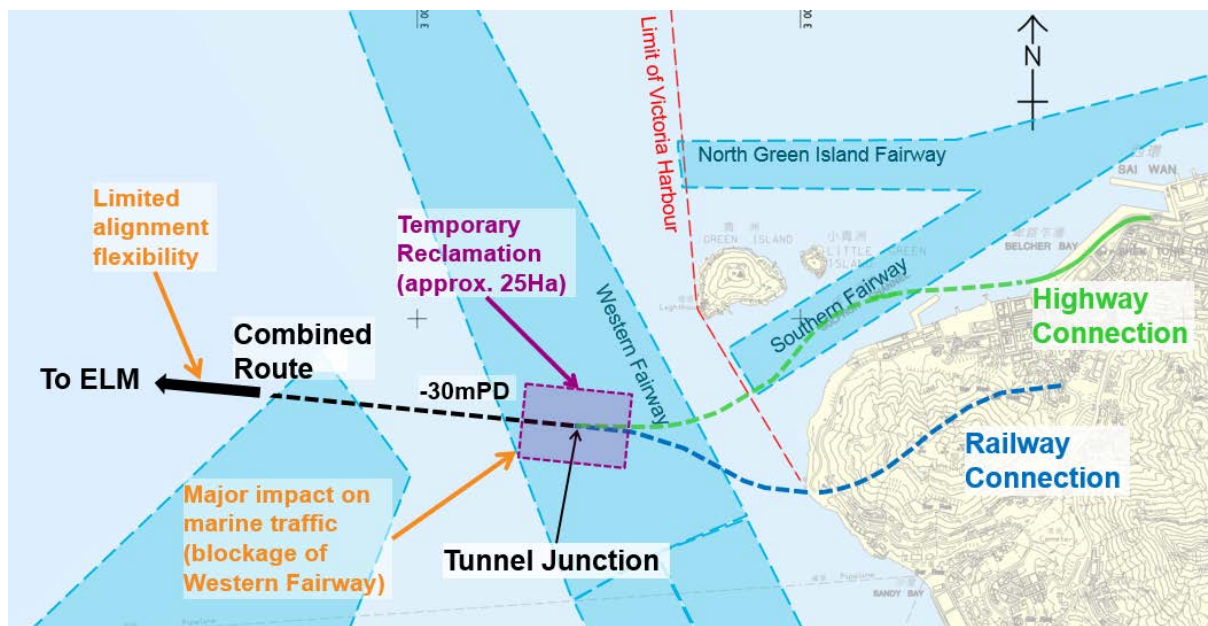


Diagram 2.4 - Alignment and Tunnel Junction of the Combined Route

3 POSSIBLE ALIGNMENT SCHEMES FOR HIGHWAY CONNECTION

3.1 Possible Scheme of Highway Connection without Linkage to the Potential Route 4 Extension

- 3.1.1 The highway Transport Infrastructure shall provide direct connection with the existing strategic road of Hong Kong Island in order to maintain the completeness of the whole strategic road network in the territory.
- 3.1.2 Connaught Road West (Route 4) is the road artery along the west Hong Kong Island that ends at Kennedy Town connecting to Central. Linking to existing Route 4 with connecting point at Kennedy Town should be the most reasonable option. The connection occurs approximately 150m west of the Hill Road at Kennedy Town. Currently 2 temporary ramps are provided for the use by local traffic to connect into ground level roads at Kennedy Town. Adequate clearance should be allowed for the new flyover to span over the existing roads and tramline.
- 3.1.3 From the reserved stub end at Existing Connaught Road West Flyover, the Transport Infrastructure will first turn southwards to run along the shoreline of WDPCWA. The Transport Infrastructure will then turn northwards to run outside the shoreline of Kennedy Town, so as to avoid the existing development such as The Merton and Manhattan Heights.
- 3.1.4 From the point of passing the existing developments, the Transport Infrastructure can either turn inland to avoid / minimize the reclamation within Victoria Harbour, or turn offshore to avoid the constraints in the north-west harbourfront of Hong Kong Island. The structural form can either be long span bridge or subsea tunnel. For subsea tunnel, IMT tunnel is adopted for further development in this Study.

Possible Scheme H1-1 – Offshore Tunnel

- 3.1.5 The layout of this Possible Scheme H1-1 is shown in **Diagram 3.1**. The offshore tunnel scheme starts from the reserved stub ends at Connaught Road West Flyover and turn southwards. The Transport Infrastructure will then run along the shoreline of WDPCWA while lowering to the level below existing seabed and run outside New Praya Kennedy Town. The Transport Infrastructure then turns northwards from WDPCWA. In the meantime, it reaches the desirable level of 2 metres below existing seabed level for tunnel protection. At this point, the Transport Infrastructure turns northwards in the offshore scheme and avoids the Land Use Review on the Western Part of Kennedy Town.
- 3.1.6 The Transport Infrastructure will descend at the section above WDPCWA, so as to achieve the desirable level of subsea tunnel. The reduction in speed of goods vehicles and buses for going up will be compensated by the provision of a climbing lane for the section of eastbound depressed road and flyover abutment in accordance with relevant design requirements. Since the Transport Infrastructure will be mainly straight at this section of larger gradient, the potential safety issue from the larger gradient is considered to be less significant.

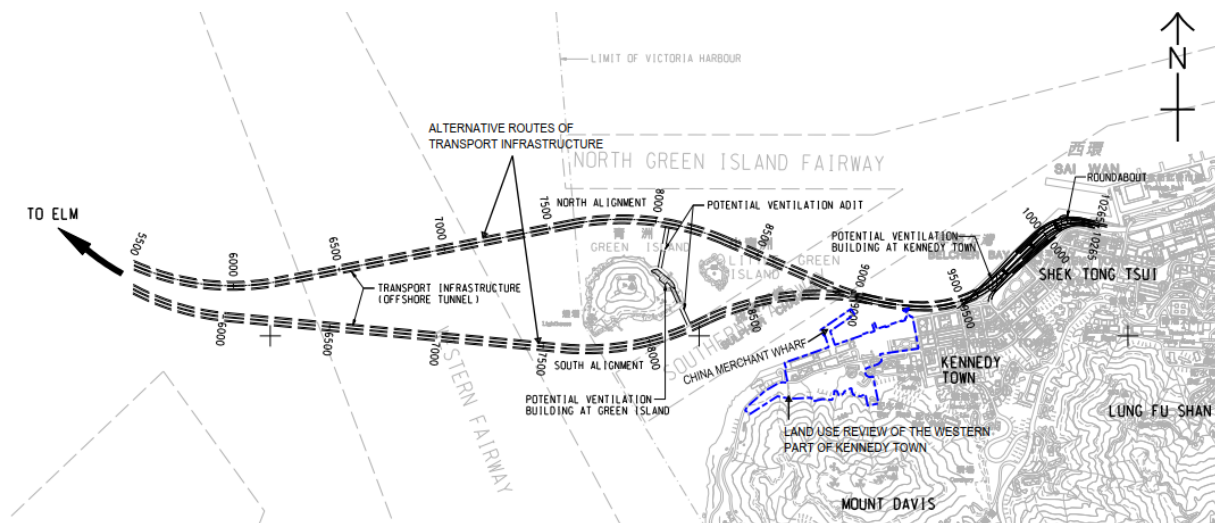


Diagram 3.1 Scheme H1-1 Overall Layout Plan

3.1.7 For a more straight forward connection, the Transport Infrastructure can pass the Green Island and Little Green Island from south. Alternatively, the Transport Infrastructure can also pass the Green Island and Little Green Island from north. By adopting this alternative arrangement, the Transport Infrastructure will be further away from the existing China Merchant Wharf to reduce the impact on the wharf operation during construction. The length of the northern tunnel encroaching into Southern Fairway is shorter than that of the southern tunnel, resulting in less impact on marine traffic of Southern Fairway. There are coral communities along the northern shore and southern shore of Green Island. The south alignment of the possible scheme (south of the Green Island) would have direct impact on the coral community along the southern shore while alternatively the north alignment would avoid direct impact on the coral community occurring along the northern shore of Green Island. The White-bellied Sea Eagle (WBSE) nesting site on Green Island is active. The potential impact on coral, water quality and terrestrial ecological impact to WBSE shall be assessed and mitigation measure, if required, shall be proposed in future studies. Refer to **Diagram 3.2** and **3.3** for illustrations on the overall view, connectivity and main features of this scheme.



Diagram 3.2 Possible Scheme H1-1 – Overall View

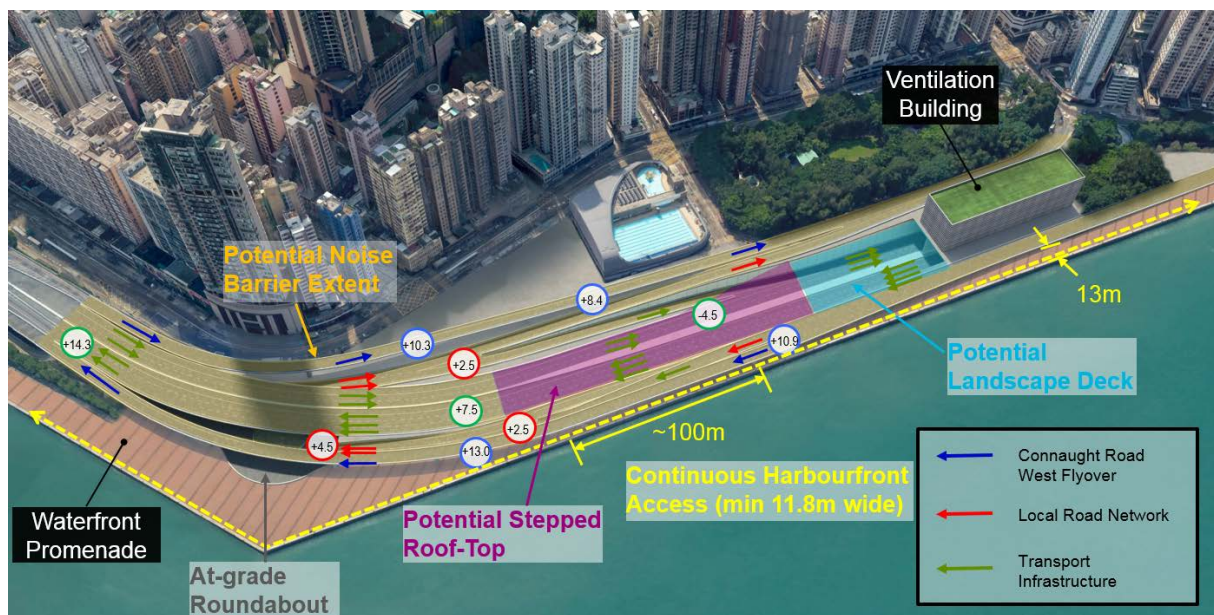


Diagram 3.3 Possible Scheme H1-1 – Connectivity, Tunnel Portal & Landfall

3.2 Possible Schemes of Highway Connection with Linkage to the Potential Route 4 Extension

- 3.2.1 Route 4 Extension– Section between Kennedy Town and Aberdeen (previously known as Route 7) was planned at Kennedy Town in year nineteen-nineties. For the former Route 7 between Kennedy Town and Aberdeen, 8km dual 3 lanes carriageway was proposed to connect Kennedy Town and Aberdeen to relieve the traffic congestion at Aberdeen Tunnel and Pok Fu Lam Road.
- 3.2.2 Two options were proposed for the potential Route 4 Extension. In the first option, the Route 4 Extension would run foreshore across Sandy Bay after going through Mount Davis. In the other option, the Route 4 Extension would run inland between Kennedy Town and Aberdeen. Potential Route 4 Extension could likely relieve the loading of the major north-south corridor at Hong Kong Island, i.e. Pok Fu Lam Road and Aberdeen Tunnel.
- 3.2.3 To ensure potential connection of Route 4 Extension to Western Hong Kong Island is not impeded by the Transport Infrastructure, possible schemes of the highway connection with linkage to the potential Route 4 Extension are developed based on the schemes without linkage to Route 4 Extension, taking into consideration constraints posed by PHO and existing / planned developments in Kennedy Town. Different options of alignments, structural forms and interchange locations were explored to identify the possible options.

Possible Option H2-1A (Route 4 Extension in bridge form with Interchange at Kennedy Town)

- 3.2.4 The layout of this Possible Option H2-1A is shown in **Diagram 3.4**. The offshore route, while may cause implication related to PHO, avoids the constraints posed by the existing / committed / planned developments in Kennedy Town. The offshore tunnel scheme (Possible Scheme H1-1) is adopted as the basis of this scheme under the scenario with linkage to potential Route 4 Extension to minimize the reclamation within the Victoria Harbour.
- 3.2.5 As for the potential Route 4 Extension, this possible scheme follows the original design intention, i.e. to provide direct connection between Kennedy Town and Aberdeen. The interchange is proposed in Kennedy Town. A roundabout junction at Shing Sai Road is proposed to improve the junction capacity for the interchange between existing Route 4, the Transport Infrastructure, local road network and potential Route 4 Extension.

3.2.6 In case the marine viaduct Route 4 Extension runs foreshore, it will run along the existing shoreline, while allowing sufficient headroom / aircraft for the operation of China Merchant Wharf and Island West Transfer Station. After passing the Island West Transfer Station, the Route 4 Extension would turn southwards heading to Aberdeen. The alignment of viaduct would be more flexible than the subsea tunnel. The Route 4 Extension in this scheme can join at Sandy Bay.

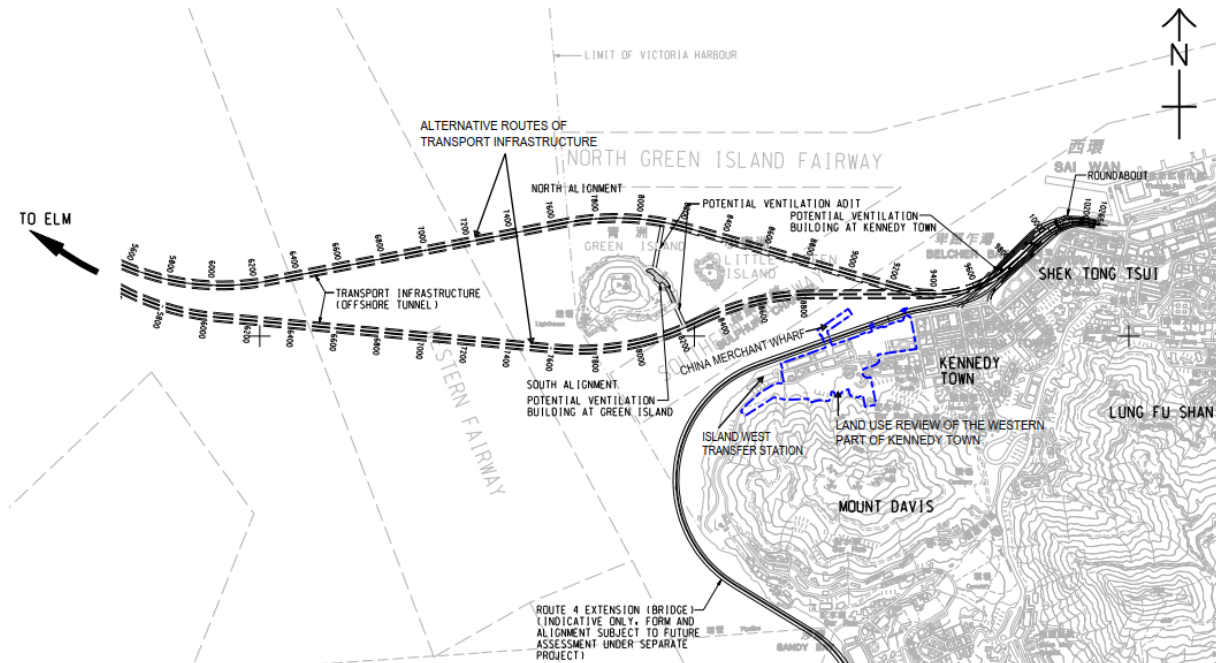


Diagram 3.4 Option H2-1A Overall Layout Plan

3.2.7 The Route 4 Extension in this scheme is likely to cause considerable visual impact to the visually sensitive receivers. Permanent Reclamation would be required for the pier and pile cap of the bridge structure. Also, in order to accommodate the foreshore marine viaduct, the Transport Infrastructure will need to be shifted away from the existing seawall. In order to avoid permanent reclamation within the Victoria Harbour, the shifted Transport Infrastructure in this Possible Option H2-1A shall adopt a steeper gradient for the section from tunnel portal towards Connaught Road West Flyover. Refer to **Diagram 3.5**, **3.6** and **3.7** for illustrations on the overall view, connectivity and main features of this scheme.



Diagram 3.5 Possible Options H2-1A & H2-1B – Overall View (Before Implementation of Route 4 Extension)



Diagram 3.6 Possible Options H2-1 A & H2-1B – Tunnel Portal & Landfall (Before Implementation of Route 4 Extension)



Diagram 3.7 Possible Option H2-1A – Overall View (After Implementation of Route 4 Extension – Bridge)

3.2.8 No significant direct marine and terrestrial ecological impacts are anticipated from the Route 4 Extension. Given the structural form of IMT, which is below the existing seabed level, there will be no permanent seabed loss. The White-bellied Sea Eagle (WBSE) nesting site on Green Island is active. The potential impact on coral, water quality and terrestrial ecological impact to WBSE shall be assessed and mitigation measure, if required, shall be proposed in future studies. On the other hand, there are uncertain marine archaeological potential. Particularly focused should be placed along the future alignment of the Route 4 Extension that could disturb the seabed.

Possible Option H2-1B (Route 4 Extension in tunnel form with Interchange at Kennedy Town)

3.2.9 The layout of this Possible Option H2-1B is shown in **Diagram 3.8**. The structural form of subsea tunnel is assumed for Route 4 Extension in this possible scheme. The subsea tunnel will significantly reduce the water area affected by the form of marine viaduct in Possible Option H2-1A and also minimize the landscape and visual impact. The ventilation building for Route 4 Extension in this scheme is likely to cause visual impact to the visually sensitive receivers.

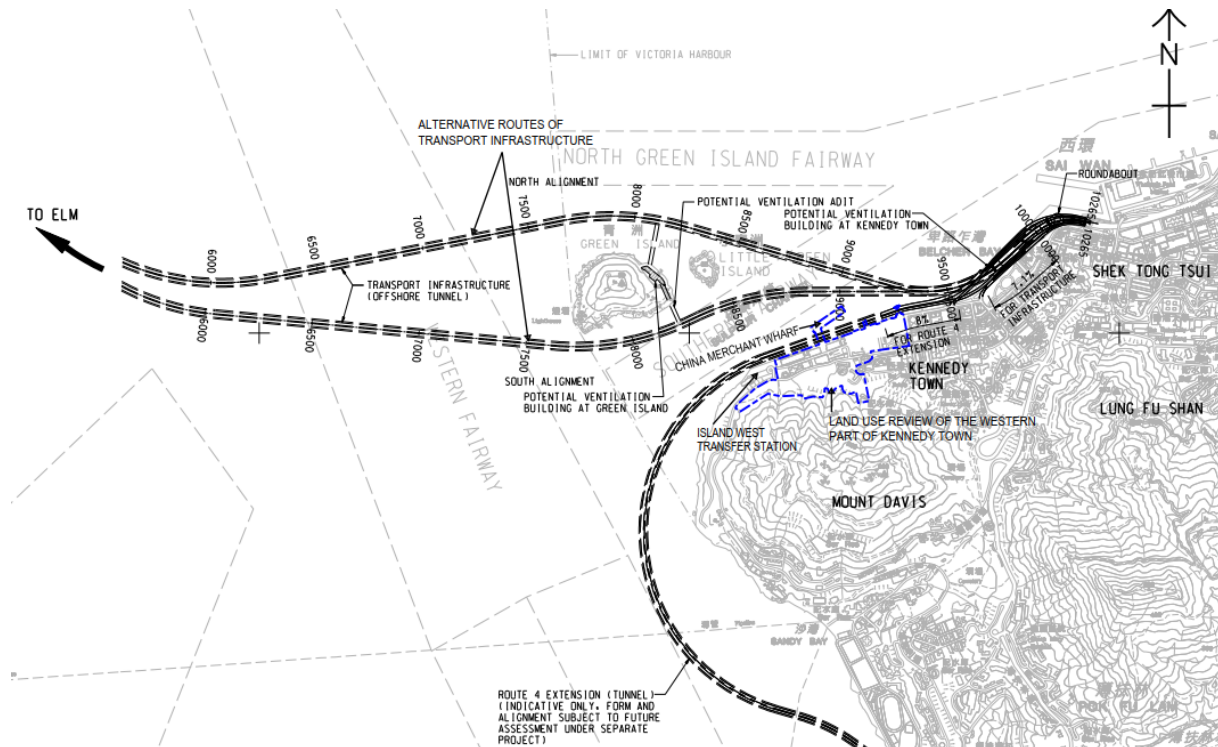


Diagram 3.8 Option H2-1B Overall Layout Plan

3.2.10 Similar to the Possible Option H2-1A, a roundabout junction will be provided at Shing Sai Road for the interchange between existing Route 4, the Transport Infrastructure, local road network and potential Route 4 Extension. From the offshore slip roads that connect to the roundabout junction, the Route 4 Extension runs along the shoreline of Kennedy Town towards west. As the Route 4 Extension will turn southwards after the Island West Transfer Station, it needs to cross the Transport Infrastructure at a higher level and runs along the shore line of Kennedy Town between the existing seawall and the subsea tunnel of Transport Infrastructure. Similar to the Possible Scheme H2-1A, it will not be able to avoid the impacts on China Merchant Wharf and reclamation within Victoria Harbour (Approximately 3.15 Ha permanent reclamation and 0.4 Ha water area to be affected by marine viaducts).

3.2.11 After passing the Island West Transfer Station, the Route 4 Extension would turn southwards heading to Aberdeen. Larger turning radius is required for the subsea tunnel to facilitate the construction and placement of IMT tunnel. The Route 4 Extension in this option will have the same alignment as Possible Option H2-1A south of Telegraph Bay. Refer to **Diagram 3.9** and **3.10** for illustrations on the overall view, connectivity and main features of this scheme.



Diagram 3.9 Possible Option H2-1B – Overall View (After Implementation of Route 4 Extension – Tunnel)

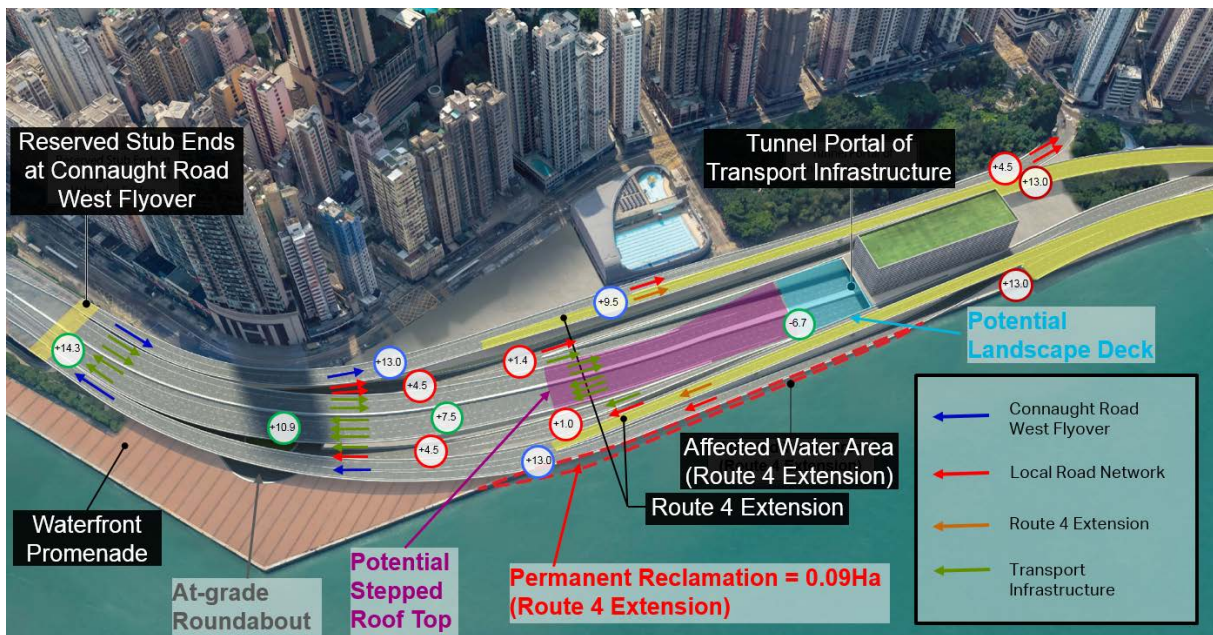


Diagram 3.10 Possible Options H2-1A & H2-1B – Tunnel Portal & Landfall (After Implementation of Route 4 Extension – Tunnel/Bridge)

Possible Scheme H2-3 (Grade Separated Interchange outside Victoria Harbour without weaving and Dedicated Lane to Aberdeen)

3.2.12 The Possible Scheme H2-3 landfall and connections would be similar to Possible Scheme H2-1B with a wider tunnel portal for 2 additional R4E eastbound lanes. The layout is shown in **Diagram 3.11**. It is considered that this possible scheme would have similar land, marine, environment, landscape and visual impacts as Possible Option H2-1B as discussed above. This scheme is developed based on exploring the permanent reclamation requirement with direct connections to Connaught Road Flyover and local road networks via the at-grade roundabout instead of provision of weaving lane at the Kennedy Town tunnel landfall.



- ### 3.3 Summary

- AECOM**

- 3.3.2 Under the scenario “with linkage to potential Route 4 Extension”, in view of the discussions above and in accordance with HPLB Technical Circular No. 1/04, Options H2-1A, H2-1B and Scheme H2-3 are considered as the possible options/scheme for further studies if Route 4 Extension is needed in the future. Permanent reclamation is not required for the implementation of Scheme H2-1A and H2-1B prior to implementation of Route 4 Extension; but is required for the implementation of Route 4 extension under Scheme H2-1A and H2-1B or provision for Route 4 Extension under Scheme H2-3. However, there exist uncertainties for these possible options/scheme due to the traffic performance, technical feasibility, marine traffic impacts and potential environmental impacts arising from the potential Route 4 Extension. The feasibility of these options/scheme is subject to further studies.

4 POSSIBLE ALIGNMENT SCHEMES FOR RAILWAY CONNECTION

4.1 New Railway Corridors in Kennedy Town

- 4.1.1 The Transport Infrastructure will have direct interface with land use proposals and their implementation programme at Kennedy Town and its nearby area of Hong Kong Island. It was also recognised that any potential railway connections in urban areas in particular western area Hong Kong Island would be technically challenging.
- 4.1.2 It is noted that the direct extension of the ISL to the ELM would not only be constrained by the existing as-built railway infrastructure but also by the existing estate developments in the western part of Hong Kong Island. If an extension of the ISL/WIL cannot be developed, a new corridor serving between the ELM and Kennedy Town shall be explored with the identification of a station location that is close to the existing/planned railways to facilitate convenient interchange between the different railway lines.
- 4.1.3 This study primarily focuses on the railway infrastructure between the ELM and western part of Hong Kong Island. It has evaluated different tunnel forms and alignments of the recommended railway Infrastructure between ELM and Hong Kong Island from across busy fairways and channels onto the land connections with the existing railway infrastructure.

4.2 Possible Schemes Alignment

- 4.2.1 The layout of the possible alignment schemes for railway connection are shown in **Diagram 4.1**.

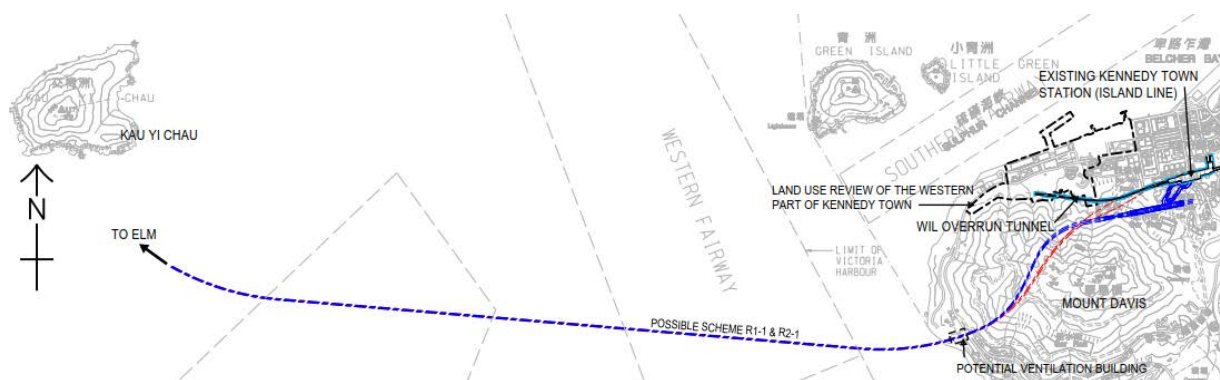


Diagram 4.1 Possible Schemes – Overall Layout Plan

Possible Scheme R1-1 – Extension of the ISL

- 4.2.2 This is a possible scheme by extending the existing ISL to the ELM (**Diagram 4.2** and **4.3** refer). The starting point of the scheme is from the existing overrun tunnel of the ISL/WIL. The KET Station is located at a shallow level (rail level is approximately -5.3mPD) relative to the ground level. The future road network and the nearby residential buildings, such as Sai Wan Estates and Kwun Lung Lau constrain the horizontal alignment. The vertical alignment would also need to drop relatively quickly from the KET Station passing through Mount Davis to the landing point of the IMT tunnels. The IMT section runs westward to the south of Kau Yi Chau, where the seabed level is about -5mPD. The middle section of the marine portion of the alignment runs across the Western Fairway where the seabed level is around -30mPD.
- 4.2.3 The tunnel crossing between ELM and Hong Kong Island would be formed by IMT tunnel with an invert level of -24mPD at the landing point west of Mount Davis. It is noted that a tunnel crossing with TBM tunnel is not feasible as the railway alignment would not be able to

descend to -48mPD at the landing point, with a maximum design gradient of 4%, in order to provide sufficient cover below the seabed for TBM tunnel construction.



Diagram 4.2 Possible Scheme R1-1 – Overall Layout Plan

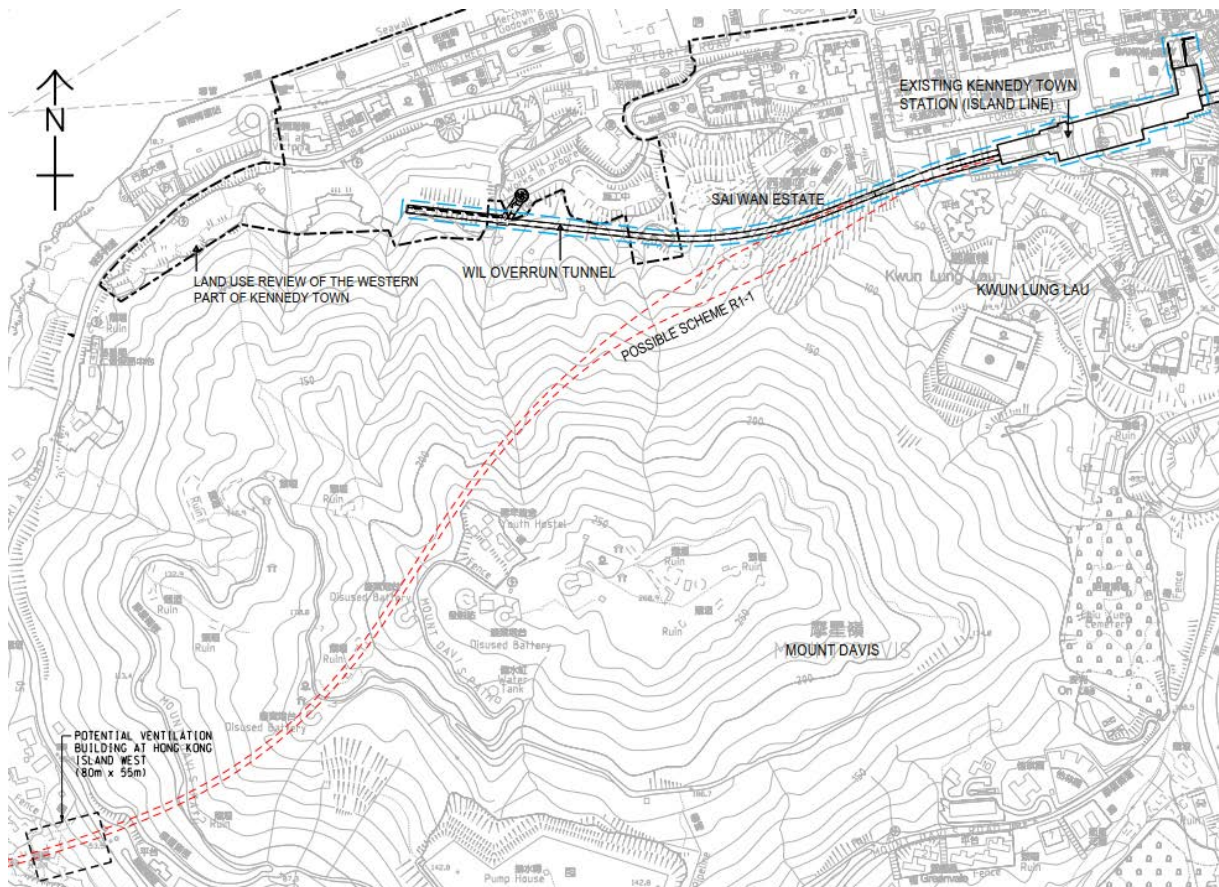


Diagram 4.3 Possible Scheme R1-1 – Details of Inland Section

Possible Scheme R2-1 – New Railway Line

- 4.2.4 This is a possible scheme by forming a New Railway Line from the ELM to Kennedy Town (**Diagram 4.4** and **4.5** refer). From the landing point of the subsea crossing, the railway runs eastwards under Mount Davis towards the new station at Kwun Lung Lau. For this scheme, there is no constraint on the subsea tunnel form and it can be either an IMT or bored tunnel option as there is no need to make a connection with the existing WIL overrun tunnel.

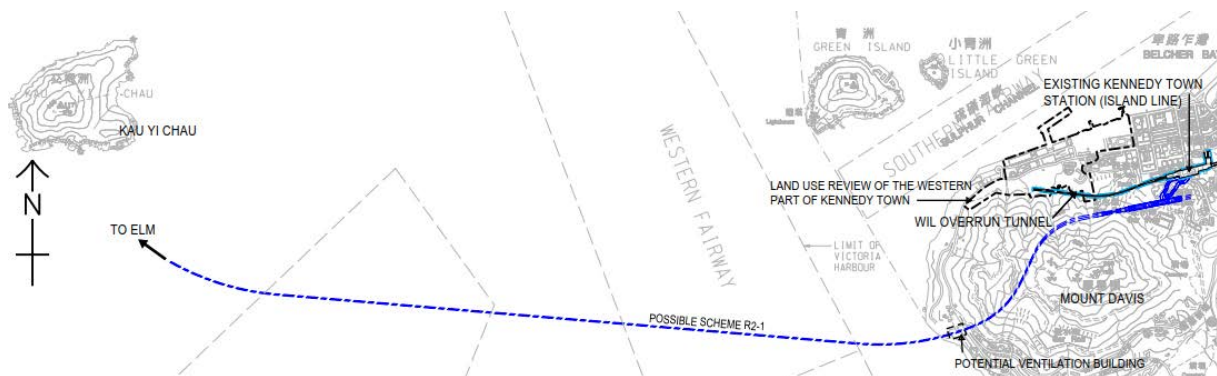


Diagram 4.4 Possible Scheme R2-1 – Overall Layout Plan

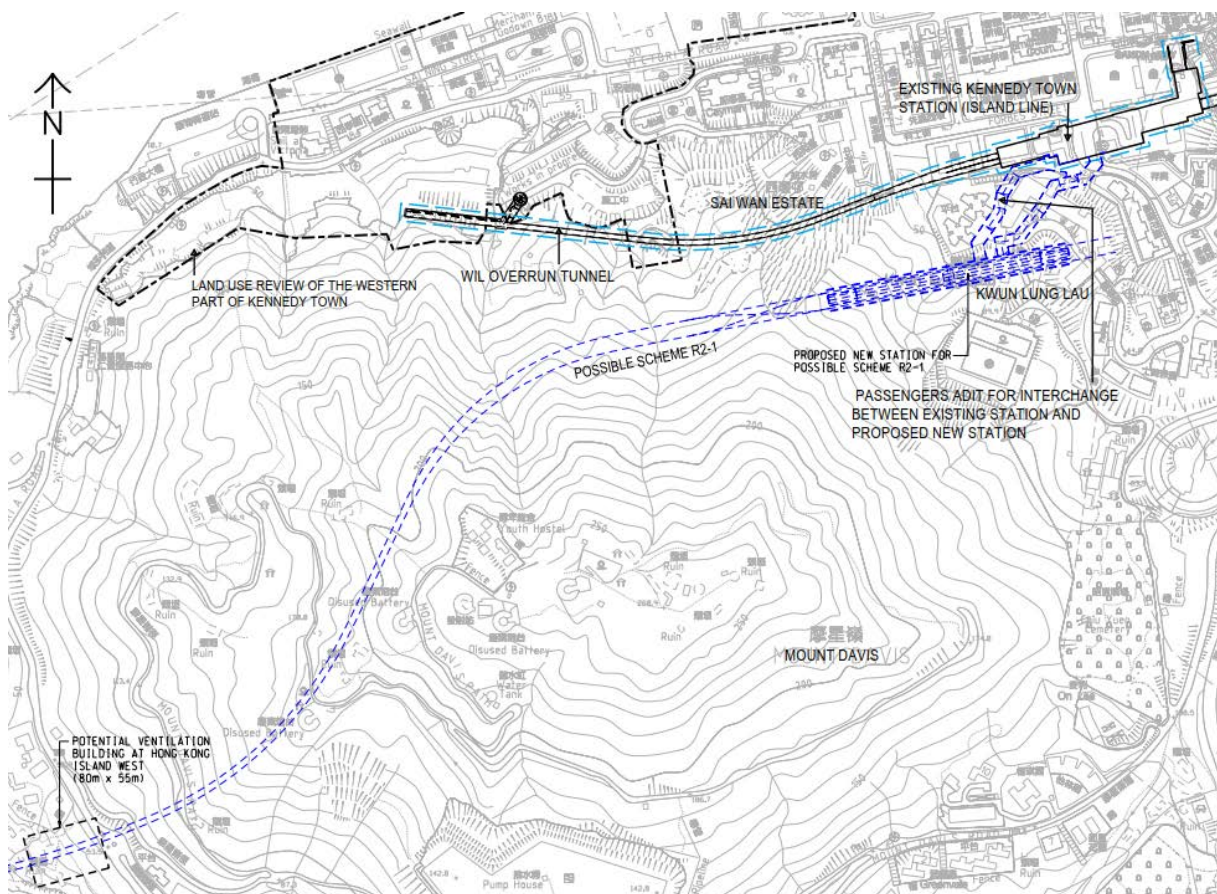


Diagram 4.5 Possible Scheme R2-1 – Details of Inland Section

4.3 Summary

- 4.3.1 Two possible railway connection schemes (R1-1 and R2-1) has been identified in this Study. Possible Scheme R1-1 is formed by an extension of the existing Island Line (ISL); whereas Possible Scheme R2-1 is formed by a new railway line. Summary on the findings of the possible schemes are presented below.

Possible Scheme R1-1 - Extension of the Island Line

- 4.3.2 For Possible Scheme R1-1, it would be expected to run with 8-car Urban Railway Line (URL) trains and provide a through running service to the ELM, i.e. the ISL would be extended from the Kennedy Town Station (KET) to the ELM. The train service and operating hours would match those of the ISL service.
- 4.3.3 As this possible scheme is formed by the extension of the existing ISL from the KET Station, a new station is not required at Kennedy Town, only new tunnel infrastructure and associated facilities will be required such as ventilation building, etc. The catchment area of the existing ISL service would remain the same as there is no new station for this possible scheme.
- 4.3.4 From a passenger point of view, this option would be the most convenience as there is no need to interchange to another railway line, people travelling from the ELM on the ISL stay on the railway to reach various destinations on the north shore of Hong Kong Island. Passengers from the ELM could simply ride the ISL into the Central Business District (CBD) without changing trains. However, the URL train speeds are relatively slower compared to the District Lines and the train journey time will take slightly longer.
- 4.3.5 The construction of the ISL extension requires connecting the new tunnels to the existing WIL overrun tunnel, which is in operation. The construction of the connection and junction chamber with the existing overrun tunnel will be extremely difficult to build and is of very high risk due to the need to carry out the works in an operational environment. The poor ground conditions where the connections are to be made and the nearby building constraints make the construction works even more technically difficult.

Possible Scheme R2-1 - A New Railway Line

- 4.3.6 Possible Scheme R2-1 could be designed as a District Line, and potentially form a strategic railway corridor route to North Lantau/Tuen Mun via the ELM. The transport infrastructure could therefore be designed to meet the forecast patronage demands and use rolling stock with higher speeds (up to 130 km/h or more) to reduce the journey time and be more attractive to rail users.
- 4.3.7 The New Railway Line has the advantages over the Extension of the ISL in the following aspects:
- It is neither restricted by the capacity of the ISL nor the design standards such as speed, signalling system and rolling stock type, etc.;
 - It does not need to make a connection and break-in to the WIL overrun tunnel which, based on preliminary study, would be very difficult and may impact on the existing railway in operation;
 - The new station would potentially increase the catchment of the railway network in the Kennedy Town area;
 - The connection to the existing KET Station is relatively simple by passenger adits; and
 - Potential extension of the new rail line into other parts of Hong Kong Island.

- 4.3.8 From a passenger point of view, this possible scheme is less convenient than the direct extension of the ISL as passengers need to interchange at KET Station to the ISL.
- 4.3.9 The two possible scenarios for railway connection for the ELM to Kennedy Town should be brought forward for further investigation in the next stage of implementation.

5 IMPLICATION ON DEVELOPMENTS AT KENNEDY TOWN

5.1 Administrative Route Protection Plans

- 5.1.1 Administrative Route Protection Plans have been formulated with an aim to identify the area potentially to be affected by the possible alignments of the highway and railway connections for the Transport Infrastructure, taking into consideration tentative buffer zones allowing for sufficient construction space, for assessing the possible potential implications on the existing / planned developments on Kennedy Town. These potential implications are summarized in this section.

5.2 Potential Implication on Existing Developments

Existing Land Uses potentially affected by Highway Connection of the Transport Infrastructure

- 5.2.1 The Administrative Route Protection Boundary of highway connection of the Transport Infrastructure is prepared to protect the elevated road, at-grade road, depressed road, piers and abutment, tunnel portal, tunnel structure and dredging area.
- 5.2.2 In the densely developed Kennedy Town, the adverse impact from the construction on the existing and proposed developments should be minimized. The alignment of the Transport Infrastructure has been designed to follow existing Shing Sai Road to minimise additional land requirement where possible. The construction area boundary should be carefully planned to avoid affecting the Kennedy Town Swimming Pool and Belcher Bay Park along Shing Sai Road and the residential buildings along New Praya, Kennedy Town.
- 5.2.3 In the possible schemes for highway connection of the Transport Infrastructure, the proposed landfall of the Transport Infrastructure tunnel, the slip roads and roundabout for connection to the existing road network would occupy the WDPCWA and the coastal praya areas along the waterfront of Kennedy Town. This area is Government Land Allocations (GLAs), clearance of GLA would be required. There are currently 51 nos. of parking spaces for goods vehicles and 62 meters of roadside night time parking for goods vehicles. The potential re-provision should also be explored in future studies.
- 5.2.4 Kennedy Town (Belcher Bay) Bus Terminus is to be occupied and clearance of GLA would be required. The impact on this area would be subjected to the schedule of the relocation of the temporary bus terminus. In the event that the bus terminus could not be relocated before the construction of the Transport Infrastructure for highway connection, the bus terminus may need to be re-provisioned in the vicinity to maintain the existing level of bus services and cater for the passenger demand. Planning Department and Transport Department shall be further consulted before the implementation of the Transport Infrastructure. This should be explored in future studies.
- 5.2.5 There are five piers and a wharf located along the coastal praya areas along the waterfront of Kennedy Town, they are Davis's Street Pier, Kennedy Town Old Cattle Pier, Kennedy Town Poultry Pier, Kennedy Town Abattoir Pier, Kennedy Town Incinerator Pier and China Merchant Wharf. Except Kennedy Town Incinerator Pier, the other four piers and the wharf fall within or partially fall within the Administrative Route Protection Boundary. Davis's Street Pier is a government pier for municipal use. Kennedy Town Old Cattle Pier, Kennedy Town Poultry Pier and Kennedy Town Abattoir Pier were temporarily used for WIL construction and there is currently no access allowed for the public.
- 5.2.6 The alignment of the Transport Infrastructure has been designed to avoid adverse impact on the China Merchant Wharf. By adopting the north alignment, the Transport Infrastructure would be further away from the existing China Merchant Wharf to reduce the impact on the

wharf operation during construction. Detailed impact assessment on the existing China Merchant Wharf should be carried out in future studies.

- 5.2.7 No housing flats, community facilities and open space would be lost due to the proposed Transport Infrastructure for highway connection. However, temporary loss of existing open spaces at the waterfront of WDPCWA during construction is unavoidable.

Existing Land Uses potentially affected by Railway Connection of the Transport Infrastructure

- 5.2.8 The Administrative Route Protection Boundary of Railway Connection is prepared to protect the underground station, entrance, passenger adit, tunnel structure and dredging area.
- 5.2.9 For railway connection Possible Scheme R1-1, the Transport Infrastructure would connect to the existing railway system at Kennedy Town Station. In Possible Scheme R2-1, a new railway line is proposed with the station connecting to the existing Kennedy Town Station with 2 passenger adits. The new station is located near Kwun Lung Lau.
- 5.2.10 As the proposed railway connection of the Transport Infrastructure would adopt tunnel form and the proposed new railway station with passenger adits in Possible Scheme R2-1 are underground structures, the proposed railway connection may run through some areas at underground. During construction, temporary occupation would be required for construction of station, entrances and passenger adits.
- 5.2.11 No housing flats, community facilities and open spaces would be lost due to the proposed railway connection of the Transport Infrastructure. However, environmental nuisance to the nearby residents during construction and operation of the TI should be minimized.

5.3 Potential Implication on Planned Developments

Planned Developments potentially affected by Highway Connection of the Transport Infrastructure

- 5.3.1 In the possible scheme for highway connection of the Transport Infrastructure, the proposed landfall of the Transport Infrastructure tunnel, the slip roads and roundabout for connection to existing road network would occupy the WDPCWA and coastal praya areas along the waterfront of Kennedy Town. This area is proposed to be a waterfront open space under the Western Harbourfront Conceptual Master Plan. On the Draft Kennedy Town & Mount Davis OZP, there is a planning intention to provide a promenade at the waterfront. There is a shortage of public open space in the district.
- 5.3.2 Kennedy Town (Belcher Bay) Bus Terminus is rezoned as “Open Space” in the draft Kennedy Town & Mount Davis OZP to facilitate the implementation of the public open space / promenade. A piece of land along the waterfront to the west of Cadogan Street is rezoned from “Undetermined” (“U”) to “Open Space (1)” (“O(1)”). Kennedy Town Old Cattle Pier, Kennedy Town Poultry Pier, Kennedy Town Abattoir Pier and Kennedy Town Incinerator Pier are incorporated into the planning scheme area and zoned to “O(1)”. The China Merchant Wharf is also rezoned to “OU” annotated “Commercial, Leisure and Tourism Related Uses” (“OU(Commercial, Leisure and Tourism Related Uses)”).
- 5.3.3 The Kennedy Town Old Cattle Pier, Kennedy Town Poultry Pier and Kennedy Town Abattoir Pier would be temporarily affected during construction and reinstated for future public open space after construction. No impact on the Kennedy Town Incinerator Pier is anticipated.
- 5.3.4 Loss of the waterfront area of WDPCWA is unavoidable. Mitigation measures have been explored to enhance connectivity and accessibility to the waterfront. The space underneath

the elevated structure may accommodate the sports facilities and cycle tracks, while landscape deck with resting area and viewing pavilion can be provided to reduce the visual impacts. Provision of the other community facilities including sports, cultural and other social services venues may also be considered.

- 5.3.5 Stepped roof-top could be provided to cover the portal area and develop into open space or other community uses on top of it. The stepped roof-top is not practical to construct above the abutment and elevated section of the Transport Infrastructure as the level of the stepped roof-top would be at least +13mPD which would lead to visual impact to the residential area nearby. Therefore, the possible stepped roof-top extent is limited to the area between portal and abutment of the Transport Infrastructure.
- 5.3.6 A future harbourfront access from Kennedy Town to Sai Wan can be provided between the northernmost slip road of the Transport Infrastructure and coastline. The minimum walkway widths are different under scenario 1 (without linkage to Route 4 Extension) and scenario 2 (with linkage to Route 4 Extension). A continuous walkway can be provided along the existing waterfront under scenario 1 but only before the implementation of Route 4 Extension under scenario 2.
- 5.3.7 Minor reconfiguration of the interchange at WDPCWA is needed during the implementation of Route 4 Extension. After the implementation of Route 4 Extension, this waterfront space allowed for walkway would be segregated and occupied by the eastbound carriageway of the Route 4 Extension. Boardwalk outside the existing seawall and underneath the northernmost slip road of the Transport Infrastructure could be provided to connect the harbourfront walkway. The potential measures to provide a continuous walkway will be studied in future studies of Route 4 Extension if necessary.

Planned Developments potentially affected by Railway Connection of the Transport Infrastructure

- 5.3.8 The proposed railway connection of the Transport Infrastructure would adopt tunnel form and the proposed new railway station with a passenger adit in Possible Scheme R2-1 are underground structures. To protect these underground structures, all new buildings and engineering works including utilities works within the limits of the route protection boundary shall be subject to special scrutiny of the Government prior to giving approval to any plans and/or consent for commencing construction works. Areas above the proposed alignment of railway connection of the Transport Infrastructure and areas within the Administrative Route Protection Boundary may be restricted from future development. No future development is planned within the Administrative Route Protection Boundary of Railway Connection except the Strategic Cavern Area No. 41.
- 5.3.9 As set out in the Cavern Master Plan, Mount Davis accommodates the Strategic Cavern Area No. 41. The railway connection of the Transport Infrastructure will need to avoid the strategic cavern area as far as practicable. Any impacts related to the design and construction aspects in relation to the Mount Davis SCVA should be thoroughly considered in the later stage of the project. The detailed railway tunnel alignment should be optimised as far as possible in later stage of the project in order to preserve the development potential of the SCVA.

6 CONCLUSIONS AND WAY FORWARD

6.1 Highway Connection

- 6.1.1 For the possible schemes of highway connection for the Transport Infrastructure, the affected zone is from the stub ends of Connaught Road West Flyover all along to the New Praya, Kennedy Town. The Davis's Street Pier and Kennedy Town Old Cattle Pier would be temporarily closed during the construction of the Transport Infrastructure and reinstated after construction. Measures have been taken to reduce the impact by dredging works on China Merchant Wharf. The construction area boundary should be carefully planned in Kennedy Town to avoid affecting the existing developments.
- 6.1.2 No housing flats and community facilities would be lost due to the proposed Transport Infrastructure for highway connection. However, loss of the planned open space at Kennedy Town (Belcher Bay) Bus Terminus and the waterfront area of WDPCWA is unavoidable which would be reprovisioned in the detailed design of the Transport Infrastructure or alternative sites would be identified in the further studies. A landscape deck with resting area and viewing pavilion is proposed over the at-grade and depressed part of the Transport Infrastructure to provide space for public enjoyment and to reduce the visual impact. A stepped roof-top is also proposed to cover the tunnel portal area for the development of open space or other community uses on top of the tunnel portal area.
- 6.1.3 It is concluded that the highway connection of the Transport Infrastructure has implications on the future development of the waterfront area. Measures had been proposed to ensure the continuation of the waterfront promenade is not severed with sufficient width along the waterfront reserved for provision of walkway as far as practicable.
- 6.1.4 For the Possible Scheme H1-1, H2-1A and H2-1B, zero permanent reclamation can be achieved. However, a permanent reclamation of about 1.0 Ha or 2.7 Ha within Victoria Harbour are needed for the implementation of Route 4 Extension under Possible Scheme H2-1A (Route 4 Extension by bridge) or H2-1B (Route 4 Extension by tunnel) respectively. In addition, the implementation of Route 4 Extension would have an affected water area of about 14.6 Ha or 0.7 Ha within Victoria Harbour for Possible Scheme H2-1A or H2-1B respectively.
- 6.1.5 Possible Scheme H2-3 has a permanent reclamation of about 0.6 Ha to 1.2 Ha within Victoria Harbour for the implementation of Route 4 Extension.
- 6.1.6 It is concluded that temporary reclamation will be required and permanent reclamation will not be required for the development of the Transport Infrastructure under the scenario without linkage to the potential Route 4 Extension. Under the scenario with potential Route 4 Extension, permanent reclamation will be required when the Extension materialise. Before that, only temporary reclamation will be required.

6.2 Railway Connection

- 6.2.1 The railway connection of the Transport Infrastructure may run through some underground areas and temporary occupation would be required during construction.
- 6.2.2 No housing flats, community facilities and open space would be lost due to the proposed Transport Infrastructure for Railway Connection. The protection requirements for existing structure will be developed with geotechnical information obtained in future studies. All new buildings and engineering works including utilities works within the limits of the route protection boundary shall be subject to special scrutiny of the Government prior to giving approval to any plans and/or consent for commencing construction work.

- 6.2.3 The impacts due to the new railway connection of the Transport Infrastructure also include the interface with the existing KET station and WIL overrun tunnel. For Possible Scheme R1-1, connection to the existing WIL overrun tunnel would be difficult. For Possible Scheme R2-1, modification works are required to connect the two stations via an interchange subway.

6.3 Way Forward

- 6.3.1 The implications on developments at Kennedy Town identified in this Study should be taken into consideration in the future stages of the implementation of Transport Infrastructure for connecting Kennedy Town to ELM. As the exact alignment of the Transport Infrastructure is yet to be fixed, the affected land lots assessed in this report will be subjected to review by further studies.
- 6.3.2 The Preliminary TTIA carried out under this project studied and identified the recommendations on the requirements for the new transport infrastructure or upgrading/improvement works to cater the development of ELM. The Preliminary TTIA was carried out to facilitate the development of possible highway and railway connection schemes between ELM and Kennedy only and was based on various assumptions made on the forecast and development. A Detailed TTIA shall be carried out in future to verify the assumptions, results and assess the impacts on the local road networks.
- 6.3.3 A Detailed Marine Traffic Impact Assessment and Navigation Simulation should be conducted in future studies to further assess the marine traffic impacts arising from the Project and the associated marine works; and to recommend mitigating measures to maintain marine safety, alleviate/minimize the impacts and effects to an acceptable level. In addition, detailed assessments on the possible underwater blasting and the subsea diving operations concerned should be provided in future studies to ensure the feasibility and safety of the proposed construction methods.
- 6.3.4 Under this feasibility study, only three nearby existing man-made features are located within 100m from the possible alignment schemes for highway connection but they would be unlikely to affect or be affected by the proposed works. These 3 man-made features are located at Green Island and are far away from the proposed works. No tunnelling operations will be undertaken in the proximity of these features. Hence, the proposed works would not be likely to have adverse effect on the stability of these existing man-made features. Besides, no natural terrain hazards exist since the possible highway alignment is located within offshore areas. A total of 196 nos. of existing man-made slopes and retaining walls have been identified within a distance of 100m from the possible alignment schemes for railway connection, of which eleven existing man-made features that could affect, or be affected by, the proposed underground station adjacent to Kwun Lung Lau Estate under Scheme R2-1. The potential impact on these features should be assessed at the later stage of the project.
- 6.3.5 At the later stages of the project after the alignment is confirmed, all existing man-made features which could affect or be affected by the proposed project and natural terrain catchments that may affect the proposed project shall be further studied and the necessity of slope works and hazard mitigation measures shall be assessed.
- 6.3.6 A Geotechnical Assessment shall also be carried out for the possible development option at the Study/investigation/Preliminary Design Stage to define the scope and programme of necessary slope works and hazard mitigation measures to be carried out under the project.
- 6.3.7 Many sections of the proposed highway and railway alignment have very few ground investigation records, particularly the offshore/marine areas and the section of the alignment beneath Mount Davis. Recommendations for further ground investigation works, to be carried out in the subsequent feasibility/investigation level assignment, are described below. These GI works will need to be supplemented with further ground investigation works in the preliminary/detailed design stages. For tunnelling works, more ground investigation works

- should be proposed and undertaken with reference to GEO Technical Guidance Note TGN No. 24 during the preliminary/detailed design stage.
- 6.3.8 The land GI works should include vertical boreholes, with installation of standpipes and groundwater monitoring, to determine the rock head profile, assess the soil/rock properties and hydrogeological conditions for the land portion of the alignment.
- 6.3.9 The marine GI works should include vertical borehole and Cone Penetration Tests for the marine portion of the alignment to provide general information on the ground conditions and to better characterise the marine deposits/alluvium for the design purpose.
- 6.3.10 In addition to the above recommended marine ground investigation works, it is also recommended to undertake marine geophysical survey along the possible alignment of the proposed transport infrastructure. The survey is considered to be a more cost-effective method than marine ground investigation since it can provide an efficient determination of ground conditions with wider coverage. The wider coverage of data can cater for the possible future adjustments to the possible alignment and also identify areas where rock excavation works could be minimised.
- 6.3.11 Moreover, since there are uncertain marine archaeological potentials, it is recommended to conduct a Marine Archaeological Investigation (MAI) along the alignment in future studies of the project. Marine Archaeological Investigation (MAI) should be conducted prior to commencement of any marine ground investigations which may produce potential marine archaeological impact.
- 6.3.12 The feasibility of IMT in regards to marine traffic and transport will need to be fully ascertained in future studies with a detailed Marine Traffic Impact Assessment and stakeholder consultations to look into any mitigation measures for possible impacts on marine traffic and port facilities.
- 6.3.13 All possible options/schemes for the Highway Connection would affect the WDPCWA, which had been included in the Western Harbourfront Conceptual Master Plan. As PCWA operation serve important economic and social functions for Hong Kong, the re-provision of WDPCWA should be explored in details in future studies along with Western Harbourfront Conceptual Master Plan and development of ELM where it may be considered as one of the potential re-provisioning sites subject to the timing, land use compatibility and availability of land access, etc. WDPCWA is essential for cargo handling industry and in particular for cargo transport to outlying islands in Hong Kong. Hence, relevant stakeholders, including the WDPCWA cargo operators, should be consulted at the earliest opportunity in future stage of the project if their operation is affected by the construction of the Transport Infrastructure and if re-provisioning of WDPCWA is required.
- 6.3.14 Strategic Environmental Assessment including comparison of the environmental benefits / disbenefits as well as assessment on the relevant environmental aspects shall be conducted in future studies for the development of ELM, so that the comprehensive evaluation and findings can be incorporated in the development of the Transport Infrastructure. The study area and scope of the assessment shall be determined in consultation with EPD when appropriate in future studies.
- 6.3.15 It is noted that the possible schemes for railway connection may have potential impact on the historic buildings/items at Mount Davis area and the surrounding area. This Study has considered historic buildings that were confirmed on or before 7 September 2017. The project proponent is required to observe the Development Bureau Technical Circular (Works) No. 6/2009 regarding Heritage Impact Assessment Mechanism for Capital Works Projects, in future studies of this Project and take the action as required according to the Circular.